



**UNIVERSITÀ
DI PAVIA**

Department of Economics and Management
Master in International Business and Entrepreneurship
International Management

**PORTFOLIO MANAGEMENT FOR
SUSTAINABLE FINANCIAL SUCCESS**

*Gestione di portafogli per un rendimento finanziario
sostenibile*

Supervisor:

Prof. Mario Alessandro Maggi

Student:

Isabella Danieli

Anno Accademico 2023-2024

Index

ABSTRACT	3
INTRODUCTION	7
1 - LITERATURE REVIEW	11
1.1 Corporate Social Responsibility	11
1.2 Socially Responsible Investments	14
1.3 Environmental Social Governance Indices.....	16
1.3.1 ESG and Sustainable Development Goals.....	20
2 - THEORETICAL FRAMEWORK.....	25
2.1 Portfolio Selection and Traditional Investments.....	25
2.1.1 Risky and Risk-less Assets.....	26
2.1.2 Single Index Models	31
2.1.3 Risk and Performance	33
2.1.4 Traditional Indices Calculation	35
2.2 ESG Indices and Sustainable Investments.....	37
2.2.1 ESG Rating Agencies Methodologies.....	39
2.2.2 ESG Investing Strategies	43
3 - METHODOLOGY: PORTFOLIO MANAGEMENT	47
3.1 Data collection	47
3.2 Investment Strategies.....	52
4 - ANALYSIS OF THE RESULTS	59
4.1 Traditional and ESG Investments Comparison.....	59
4.2 Sub-period analysis.....	65
5 - CASE STUDY: B CORP.....	71
5.1 Overview of B Corporations	71
5.2 B Corporations and SDG	75
CONCLUSION	79
BIBLIOGRAPHY.....	83

ABSTRACT

This thesis addresses the integration of Environmental, Social, and Governance (ESG) factors into investment strategies, juxtaposing traditional portfolio management theories with sustainable investing practices. The study begins with a comprehensive literature review, tracing the evolution from Corporate Social Responsibility (CSR) to the significance of ESG criteria in investment decisions, followed by an overview of traditional investment theories. A practical portfolio analysis is then conducted, examining the performance of various sustainable investment strategies compared to a traditional equally-weighted portfolio as a benchmark. Using data extracted from LSEG for 2018-2023, the study constructs portfolios based on different ESG screening methods, including negative and positive screenings and thematic investments. The results indicate that sustainable investment strategies can effectively achieve positive financial returns and high ESG scores, often with comparable or lower risk than traditional strategies. Specifically, the ESG combined negative screening demonstrated superior risk-adjusted performance, particularly during crisis periods such as the Covid-19 pandemic and geopolitical conflicts. The thesis also explores B Corporations as prototypes of ideally sustainable companies, underscoring their ability to balance high levels of sustainability with financial success. Through detailed analysis and comparison, this study confirms that incorporating ESG factors into investment strategies can positively impact both financial and non-financial performance, offering a viable pathway for achieving economic benefits while contributing to broader sustainability goals.

ABSTRACT

Questa tesi affronta l'integrazione dei fattori Environmental, Social e Governance (ESG) nelle strategie di investimento, contrapponendo le teorie tradizionali di gestione del portafoglio alle pratiche di investimento sostenibile. Lo studio inizia con una revisione della letteratura, tracciando l'evoluzione dalla Responsabilità Sociale d'Impresa (CSR) all'importanza dei criteri ESG nelle decisioni di investimento, seguita da una panoramica delle teorie di investimento tradizionali. Viene poi condotta un'analisi di portafoglio, esaminando la performance di varie strategie di investimento sostenibile rispetto a un benchmark. Utilizzando dati estratti da LSEG per il periodo 2018-2023, lo studio costruisce portafogli basati su diversi metodi di screening ESG, inclusi screening negativi e positivi e investimenti tematici. I risultati indicano che le strategie di investimento sostenibile possono ottenere rendimenti finanziari positivi e alti punteggi ESG, spesso con un rischio paragonabile o inferiore rispetto alle strategie tradizionali. In particolare, lo screening negativo basato sugli score ESG e che tiene conto anche delle controversie aziendali ha dimostrato una performance superiore, soprattutto durante periodi di crisi come la pandemia di Covid-19 e i recenti conflitti geopolitici. Questa tesi esplora anche le B Corporation come prototipi di aziende idealmente sostenibili, evidenziando la loro capacità di bilanciare alti livelli di sostenibilità con il successo finanziario. Attraverso un'analisi dettagliata, questo studio conferma che l'integrazione dei fattori ESG nelle strategie di investimento può avere un impatto positivo sia sulle performance finanziarie che su quelle non finanziarie, offrendo una via percorribile per ottenere benefici economici contribuendo allo stesso tempo a più ampi obiettivi di sostenibilità.

INTRODUCTION

As we draw closer to the deadline for the 2030 Agenda, it is clear that significant signs of progress still need to be made. According to UN DESA (2023), 80% of the targets set to achieve poverty reduction, hunger eradication, peace, and climate goals are either insufficient or in reverse, thus the need for action is urgent. The pursuit of these goals and the incorporation of sustainability into all aspects of human life has also permeated the global investment sector, highlighting the interdependence between economic activities and their effects on society and the environment.

In recent years, there has been a significant global trend towards a more sustainable way of investing and investors are taking Environmental, Social and Governance (ESG) factors into account when making decisions. In comparison to the traditional approach, which purely focuses on financial metrics such as optimization, the Capital Asset Pricing Model and the risk-return trade-off, investors are now becoming more concerned about the long-term development of the company and its positive and negative impacts. For these reasons, while approaching the financial sector, ESG factors are now taken into consideration alongside traditional portfolio theory, domestically and internationally, in the so-called Sustainable Investing. Through these ESG factors, in fact, it is possible to include in investment decisions many issues that were previously ignored, such as community engagement, board diversity and carbon emissions, in order to gain a clear picture of a company's financial and extra-financial performance.

The objective of this thesis is to analyze the recent evolution of ESG factors and their integration into investment strategies in comparison to traditional portfolio management theories. This contrast is explored practically by implementing a portfolio analysis: initially, the portfolio performance of a traditional investment strategy is examined and then sustainability indices based on ESG factors are integrated into the analysis. This empirical study aims to assess whether

sustainable investment strategies can achieve financial success, in terms of high economic return and low risk, alongside the positive outcomes for society and the environment associated with high ESG scores. Additionally, it aims to investigate the behavior in time of sustainable investment strategies compared to the traditional strategy, considering three sub-periods from 2018 to 2023.

With these objectives considered, the main research question that leads this study is whether including ESG factors in investment strategies could have a positive economic return while achieving a positive non-financial impact.

The analysis in this thesis contributes to the discussion on sustainable investing and the effectiveness of integrating ESG factors into the traditional portfolio theory. Managing different investment strategies, this study offers valuable insights into the synergies between financial performance and sustainability, meaning economic return and non-financial outcomes.

Another component of this thesis is the examination of B Corporations, which are presented as a case study as a prototype for ideally sustainable companies.

Chapter 1 begins with a comprehensive literature review of the Integration of Sustainable Practices in Investment Strategies, examining the evolution of Corporate Social Responsibility (CSR) initiatives, the emergence of Sustainable and Responsible Investments (SRI), and the birth of Environmental Social Governance (ESG) indices.

Progressively, in Chapter 2, the theoretical framework for portfolio management is presented. The chapter starts with Portfolio Selection methodologies, including traditional approaches such as Markowitz's portfolio optimization and the Capital Asset Pricing Model (CAPM), also considering contemporary models like multi-factor models. Then, Risk-Adjusted Measures are analyzed. The chapter concludes with the calculation methodologies of traditional indices and the essential notions of Sustainable Finance referring to ESG indices, with a focus on the main ESG Investing Strategies.

In Chapter 3 the methodology employed in the study is elucidated, focusing on data collection, the creation of the dataset for the portfolio analysis and the presentation of the investment strategies applied. Moving forward, Chapter 4 presents the results of the various investment strategies, as well as a sub-period analysis to determine the effect that Covid-19, the energy crisis and the recent wars had on risk and returns.

The case study on BCorp is presented in Chapter 5, providing an overview of the companies, and exploring their relationship with ESG factors. Finally, the Conclusion is presented, summarizing the key findings of the study.

1 - LITERATURE REVIEW

Sustainable investing has undergone significant evolution in recent years, and the body of literature examining the integration of sustainability into investment strategies is extensive. The purpose of this chapter is to provide a literature review of the existing academic papers, articles and empirical findings to date on the practice of sustainable investing. Beginning with the introduction of Corporate Social Responsibility (CSR) initiatives, which represent the first integration of community well-being into corporate practices, the following section looks at the correlated emergence of Sustainable and Responsible Investment (SRI). Finally, the development of environmental, social and governance (ESG) indices as an application of SRI is reviewed, taking into account the empirical research that has already been conducted, with a focus also on the relationship between ESG and the Sustainable Development Goals.

1.1 Corporate Social Responsibility

In their work from 2005, Kotler and Lee offered a broad definition of Corporate Social Responsibility (CSR) as a devotion to enhancing societal welfare and prosperity through voluntary business practices and allocating corporate resources. They highlighted an essential characteristic that differentiates Corporate Social Responsibility from the traditional corporate rules and regulations that companies are required to follow, that is their voluntary nature. As also Vogel affirmed in 2005 “CSR is beyond compliance” so it can be considered a new way of self-regulation (Calveras, Ganuza, Llobet, 2007). The definition of CSR was also provided by some International Organizations. In particular, the European Commission defined CSR as a voluntary effort to integrate social and environmental considerations into company operations and stakeholder interactions, extending beyond mere legal compliance (Commission of the European Communities 2001). Holmes and Watts (2000) from the World Business Council for Sustainable Development highlighted the importance of stakeholders,

characterizing CSR as a corporate commitment to fostering sustainable economic development, achieved through collaborative efforts with employees, families, local communities, and broader society to enhance overall well-being.

The theoretical underpinnings of CSR encompass two opposing perspectives: the neoclassical economic paradigm (Friedman 1970) and the stakeholder perspective, subsequently developed by Edward Freeman in 1984. The theory of Friedman's is based on maximization of profit, the relevance of shareholders in a company's actions, and the idea that externalities should be managed by governments. In this view Corporate Social Responsibility could be described as "unnecessary and inconsistent with profit maximization" (Friedman 1970). On the other side, Freeman considers the influence that management has on the interest of every category of stakeholders, not forgetting the legitimate economic profitability (Freeman 2005). Within this context, as described by Liang et al. (2020), CSR has a strategic function of representing a win-win scenario benefiting not only the company's shareholders but also other stakeholders and society in general. In other words, by getting involved in Corporate Social Responsibility, companies could have long-term positive financial performance and contribute to the long-lasting well-being of the external environment, by "doing well by doing good". (Liang et al. 2020)

In terms of validating the use of CSR, four different approaches were identified by the literature (Charlo et al. 2017). The "Regulation Approach" is the ethical obligation that companies have to act, the "Descriptive Approach" legitimates companies to imply CRS activities, and the "Instrumental Approach" defines CRS as an instrument to achieve competitive advantage. The last methodology is the one adopted in this thesis, meaning the "Strategic Approach". This approach merges the previously mentioned methods and considers CSR as a way to form shared values for the company and the external environment. (Diez-Cañamero et al. 2020)

Many studies have been made to prove the effective concrete benefits of CSR on companies and stakeholders. First to be considered is the study by Sen et al. in 2006, which showed how multifaceted is the impact that CSR activities have. Not only there is an increase in product purchases by customers, as well as “CSR associations, attitudes, and identification but also the intent of stakeholders to commit personal resources” (Sen et al. 2006). Other CSR benefits were identified by Servaes et al. (2013), which proved the relationship between increased customer awareness and CSR activities, and by Edmans (2011), who related higher productivity and satisfaction of employees to CSR actions.

Considering the relationship between CSR and firm performance, meaning the connection between sustainability and economic return, an important contribution is provided by Zhichuan Li et al. in 2019. In their study they created a value-weighted portfolio based on the “100 Best CSR companies in the world” and measured the effects of CSR on the stock market, meaning the firm’s value. To create the portfolio they used scores of CSR performance, based on external communities, workplace environment, and management, and found significant abnormal returns. They concluded that CSR activities are positively related to a firm’s financial performance and that the benefit for shareholders can be long-lasting if CSR itself is considered by management as a strategy for the long-term activity of the company. (Zhichuan Li et al. 2019)

Corporate Social Responsibility (CSR) involves businesses voluntarily contributing to societal welfare and environmental sustainability. This commitment to ethical conduct and stakeholder engagement is the basis of Socially Responsible Investing (SRI), which practically integrates CSR principles into investment decisions.

1.2 Socially Responsible Investments

The term Socially Responsible Investments (SRI) represents the process of financial investment that considers also the social, environmental and corporate governance impacts, differently from the traditional investment strategies that are solely based on economic return (SIF, 2009). The name Socially Responsible Investment derives from the concept of “Ethical Investments”, and is based on the moral principles of investors (Renneboog et al. 2008). The resolutions of these shareholders on environmental and social issues gradually went from non-conventional to mainstream, without overlooking the importance of the positive financial return of their investments (Sparkes et al. 2004). Also Kiyamaz (2019) in his paper reflected on the growing concern of shareholders, meaning investors, on environmental degradation, violations of human rights, and exploitation of laborers. He wrote that SRI reflects the growing “awareness for the social issues influencing living conditions” (Kiyamaz 2019).

This definition of Socially Responsible Investment is consistent with the one given by Schueth (2003), according to which SRI is an investment method that includes individual ethics and collective welfare in investment decision-making. Schueth, along with other scholars, emphasizes also the significance of recognizing that investments in social and environmental initiatives not only improve firm efficiency but also open doors for expansion into new markets. An essential contribution in defining SRI is provided by Berry and Junkus in 2013, who said that “both SRI and non-SRI investors consider environmental factors to be important when deciding how to invest”. According to them, SRI is consistent with the concept of “Doing Well while Doing Good”, and allows investors to invest sustainably following their environmental, social and governance considerations.

Many studies practically investigated the performance of the SRI index, to understand whether the inclusion of Corporate Social Responsibility (CSR) in investment strategies would improve financial performance. On one side,

advocates of the traditional portfolio theory like Clow (1999) argue that Socially Responsible Investments using exclusion constraints and a selective approach, reduce investment possibilities and the diversification of the portfolio therefore increasing the risk. This view is refuted by Diltz, who previously (1995) suggested that the effect of under-diversification of the stock markets will have little effect on the performance of the SRI portfolio, given the vastness and liquidity of the market. On the other hand, higher performance on SRI funds relative to non-SRI funds was found by Lean et al. in 2015. In particular, they did a comprehensive study based on 10-year data, with a sample covering almost 250 US SRI funds and twice as many European funds. They discovered that Socially Responsible Investments outperform the market benchmark, meaning that investors in these funds “do not need to sacrifice financial performance to satisfy their environmental, ethical, and social concerns” (Lean et al. 2015).

Despite these two opposite views and findings, most of the studies on SRI performance compared to non-SRI did not reveal significant differences in financial performance. Revelli and Viviani in 2014 did a meta-analysis of the previous studies to test whether there is a positive or negative relationship between the financial performance and SRI, to test whether the inclusion of Corporate Social Responsibilities in financial decisions is profitable or not. They found out that there is no significant cost or benefit in investing in SRI, nevertheless, they highlighted the importance of going beyond the financial performance of Socially Responsible Investments and of the considerations of their extra-financial benefits. A first example confirming their theory is the study of Bello, published in 2005. He studied socially responsible funds compared to conventional ones, considering the characteristics of the assets in the fund, the diversification and the performance of the portfolio and found out that there is no significant difference in any aspect considered. Also, Managi et al. in 2012 did not find any statistical difference in means and volatilities of SRI indexes in the UK, US and Japanese markets. Another study on SRI performance was conducted by the previously mentioned Kiyamaz in 2019. He studied 152 SRI funds in a 20-year

time range with different factor models and unveiled that the returns of SRI compared to their benchmarks are comparable. To conclude, Lean and Pizzutilo in their 2020 study, analyzed also Socially Responsible Investment Indexes, instead of mutual funds. They studied excess returns on investments based on SRI and non-SRI indexes during crisis and non-crisis times and found no evidence of asymmetries in the return.

In contrast with traditional investment strategies, Socially Responsible Investing (SRI) emphasizes the integration of Social, Environmental and Governance criteria into investment decisions. This approach is not only consistent with the principles of Corporate Social Responsibility (CSR) but also with the broader framework of Environmental, Social and Governance (ESG) considerations. ESG factors have become increasingly important in portfolio management, reflecting a growing recognition of the link between financial performance and sustainable business practices, so that they can be seen as the driving force behind Socially Responsible Investments.

1.3 Environmental Social Governance Indices

Building upon the principles of Socially Responsible Investing (SRI), Environmental, Social, and Governance (ESG) indices focus on sustainability and ethical considerations in investment strategies and rapidly became key metrics for evaluating companies' performance and risk profiles. As stated in the “ESG Investing: Practices, Progress and Challenges” published by OECD in 2020: “ESG scoring and reporting has the potential to unlock a significant amount of information on the management and resilience of companies when pursuing long-term value creation”. The literature around ESG is vast and in expansion, with many studies analyzing various aspects of the topic.

As many scholars described, ESG rating can be considered the response to the growing demand by investors for disclosure about Corporate Social Responsibility (CSR) practices. They are extra-financial ratings that evaluate

companies and their policies based on some criteria that are not solely and strictly related to financial performance. The terms CSR and ESG, as confirmed by the Corporate Governance Institute (2024), are not interchangeable: the first, as described previously, refers to the attention of the company to its stakeholders and the commitment to sustainable practices, whereas the latter represents the criteria used to evaluate those activities and are provided by specialized rating agencies. As Escrig-Olmedo et al. highlighted, ESG indices and rating agencies were proliferating already in 2010, trying to help investors include sustainability in their investment decisions but with no standard methodology. Despite some differences in the weights that any agency gave, Escrig-Olmedo et al. always found comparable ways of calculating the indices. In particular, they determined that the foundations for the calculations were some specific global standards and an adapted Stakeholder Model, over which companies were rated by combining positive criteria, such as Environmental Management and Supply chain labor standards, and negative criteria.

It is difficult to pinpoint an exact moment when the term was coined, but there are studies analyzing the relationship between Environment (Env), Social (Soc) and Governance (Gov) factors and economic return and financial performance of companies since the 1970s. A fundamental contribution summarizing all the studies related to this topic was provided by Friede et al. in 2015. They conducted a meta-analysis combining results of primary and secondary academic papers that investigated the relationship between ESG and financial performance in the previous 40 years, for a total of 2200 individual studies. In this dataset, they sometimes found contradictory results, but the conclusion of their analysis is clear. They found a non-negative relationship between ESG criteria and the financial performance of companies in almost 90% of the analyzed cases. Moreover, this relationship was positive in most of the studies. In other words, “investing in ESG pays financially” (Friede et al. 2015). Another relevant finding is the stability of this relation over time, meaning the time invariability of the ESG financial performance pattern. (Friede et al. 2015)

In 2023 Atz et al. continued Friede's et al. analysis, by surveying almost 1200 primary papers and 27 meta-reviews that were published between 2015 and 2020, offering an updated version of the previous study. Their objective was to understand whether ESG strategies effectively bring better financial performance by summarizing the results of the multitude of studies that have been carried on in those 5 years. The main result of their research confirms what was previously found by Friede et al. in 2015, meaning that the financial performance of investment strategies based on ESG is, on average, not distinguishable from traditional investment strategies. Moreover, considering the broader term "sustainability" they also found a significant positive correlation with financial performance.

Looking at specific studies that have examined the impact of ESG criteria on companies' economic returns and financial performance, Giese's et al. research in 2019 is an example. They investigated the linkages between MSCI ESG ratings of companies and their systematic and idiosyncratic risk profiles which consequently would affect their equity valuation and performance. More specifically, they uniquely evaluated three channels, namely valuation, risk and cash flow channels, for the transmission of the ESG information in the risk-return profile of portfolios. Their empirical study suggests that modifications of the Environmental, Social and Governance ratings of companies are indicators of their financial performance. Another relevant study, but with a different perspective, was carried out in 2020 by Abate et al. They conducted an empirical analysis of mutual funds in Europe and tried to assess whether European mutual funds with high ESG scores had better risk-adjusted performance than the ones with low ESG ratings. Despite considering mutual funds, differently from Giese et al. and other studies, their results are consistent with the studies of Friede et al. and Atz et al. They confirm the positive relationship between ESG and financial performance and prove that investments in funds with high ESG ratings are more financially efficient.

Among others, Bermejo et al. in 2020 verified the positive relationship between ESG disclosure and high return growth from one side and the negative effect on the volatility of the portfolio on the other side. Their panel-data research is based on financial ratios and the information provided by Bloomberg for a group of 6211 European ESG-rated companies in the period 2006-2019. They also shed light on another relevant characteristic of ESG-related investments, which is the strong effect that the Governance pillar has on the financial performance of companies compared to the Environmental and Social pillars. The relevance of factor G is highlighted also by Lopez de Silanes et al. (2022) who focused on the Bloomberg disclosure ratings. They analyzed the positive impact that ESG scores of companies have on the portfolio decisions of institutional investors, evaluating both ESG total scores and individual ESG factors scores. As far as the Governance factor is concerned, they confirmed the strongest effect that this pillar has on the financial performance, in particular with a higher Sharpe ratio and lower betas, indicating better risk-return performance and lower systemic risk exposure.

Worth noting is also the study of Pedersen et al. (2020), who were able to integrate ESG investments into the traditional investment strategy and portfolio theory. They explicitly derived and conceptualized the ESG-efficient frontier, building a theoretical framework for ESG integration in portfolio management. They also deduced an ESG-adjusted CAPM that determines the equilibrium asset prices in heterogeneous market environments, which makes ESG scores good or bad influencers of returns. Apart from this theoretical foundation, Pedersen et al. also tested their theory with ESG proxies and their results confirmed the relevance of the Governance (G) factor for positive returns, consistent with the prior literature.

In terms of the volatility risk associated with ESG-based investments, an important study to be considered is the one conducted by Kumar et al. in 2016. They examined different companies either listed on the Dow Jones Sustainability

Index or not, for 2 years. Comparing ESG firms and their peers in the same industry, they found lower volatility of the performance of stocks related to ESG companies in all 12 industries considered. Moreover, they also highlighted how the inclusion of ESG considerations in the industries increased the risk-adjusted return, taking the Sharpe ratio as a measure. They called this connection between lower risk and higher risk-adjusted return “hidden value of ESG investments” (Kumar et al. 2016). Hoepner et al. in 2017 investigated the volatility risk of investments based on ESG too, but, differently from the previous study, their unique research was based on pension funds. No matter the dissimilar basis for the analysis, the results are comparable to the previous one. Specifically, Hoepner et al. first found lower downside volatility in investments in pension funds that considered ESG factors compared to the non-inclusion of ESG elements. Secondly, they also confirmed previous studies in determining that ESG integration in investment strategies has a non-negative financial effect.

Many other scholars delved into different aspects of ESG ratings, disclosure, regulations and performance, but the following subparagraph of this thesis aims to shed light on some studies analyzing the influence that ESG has on Sustainable Development. More specifically, the 17 Sustainable Development Goals are taken into consideration, being clear indicators of the progress towards a fairer, cleaner and more sustainable world.

1.3.1 ESG and Sustainable Development Goals

Providing a more holistic consideration, several studies analyzed the impact that ESG considerations have on Sustainable Development. In particular, a positive relationship has been highlighted by examining the correlation between ESG scores and the Sustainable Development Goals.

Sustainable Development Goals consist of 17 interlinked goals included in the 2030 Agenda for Sustainable Development and were promulgated by the United Nations in 2015. Each Goal is divided into targets focused on specific issues

related to that goal. They represent “an urgent call for action of all countries” (United Nations), a partnership to eliminate all kinds of inequality, boost economic growth, tackle the well-being of the population and protect the planet by fighting climate change. In other words, they foster Sustainable Development of every kind, leveling the economic, environmental and social spheres, everywhere, now and in the future. (United Nations)

One of the first studies that delved into the relationship between SDGs and Refinitiv ESG scores was conducted in 2021 by Khaled et al. In their piece of research, they were able to map the 169 targets of the Sustainable Development Goals with the different ESG scores given to firms, representing their sustainable practices. They highlighted the linkages between them and the positive effect that progress on specific ESG issues can have on specific SDG targets. The second important insight is given by Bekaert et al. in 2023. They first analyzed the relationship between ESG and alpha of a sector-neutral portfolio MSCI ESG, to determine whether it was possible to have higher alphas compared to other portfolios, in the specific the MSCI US index. Then, they also deepened their research by investigating the impact that those portfolios had on SDG. The output of this research, for the data considered, is the positive link that they found between the alpha of the portfolio, its ESG score momentum and the SDG impact.

A significant contribution has been provided in a Joint Discussion Paper from the OECD and MSCI by Eastman et al. in 2018, which worked together to explore the relationship between institutional investing and the Sustainable Development Goals. This paper suggests establishing a comprehensive framework for discussing investment choices and exploring the potential involvement of institutional investors in achieving the SDGs. The main idea underlying this concept is that companies can support SDG achievement by improving their Positive Impacts, decreasing their Negative Impacts and Promoting Improvement from other companies. Given that, they propose a theoretical investment index for institutional investors in public equity markets to address each specific

requirement of the SDGs. The aim was to align investment decisions to SDGs in a transparent, measurable, flexible and scalable way. After 6 years, in January 2024, the “MSCI SDG Alignment Methodology” was finally promulgated. In this Methodology positive and negative contributions toward SDG achievement are weighed against each other, measuring the overall alignment of the company with each Goal. More specifically, the “Net Alignment Score” is calculated as an average of the underlying positive or negative elements of the Product Alignment and the Operational Alignment for each target of all the Sustainable Development Goals. Figure 1. summarizes the technique to measure the “Net Alignment Score”. The methodology is built by combining publicly available data from the dataset of MSCI ESG Research and is still under study, but offers a significant connection between the ESG scoring of companies and their contribution to SDG achievement. Figure 2. represents an example of the methodology to assess the impact of companies on SDG 7, with a recap of the targets and the division per Product Alignment and Operational Alignment.

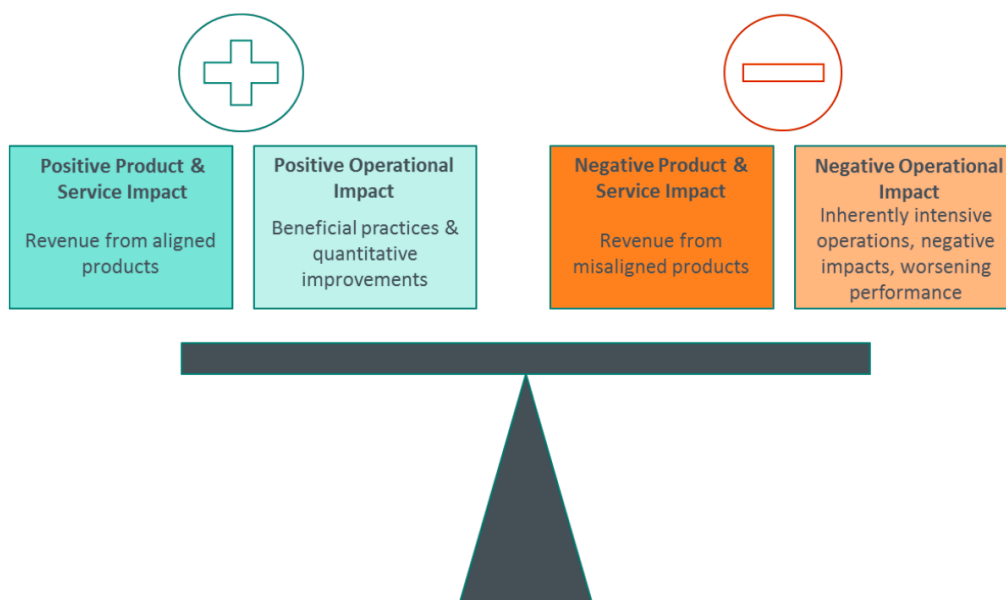


Figure 1. Net SDG Alignment - Source: MSCI ESG Research

SDG 7: Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all

SDG 7 Targets:

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support

Product Alignment	
Revenue from products and services with positive impact	<ul style="list-style-type: none"> - Alternative energy generation & turbine manufacturing, including hydropower - Demand-side management - Smart grid
Revenue from products and services with negative impact	<ul style="list-style-type: none"> - Electric power generation from fossil fuels - Oil & gas exploration and production or coal mining - Fossil fuel turbines
Operational Alignment	
Metrics indicating positive impact	<ul style="list-style-type: none"> - Targets for carbon reduction or energy-efficiency enhancement - Using energy from renewable sources
Metrics indicating negative impact	<ul style="list-style-type: none"> - Ownership of fossil fuel reserves - Over 20% of operations are in business activities that are typically carbon-intensive - Controversies related to the following: <ul style="list-style-type: none"> Environment: <ul style="list-style-type: none"> • Energy and climate change Customers: <ul style="list-style-type: none"> • Restricted access to products and services by utilities • Predatory fraud and billing by utilities • Product and service safety/quality by utilities
Performance metrics	<ul style="list-style-type: none"> - Trend in energy consumption intensity

Figure 2. SDG 7 - Source: MSCI SDG Alignment Methodology January 2024

2 - THEORETICAL FRAMEWORK

After reviewing the literature on sustainable investment practices, the theoretical framework is here presented, outlining the main concepts and models related to traditional investment strategies and portfolio theory. This chapter presents the theoretical foundation for the methodology discussed in the following section. It encompasses essential elements for understanding and answering the research question of this thesis, i.e. assessing the financial impact of investment strategies based on ESG factors and comparing them with traditional investments.

The first section presents the theory of portfolio selection, including key related concepts such as risk and return and portfolio optimization. It also reviews the Markowitz Model, Capital Asset Pricing Model, and Multi-factor Models. It then examines traditional investment strategies, considering risk-adjusted performance measures, as well as the main methods for calculating traditional indices. The paragraph concludes by discussing ESG index calculation and sustainable investments, reviewing the methodology of the main ESG rating agencies to understand their rationale and way of working. Finally, the major sustainable investment strategies are presented theoretically, to better explain the choice of strategy used in the empirical analysis that follows.

2.1 Portfolio Selection and Traditional Investments

While considering any type of investment, investors are concerned about two essential elements: risk and return, on which the assumption of the investors' model is based. The first assumption is that investors are risk-averse, meaning that they prefer low-volatility assets and investments with low uncertainty. Many factors can influence investments and their uncertainty, such as the maturity, the characteristics of the issuer and the type of market. The second assumption is that investors are non-satiable, which means that they prefer assets with higher returns. In particular, return indicates the holding period return (HPR) and is measured

with the compound formula. The change in the market price of the security is summed with any other income received in the period and divided by the initial price of the security, following the formula $r_t = \Delta P_t / P_{t-1}$. (Elton et al.)

2.1.1 Risky and Risk-less Assets

To deal with risk and return, companies use portfolios, which are collections of assets. Given $x_1, x_2 \dots x_n$ the weight of n assets on the portfolio so that their sum is equal to 1, the return of the portfolio is the weighted sum of components' returns. It is also possible to express this relationship in terms of expected return:

$$R_p = \sum_{i_1}^N x_i r_i \quad \mu_p = \sum_{i_1}^N x_i E(r_i)$$

Considering uncertainties, a commonly used measure for the risk associated with the portfolio is the variance, namely the dispersion of outcomes from the mean. The formula is a little more complicated than the one for the return and is composed of two parts. The first term is the sum of the variance of the returns of the single assets, multiplied by the squared weight of the asset. The second term represents the covariance through a double sum of the multiplication of the weights of the assets, two at a time, and their covariance. In many cases, the covariance is standardized and substituted in the formula by the correlation coefficient. Considering two securities i and j , the correlation ρ_{ij} is the covariance divided by the product of the two standard deviations. (Elton et al.) In formula:

$$\sigma_p^2 = \sum_{i=1}^N x_i^2 \sigma_i^2 + \sum_{i=1}^N \sum_{j=1, j \neq i}^N x_i x_j \sigma_i \sigma_j \rho_{ij}$$

The specific choice of the portfolio depends on the so-called risk-return criterion, meaning that assets with higher expected returns $\mu_A > \mu_B$ and lower risk $\sigma_A^2 < \sigma_B^2$ are preferred. This theory is also called Markowitz's Mean-Variance Optimization Model and was introduced by the economist Harry Markowitz in 1952. Diversification of the portfolio is essential to limit the effect of the correlation coefficient between the assets. International diversification may serve this

purpose, being the correlation coefficients between international markets particularly low compared to intra-country (Elton et al.). Looking at the formula, when $\rho_{ij} < 1$ the portfolio standard deviation is less than the weighted average of the standard deviations of the underlying assets, therefore diversification has a positive effect on the portfolio return. Focussing on the characteristics of the risk to which assets are subjected, two main parts can be identified. The first is the market risk, also called systematic and non-diversifiable risk, which comprehends all the risk factors common to the whole economy, such as inflation, interest rates and exchange rates. The latter is the firm-specific risk, called nonsystematic and diversifiable risk, that is uniquely related to the asset and is the one that can be limited through diversification. (Bodie et al.)

As far as the weights of the portfolio are concerned, they can be both positive and negative. In the first case, the investor buys assets and is in a long position. In the second case, the investor sells stocks that does not own, thanks to a borrower, to buy them back later. In this transaction, the investor is in a short position. Short selling is an important instrument that investors could use and allows them to adopt either a speculative position, increasing their risk, or a defensive position, reducing it. This type of selling is complicated, but can be useful when investors expect a negative return on a specific asset or when the cash flow generated from the initial short selling of an asset is profitably used to buy another asset with a higher return. (Elton et al.)

Theoretically considering all possibilities of risk and return for combinations of risky assets, it is possible to identify a diagram in the risk-return space. In this diagram, it is feasible to determine a set of portfolios considered to be efficient, referring to the concept of Pareto efficiency in terms of trade-off between risk and return. This set of portfolios consists of the envelope curve of all the portfolios between the portfolio with the minimum variance and risk, and the one with the maximum return. The portfolio with the lowest feasible risk is called the Global

Minimum Variance portfolio and the set of efficient portfolios on this curve is called the Efficient Frontier of risky assets, as presented in Figure 3.

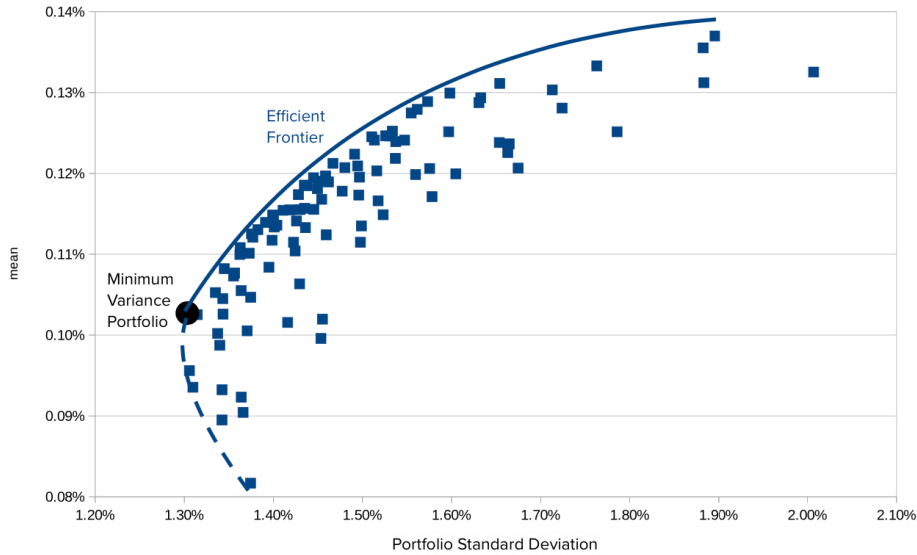


Figure 3. The efficient frontier of risky asset

The optimal portfolios stay on the efficient frontier but the choice of the portfolio depends on the individual preferences about risk-return combinations, that is represented by the shape of the utility function of the investor. When short sales are allowed, the efficient set expands and has no finite upper and lower bound. Short selling allows investors to achieve returns that exceed any fixed upper limit and risks that exceed the lower limits, as shown in Figure 4 (Bodie et al.)

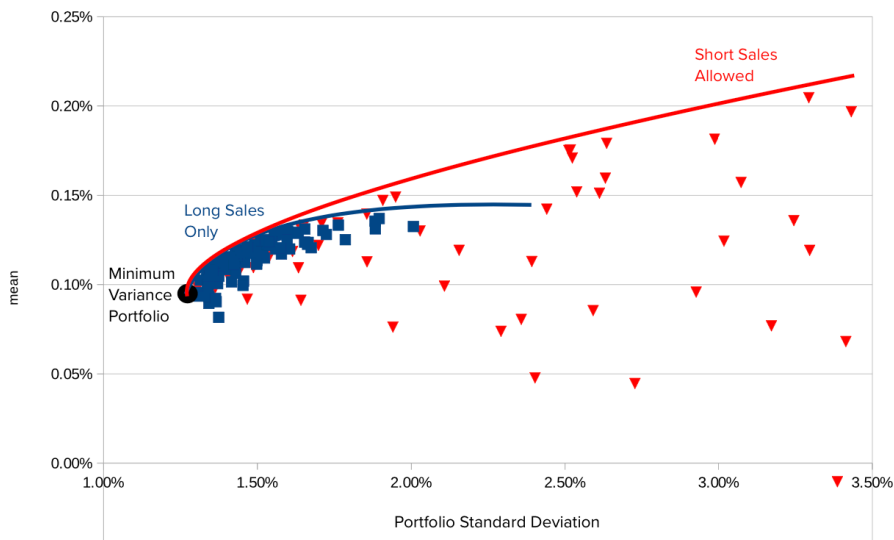


Figure 4. The efficient frontier with Long or Short sales

The efficient frontier changes also in the case of risk-free assets. As Fabozzi and Grant (2001) described, these assets are securities with a certain return and a standard deviation equal to zero, meaning that their future return will be realized with certainty. A common example of risk-free securities is the short-term obligation of the US government, also known as Treasury Bills. By including these types of assets in the analysis, it is possible to define a new efficient frontier, in which the investors can both borrow and lend at the risk-free rate. Every combination of risk-free securities and risky assets stays on the Capital Market Line. This new frontier is a straight line, as presented in Figure 5, starting from the risk-free on the vertical axis and linearly increasing tangential to the previously analyzed Markowitz efficient frontier and the point of tangency is the portfolio M , which contains risky assets only. Specifically, according to the CML, considering a combination of a portfolio of risky assets M and the risk-free rate, there is a positive relationship between the expected return of the portfolio and the standard deviation of the portfolio:

$$\mu_P = r_f + \frac{\mu_M - r_f}{\sigma_M} \cdot \sigma_P$$

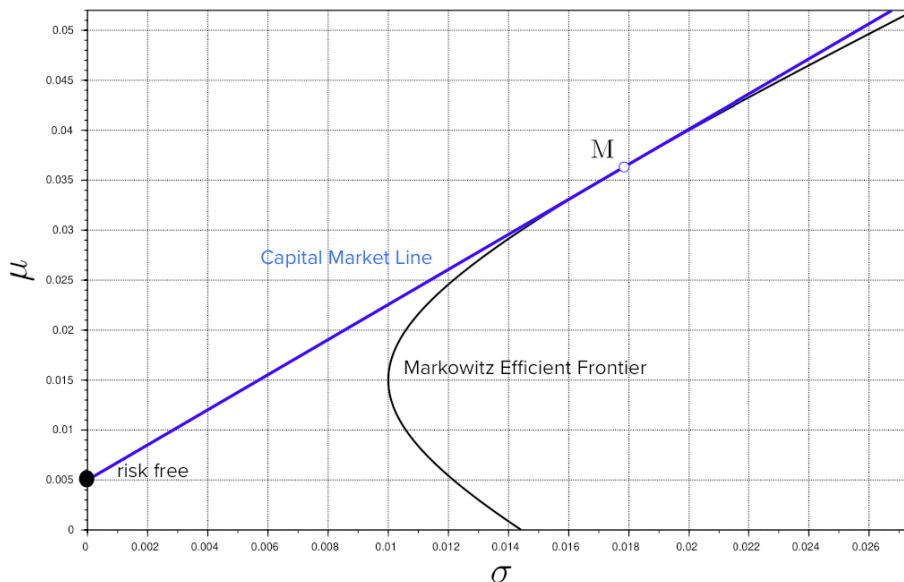


Figure 5. The Capital Market Line

M is the Market Portfolio, which proportionally contains all risky assets available to the investors, and that is the only optimal portfolio containing risky assets (Elton et al.). The choice of the portfolio P is composed of the determination of the optimal risky portfolio M at first, and then the choice of the best mix of risky portfolio and the risk-free assets. Portfolios on the CML that are to the left of M are combinations of risky and risk-free assets, whereas portfolios to the right of M are made of risky assets purchased with funds at the risk-free rate. This dual choice of risky and risk-free assets is called separation property, by James Tobin (1958). (Bodie et al.)

In deeper analyzing the return of portfolios, statistical models exist that allow to estimate the component of systematic and diversifiable risk for portfolios, known as Index Models. According to the single index model, the return on a stock depends on a component independent from the market index α , the rate of return on the market index R_M , the sensitivity to the market factor β and an uncertain element called e with mean equal to zero and uncorrelated with the market, in formula:

$$R_i = \alpha_i + \beta R_M + e_i \quad \text{where} \quad \beta = \frac{Cov(r_i, r_M)}{\sigma_M^2}$$

The excess return independent from the market index is expressed through the parameter α , which is also used by investors to assess the attractiveness of the stock. In general, the higher the parameter, the more underpriced the security and the higher the expected return. The situation changes when short sales are allowed because while constructing a portfolio, a negative alpha on a stock may be even better than a positive one and allows investors to take a short negative position in that stock and turn that alpha positive. The other parameter, β , determines the characteristics of the stock. If $\beta > 1$ the stock has a great sensitivity to the macroeconomy and is defined as cyclical, whereas if $0 < \beta < 1$ the stock is defensive and if $\beta < 0$ it is an hedge. With some manipulation, it is possible to derive also the relationship between the total variance of the stock and the two components of risk. The systemic risk depends on market uncertainties and is

related to the variance of the return on the market index and on β , being calculated as $\beta_i^2 \sigma_M^2$. The firm-specific risk is independent of market performance and is $\sigma^2[e_i]$. It is then possible to make the same analysis considering portfolios, being β_P and α_P the weighted average of the parameters of the stocks in the portfolio. (Bodie et al.)

2.1.2 Single Index Models

Index models are often adopted to explain some equilibrium models, that were developed to determine a prediction of the relationship between the expected return and risk of an asset. Among them, the masterpiece is the Capital Asset Pricing Model (CAPM), developed by Treynor, Sharpe, Lintner, and Mossin in the early 1960s, and offers a simple but fundamental benchmark to evaluate investments. The model is based on rigorous assumptions, which however do not limit its capacity to predict prices: perfect competition, no frictions (no income taxes, no transaction costs, infinite divisibility), unlimited short sales, unlimited lending and borrowing at the risk-less rate allowed, all assets are marketable and liquid, there is one single period and investors have mean-variance preferences and homogeneous expectations. One of the main outcomes of the mean-variance model and the CAPM is the two-fund theorem, according to which all investors would hold a combination of the market portfolio M and the risk-free rate, meaning that all portfolios stay on the straight Capital Market Line (CML). Given these assumptions, by combining the CML and the aforementioned Index Model, it is possible to derive the CAMP relation, known as the Security Market Line:

$$\mu_i = r_f + \beta_i(\mu_M - r_f)$$

This equation sets the relationship between expected return and beta. Manipulating the formula, it is possible to derive the equilibrium between the excess return of the single asset $\mu_i - r_f$ and the market risk premium $\mu_M - r_f$, which is proportionate to beta. Thus, being β the unavoidable risk related to the

market and the only one rewarded, the specific risk of the single asset is the only one remaining and it can be efficiently reduced by increasing the assets in the portfolio. (Elton et al.)

Despite CAPM being a good model for predicting the return of assets and portfolios, many non-market influences influence the expected return and are not only explained by the β of the market but are additional risk factors. Multi-factor models try to capture exactly those risk factors. An essential contribution was provided by Fama and French in the 1990s, which tried to include the influence of firm characteristics on returns. They focused on the size of the firm through its market capitalization, namely the price of its stocks multiplied by the number of stocks, and incorporated it in their model through the size risk premium *SMB*, that is the outperformance between the average return of small and large companies. The other factor they included was the book-to-market value of the firm *HML*, considering value stock and growth stocks, in which case they added the value risk premium, meaning the difference between the average return between companies with high and low book-to-market value. The size factor *SMB* is negatively related to the expected return, whereas the value factor *HML* is positively correlated. In 1993 they published the Fama-French three-factor model, adding to the traditional CAPM the two new factors of risk with their relative betas. (Bodie et al.)

$$r_i - r_f = \beta_M(r_M - r_f) + \beta_S SMB + \beta_V HML$$

Subsequently, Carhart in 1997 studied the persistence of mutual funds' performance and another factor of risk was added to this equation, called Momentum *MOM*, and included it in the model. This factor represents the observation that assets increasing in price will continue to increase and assets decreasing in price will continue to decrease. It is calculated as the difference in return on an equally-weighted portfolio, considering the previous 12 months, of the 30% of stocks with the highest return divided by a portfolio of the 30% of stocks with the lowest return. (Elton et al.)

2.1.3 Risk and Performance

A fundamental step in portfolio management is the evaluation of the performance of the portfolio. Knowing that risk and return are inseparable in the evaluation of portfolios, the easiest way to determine the performance of a portfolio is to compare its return with another portfolio with similar risk. The portfolio that serves as a benchmark is usually a collection of mutual funds, called a comparison universe, thus this first approach is called direct comparison. Starting from this simple approach, many performance measures have been subsequently elaborated combining both risk and return into a single number, creating ad hoc risk-adjusted performance measures. (Elton et al.)

A commonly used methodology to rank portfolios considering the trade-off of their risk-return is the Sharpe Ratio. It is called also the reward-to-volatility ratio and measures the portfolio risk premium compared to the standard deviation of the excess return of the portfolio, in a formula:

$$S = \frac{\mu_p - r_f}{\sigma_p}$$

The higher the Sharpe Ratio, the better the return per unit of risk and the more efficient the portfolio; the interpretation of this ratio is the incremental return that investors may have for an increase in 1% of the risk (the standard deviation). Making a more graphical consideration, the Sharpe ratio represents also the slope of the line that passes through a portfolio in the $\sigma - \mu$ space and this slope, compared to the pendency of the Capital Market Line, expresses the efficiency of that portfolio. This type of analysis of the portfolio, being based on mean and variance, is called mean-variance analysis and ranks portfolios by Sharpe Ratio. Differently, the Treynor Measure examines the differential return considering β as risk measure from the CAPM. It is defined as risk premium per unit of systematic risk and the underlying idea is that the excess return of a portfolio is due to its systematic risk only, therefore the efficiency of that portfolio takes only the systematic component into account. In formula:

$$TR = \frac{\mu_p - r_f}{\beta_p}$$

Another risk-return measure is the Information ratio, which represents the difference in return of the chosen portfolio compared to a benchmark, considering the Tracking Error Volatility, meaning the volatility of the portfolio's differential returns against the benchmark. It can also be described as the ratio of alpha to the standard deviation of diversifiable risk. If the Information ratio is higher than 0, then the chosen portfolio has performed better than the benchmark. (Bodie et al.)

$$IR = \frac{\mu_p - r_b}{\sigma_{TE}}$$

Another way to measure investment performance is the Jensen performance index, which takes into consideration the previously cited α . In evaluating the performance, it is essential to compare the expected return μ_p that was determined theoretically ex-ante through the CAMP relation, with the realized ex-post $\bar{\mu}_p$ calculated through statistical models, which may be different due to forecasting errors or unfortunate casual events. In particular, the difference between the realized return of the portfolio and the expected one is called Jensen alpha. As previously said, the value of alpha assesses the attractiveness of stocks, in particular, if $\alpha < 0$ there is underperformance, if $\alpha = 0$ there is equilibrium fair price and if $\alpha > 0$ there is over-performance and miss-pricing and investors can have positive extra-return on the portfolio since the realized return is higher than the predictions. While Jensen Alpha is useful to evaluate portfolio performance, it is not possible to rank portfolios through that, because an essential part to be considered is the residual risk of the portfolio, which is not included in this valuation, differently from the Sharpe ratio. (Bodie et al.)

2.1.4 Traditional Indices Calculation

After having presented the theoretical portfolio selection, the calculation methodologies of the most important indices are hereby introduced.

Financial assets are various and can be purchased indirectly, thanks to mutual funds that serve as intermediaries, or directly. In the case of direct investments, there are many alternatives, such as derivative instruments, money market instruments, which have a maturity of less than a year, and capital market instruments, among which there are fixed-income securities and stocks. Focussing on capital market instruments, many indicators measure the performance of the stock markets, such as the Dow Jones Industrial Average for the US market, the Nikkei Average of Tokyo, or FTSE. Those indices are calculated as averages of underlying stocks and can be of three types: price-weighted, value-weighted and equally-weighted. (Bodie et al.)

Price-weighted indexes measure the return, excluding dividends, on a portfolio containing one share of each stock, and are calculated as an average of the prices of the stocks divided by the sum of their market value. Each stock's influence on the index is therefore determined by its price per share. An example of a price-weighted average index is the Dow Jones Industrial Average (DJIA), one of the oldest indexes of stock price performance that is calculated as the average price of the 30 large US stocks included, divided by the adjustment factor whenever there are discontinuities in the underlying stocks. Despite being a widely used index, DJIA averages are based only on a small number of firms, therefore it may not be a perfect representation of the whole market. The same methodology is applied by the Japanese Nikkei 225 index.

The second type of index is the market value-weight, such as the Standard & Poor's Composite 500 (S&P500), which differently from the DJIA includes indexes of 500 firms. The return of this type of index is calculated as the weighted average of the returns of each component stock, with weights proportional to

outstanding market value. In this case, each stock's influence on the index is determined by its market capitalization and, as the previous index, it does not reflect cash dividends. Another example of a market-weighted index is the Morgan Stanley International index, which is also computed including dividends. Lastly, the equally weighted indexes, are computed as a simple average of the return of the stocks included. (Bodie et al.; Elton et al.)

Investors nowadays have convenient access to market indexes for their investment portfolios. One method is the passive investment in specific mutual funds called index funds, which try to match the performance of broad market indexes proportionally buying shares in stock included in that index. An example is the Vanguard 500 Index Fund which replicates the S&P500 stock price index. Another option is to invest in exchange-traded funds (ETFs), which are investment funds composed of shares that can be traded as a single unit, like individual stocks. Thanks to this innovative solution it is now possible to trade index portfolios and some examples are the Spider SPDR, an ETF matching the S&P500 index, or the Diamonds DIA, based on the DJIA. ETFs have many positive attributes, such as liquidity, since are traded on the stock exchanges like individual stocks, transparency and flexibility, because are available for many asset classes, sectors and investment strategies, allowing investors to tailor their portfolios according to their investment objectives and risk preferences. For these reasons, they can be used in empirical analysis to enhance the robustness and applicability of the findings by providing insights into the performance of different investment strategies relative to market benchmarks and diversified portfolios. (Bodie et al.)

2.2 ESG Indices and Sustainable Investments

Having presented the traditional portfolio theory and the traditional indices calculation, it is now time to delve into a concept that has been evolving in the last twenty years and is becoming popular among investors: ESG investing. More and more investors and funds are including those concepts in their investment strategies alongside traditional investments, shifting the main focus from the pure and only short-term financial return to the creation of long-term value and resilience. Thanks to ESG practices, extra-financial evaluations are now common when selecting the assets in financial portfolios and in making risk decisions. Following this growing attention given to ESG practices, many indices, ratings, funds and ETFs have been created in recent years, forming a heterogeneous universe that is somehow transparent but still needs to be standardized. In fact, despite the equal underlying effort to create a more sustainable and durable economy, ESG rating agencies, ESG score providers and reporting practices still present many differences that will have to be bridged in the coming years. (Boffo and Patalano, 2020)

The ESG Financial Ecosystem, as described by Boffo and Patalano (2020) in Figure 6, includes two main elements: financial issuers on one side and investors on the other side. The first category asks for capital from the investors and issues stocks or debt, being the main actors of financial markets and the receiver of ESG rating. The second category is composed of all investors, who are concerned about the Sustainable Investing Strategy to adopt while selecting their portfolio of assets (Roncalli 2022). Within this spectrum, in what Boffo and Patalano call the “financial intermediation chain”, there are four other categories. ESG rating providers are the firms that rate ESG issuers, collecting heterogeneous data from different sources and elaborating scores. Roncalli (2022) categorized them into market data providers like MSCI and Bloomberg, financial rating agencies such as S&P, specialized ESG firms like Sustainalytics, and technology start-ups like Truvalue Labs, which make focused use of Artificial intelligence and Big Data.

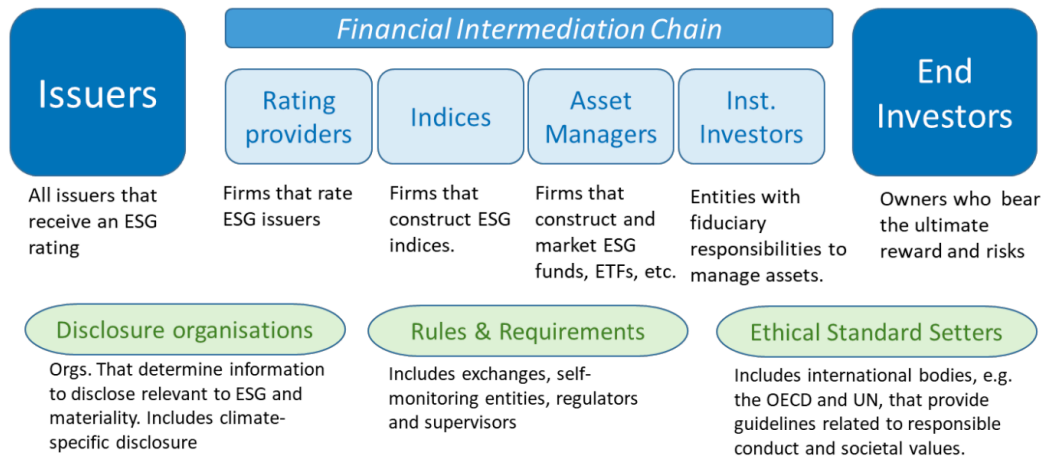


Figure 6. ESG financial ecosystem - Source: OECD

The second category in the spectrum is composed of ESG index providers, which are often also ratings providers, such as FTSE Russel and Bloomberg. These agencies construct ESG indices from the scores, creating benchmarks to track the performance of ESG-based portfolios used by investors, ESG funds and ETFs. The last two categories of the spectrum are ESG users, either asset managers and investment funds or institutional investors, which make use of ESG ratings to create and manage portfolios. At the basis of this structure, disclosure bodies like the Sustainability Accounting Standards Board and the Global Reporting Initiative, provide frameworks and guidance. Moreover, market regulators set rules and requirements and standard setters, such as the United Nations and OECD, set guidelines for responsible investments.

To better understand the differences between the various rating providers, it is worth a deeper analysis of the ESG scoring definitions, the rating methodologies and the comparison of the major ESG rating agencies. Moreover, focusing on ESG investing, given the same ESG ratings, different approaches and investment strategies can be defined, bringing very diverse investment solutions.

2.2.1 ESG Rating Agencies Methodologies

The quantity of data to build ESG scores is massive and the weights used to evaluate those data and the methodology applied may be consistently different from one rating agency to another. Despite the differences, the purpose of ESG rating is the same: help investors include ESG principles in their investment strategies and assist asset managers in creating ETFs and funds, determining the companies with the highest level of sustainability (Boffo and Patalano, 2020). Sector regulations are vague and incomplete, but according to Roncalli (2022) and others, since the utilization of ESG scorings has been steadily increasing in recent years, it is predictable that an accurate regulation will be soon promulgated.

Sources of data from which ESG scores are built are multiple. Some examples are voluntary and mandatory reports published by companies, financial filings, social media, websites, and reports by Non-Government Organizations. After the data collection and cleaning, as schematized by Roncalli (2022), raw data are then used to create ESG metrics, on which ESG indicators are built. Subsequently, ESG themes are then built from these indicators and form the foundation for the final ESG pillars, a fundamental element for ESG assessment. The scope of ESG ratings is precisely to assess the effects that companies or countries have on the three pillars: Environmental, Social and Governance. Each pillar includes many other subcategories, which depend on the rating providers. Table 1 presents some examples of the most used categories to describe the E, S and G sectors:

Environmental	Social	Governance
Energy efficiency	Community relationship	Board independence
Carbon emissions	Human rights	Board diversity
Waste management	Diversity and inclusiveness	Shareholder rights
Biodiversity preservation	Stakeholders engagement	Management compensation
Pollution control	Product safety and quality	Corporate ethics

Table 1. ESG criteria - source: Roncalli (2023)

Understanding what data the main ESG rating agencies use and how they use them is a necessary step to clarify where the differences in the final rating come from. To assess the sustainability level of companies and securities, every provider uses different key metrics, themes and indicators and provides different products for the users to help them in their process to become more sustainable. In the following section, the main rating agencies' characteristics and their sustainability-related products are presented, gathering information from their websites and the "Study on Sustainability-related Ratings, Data and Research" by the European Commission (2020):

- Bloomberg is based in New York, USA and rates almost 12000 companies with more than 120 indicators. Their ESG dataset provides useful standardized information that covers almost 93% of equity market capitalization, getting data also from third parties like MSCI and Sustainalytics. The company has a focus on social and environmental impact, for which industries are grouped by categories. The broad dataset they provide is then implied for many different scopes, such as Regulatory Reporting, Climate Solutions, Sustainable Finance with ESG Scores and ESG Fund Analytics for over 60000 mutual funds and 10000 ETFs. ([bloomberg.com](https://www.bloomberg.com))
- FTSE Russell is the key subsidiary of the parent London Stock Exchange and includes also the Refinitiv Index, which was retired and rebranded in FTSE by the LSEG in November 2023. Their ESG Scores measure the Environmental, Social and Governance metrics of 8000 securities and allow investors to assess the company's performance with about 300 ESG indicators split between 14 ESG themes, which reflect the 17 SDGs. Their flexible data-driven solution helps with the integration of ESG data into portfolio management and assists in the exposure management of ESG-related risks, taking also climate data of the sovereign into consideration. Their scores are calculated using an exposure-weighted average based on materiality. ([lseg.com](https://www.lseg.com))

- MSCI, based in New York but with office locations spread across Europe, rates securities, ETFs, countries, mutual funds and companies globally. It does not provide advisory services for companies but offers different solutions, among which there is the ESG Investing solution, which includes 9 ESG-related products, covering for example the Screening process, as well as Impact Solutions, Fund Ratings and Climate solutions (EU Commission 2020). The methodology it uses for its ratings is rules-based and evaluates companies based on their ESG risk exposure and how they manage it, ranging from “leader (AAA)” to “laggard (CCC)”. ([msci.com](https://www.msci.com))
- S&P is from New York, and its main subsidiaries are RobecoSAM and Trucost. It has four main divisions which are all somehow related to ESG factors: Commodity Insights for the energy and commodities markets, applied in the efforts toward carbon neutrality, the data provider Global Market Intelligence, useful to analyze trends in sustainable investing, Global ESG Scores that assesses companies’ impact and opportunities and the previously mentioned Dow Jones Indices, used for investment solutions (EU Commission 2020). Other relevant solutions it offers are the ESG Portfolio Analytics and, for more than 10000 companies, the Corporate Sustainability Assessment, which provides a useful in-depth company engagement that makes this rating agency different from the others. ([spglobal.com](https://www.spglobal.com))
- Sustainalytics is a subsidiary of Morningstar based in Amsterdam focused on ESG ratings. With more than 16000 companies, it is the ESG-risk rater with the widest coverage in the market. It offers many different products related to ESG practice, such as ESG Integration, Screening strategies, ESG Rating License and Index Services, for which it is characterized by a high level of transparency on the weights used in the construction. The ratings aim at measuring in an absolute way the exposure of the company to the risks related to its industry, ranking from the “negligible” level to the “severe” ([sustainalytics.com](https://www.sustainalytics.com))

- Institutional Shareholder Services, ISS, is based in Frankfurt and assesses companies using about 800 indicators. It offers several sustainability-related products about management research and recommendations, Corporate Solutions to help companies improve the fairness of their governance including goals, shareholders, risk and other aspects, and ESG management. In particular, the ESG ISS helps investors include sustainable practices in their investments, advises on screening strategies, provides useful climate-related data and determines ESG ratings for corporates and countries, through 24 products and 7 different services. (European Commission 2020)

The differences in the ratings are several, making the correlation between the scores by different agencies quite low. Billio et al. (2021) analyzed the MSCI, Refinitiv, S&P Global and Sustainalytics ESG ratings for companies and found a mean correlation of just 58%, with the individual correlations ranging from 43% to 69%. These results are consistent with the analysis previously made by State Street Global Advisors (2019), in which they studied the R^2 between couples of agencies. They focused on MSCI and Sustainalytics, as well as Bloomberg and RobecoSAM, and found a mean R^2 of less than 0.6, meaning that the difference in ratings from different providers is not insignificant. However, the results obtained when considering sovereign ESG data provided by the same agencies differ. In this case, the data about countries' specifics are more transparent and available to the public, and the countries to be evaluated are limited, compared to the thousands of corporations around the world (Roncalli 2023). Therefore, the final ESG rating associated with a single country does not consistently differ from one rating to the other and, as found by Roncalli, the wide number of variables considered in the analysis can be tracked down to just a few independent dimensions. This can be explained by the results of Gratcheva et al. (2020), which conducted a similar correlation analysis as the one of Billio et al. and found that the majority of sovereign ESG ratings are highly correlated to the GDP of the country, with an 81% correlation for aggregate ESG. This means that the sovereign ESG scores of different providers somehow converge.

The main differences between scores from different raters were analyzed by Boffo and Patalano (2020), who were able to identify major sources of differentiation. Frameworks and factor categories differ quite a lot between the raters, as well as the datasets they use, as highlighted by the previously presented bullet list. Another source of difference is the definition of financial materiality that is applied in calculating the score, meaning the determination of financially interesting information for the users of the ratings. Moreover, the inclusion or not of controversies in the rating and the qualitative judgments applied brings further differentiation. Finally, after all the data have been processed, the weights used for each indicator vary and are either quantitatively and transparently determined or qualitatively with subjective judgments. Apart from all the dissimilarities between the ratings, also the use that investors may make out of these ratings is different. Starting from the ESG scores and consistently with the ethics and personal preferences of investors, it is possible to define several investment strategies to be applied in the portfolio selection, as will be analyzed in the following paragraph.

2.2.2 ESG Investing Strategies

Investment approaches are subjective and depend on the characteristics of the investors, but, as far as ESG investment strategies are concerned, it is possible to track down the seven most common methods. Many reports and scholars made their list of investment strategies, for example, Roncalli in 2023 in its “Handbook of Sustainable Finance”, Boffo and Patalano in 2020 in their OECD study about ESG investing practices, Uzsoki in 2020 in a report from the International Institute for Sustainable Development (IISD) and the Global Sustainable Investment Alliance in its report in 2022. Despite the names of the approaches may differ, the substance of the concepts is the same.

The first three categories are based on the screening process, including or excluding certain assets due to some of their quantitative or qualitative characteristics, and the other four are thematic, impact, integration and

engagement types of investments. Among these seven main strategies, the norm-based screening, stewardship and impact investment approaches are more concerned about ethics and sustainable behaviors, whereas the others have a deeper focus on the financial performance of the portfolio. The seven strategies are the following:

- Exclusion policy and negative screening. It is a screening process that does not include in the portfolio or in the fund those assets that do not meet some ESG criteria. Those requirements may vary, for example excluding assets from the issuers with the worst ESG score or from countries with the worst sovereign ESG rating and a specific type of exclusionary screening is the worst-in-class strategy. This methodology, which is widely used in empirical analysis, may also exclude assets from whole sectors on an ethical base, such as from the tobacco industry, weapons manufacturers, industries related to genetically modified organisms, or animal cruelty but also based on controversies.
- Norms-based screening. Deriving from the negative screening, the norm-based screening excludes the portfolio companies that have violated global minimum standards or international values. Some exclusionary criteria are for example non-compliance with the principles of the Global Compact or the violation of UNICEF, UN, ILO and OECD norms.
- Positive screening. This screening practice is the opposite of the previously mentioned negative screening. According to this strategy, assets in the portfolio are included only if they meet certain positive ESG performance criteria, normally superior to the industry average. There are different approaches associated with these strategies, such as the best-in-class screening includes only companies with high ESG ratings and the momentum strategy focuses only on firms that have been improving their ESG performance.

- Sustainability-themed investing. This investment strategy takes the economic activities related to sustainable practices into consideration. It is mainly implied in the creation of mutual funds, for which not only the general ESG scores, but also a specific pillar, metrics or theme are considered. For example, the inclusion in the fund may be based on the usage of renewable energy sources, sustainable agriculture and protection of biodiversity, or in general on the whole E pillar. Other examples, not focussing only on the Environmental pillar, but also on the Governance and Social sectors, are the consideration of good practices regarding health, gender equality, food security and diversity.
- ESG integration in the portfolio. According to this approach, ESG factors are systematically incorporated into investment decisions with the scope to increase the risk-adjusted returns of portfolios. Different from the screening methodologies, ESG elements are considered in the portfolio selection and risk management in the same manner as the fundamental scores of the stocks or bonds. Including ESG considerations directly in the choice of the portfolio and its management usually implies a considerable amount of resources dedicated to the specific assessment of ESG considerations, as well as dedicated governance, tools to assess the ESG performance and specific inclusionary or exclusionary policies.
- Stewardship. This investment approach uses voting power and shareholder activism and, therefore is based on corporate engagement. The underlying idea is that active shareholders could interact with companies and improve their ESG performance and the overall long-term value for stakeholders. Shareholders' power is manifested through their voting rights, thanks to which they could act in the protection of the economic performance of the company, as well as enhancing the positive impact they have on social, environmental and governance issues. Therefore this strategy takes advantage of the direct involvement of shareholders in the company to apply ESG practices to the company.

- ESG impact investing. With a focus on the positive impact that investments could have on the environment and society, this investment strategy prioritizes ethical behaviors, without sacrificing financial performance. The focus of this investment strategy is on assets that directly finance specific projects, meaning that are associated with a concrete benefit on one of the ESG pillars or all of them. This approach is different from thematic investing which just considers securities with some specific characteristics but with no practical positive outcomes accounted for. Examples of impact investing are maximizing financial returns with green bonds, community investing and creation of funds with a specific objective of social impact. In any case, apart from the financial results, also the extra-financial impact is reported and measured, to determine the concrete benefit of the investment and the improvement in ESG practices.

Among the just mentioned seven strategies, it is not possible to define *a priori* what is the best strategy to apply to have both positive extra-financial impact and economic return, but the next two chapters aim to answer this question, practically implementing a portfolio analysis.

3 - METHODOLOGY: PORTFOLIO MANAGEMENT

Having revised the theoretical background of ESG factors, portfolio management, sustainable investments and the related literature, a practical analysis was led to test the aforementioned theories. In particular, a portfolio analysis was conducted, by extracting data, building a dataset and implementing and comparing different investment strategies. This study aims to answer the research question of this thesis, that is to determine the impact that sustainable investment strategies could have on the return of portfolios and the associated risk. A sub-period analysis was also conducted to test the implications that the recent historical events had on risk and returns associated with the different investment strategies.

3.1 Data collection

The data have been collected thanks to temporary access to the LSEG Workspace. This tool is managed by LSEG Data & Analytics, one of the biggest providers of market data, previously known as Refinitiv, and offers wide financial coverage for managers and investors, providing news, datasets and cutting-edge analytics. The relevant data for the empirical analysis, in particular companies' historical prices and company characteristics, have been extracted from the platform and then elaborated on Excel worksheets. The first step was to select a suitable period for analysis. The chosen period needed to be recent enough to provide relevant information, but not so extensive as to be unwieldy. The choice fell upon six years going from the 1st of January 2018 to the 31st of December 2023. This whole time series can be considered relevant and interesting and it is divided into three sub-periods. The first two years, 2018-2019, represent an ordinary pre-pandemic period. The second sub-period 2020-2021 comprehends the first and second waves of the Covid-19 pandemic period, followed by the recovery and the beginning of the energy crisis in 2021. The biennium 2022-2023 represents the development of the energy crisis and the Ukrainian and Palestinian wars.

Having chosen the sample period, the subsequent step was to choose the countries to include in the portfolio. Country indices were not used in this analysis as the focus was on individual companies, allowing for a more targeted approach to answering the research question of this thesis. Funds and ETFs were also excluded to conduct a comprehensive analysis starting from raw data of individual company prices. Many different countries could have been considered for this study, but it was preferred to include in the portfolio only companies with headquarters in the European continent. The main reason for this choice is that the inclusion of companies from different continents would have brought substantial differences in the size of the market, the characteristics of the macroeconomic environment in which they operate and in the sizes of the countries as well as diversity in the shocks and risks to which the companies are exposed. In particular, analyzing the European market, five countries have been chosen for their similar dimension, market size and relevance as big players in the market scene: Italy, Germany, France, Spain and the United Kingdom. Being the UK outside the Euro Area, the currency in which the price of the stocks were expressed was automatically converted into Euro while extracting data from the LSEG Workspace, to have a homogeneous dataset with no exchange rate problems and bias.

After selecting the countries, the companies to include in the dataset had to be selected. The final portfolio should have been large enough to have a wide variety of data and companies with different characteristics while avoiding excessive data handling. The Market Capitalization has been chosen as a proxy of performance measure and judgment methodology for the selection of the companies. More specifically, Market Cap is defined by LSEG itself as the total market value of the company's shares of stock and is calculated by multiplying the shares by the latest close price. With this regard, the 15 companies with the highest market cap for each country have been selected, for a total of 75 companies in the dataset, summarized in Table 2.

Identifiler (RIC)	Company Name	Headquarters
1913.HK	Prada SpA	Italy
ACS.MC	ACS Actividades de Construccion y Servicios SA	Spain
ADSGn.DE	Adidas AG	Germany
AENA.MC	Aena SME SA	Spain
AIRP.PA	L'Air Liquide Societe Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude SA	France
ALVG.DE	Allianz SE	Germany
AMA.MC	Amadeus IT Group SA	Spain
AXAF.PA	AXA SA	France
AZN.L	AstraZeneca PLC	United Kingdom
BAES.L	BAE Systems PLC	United Kingdom
BASFn.DE	BASF SE	Germany
BATS.L	British American Tobacco plc	United Kingdom
BBVA.MC	Banco Bilbao Vizcaya Argentaria SA	Spain
BMWG.DE	Bayerische Motoren Werke AG	Germany
BNPP.PA	BNP Paribas SA	France
BP.L	BP PLC	United Kingdom
CABK.MC	CaixaBank SA	Spain
CLNX.MC	Cellnex Telecom SA	Spain
CPG.L	Compass Group PLC	United Kingdom
CPRI.MI	Davide Campari Milano NV	Italy
CRDI.MI	UniCredit SpA	Italy
DAST.PA	Dassault Systemes SE	France
DB1Gn.DE	Deutsche Boerse AG	Germany
DGE.L	Diageo PLC	United Kingdom
DHLn.DE	Deutsche Post AG	Germany
DIOR.PA	Christian Dior SE	France
DTEGn.DE	Deutsche Telekom AG	Germany
EDPR.LS	EDP Renovaveis SA	Spain
ELE.MC	Endesa SA	Spain
ENEI.MI	Enel SpA	Italy
ENI.MI	Eni SpA	Italy
ESLX.PA	EssilorLuxottica SA	France
GASI.MI	Assicurazioni Generali SpA	Italy
GSK.L	GSK plc	United Kingdom
HRMS.PA	Hermes International SCA	France
HSBA.L	HSBC Holdings PLC	United Kingdom
IBE.MC	Iberdrola SA	Spain
IFXGn.DE	Infineon Technologies AG	Germany
ISP.MI	Intesa Sanpaolo SpA	Italy
ITX.MC	Industria de Diseno Textil SA	Spain
LDOF.MI	Leonardo SpA	Italy
LIN.OQ	Linde PLC	United Kingdom
LSEG.L	London Stock Exchange Group PLC	United Kingdom
LVMH.PA	LVMH Moet Hennessy Louis Vuitton SE	France

Identifier (RIC)	Company Name	Headquarters
MBGn.DE	Mercedes Benz Group AG	Germany
MDBI.MI	Mediobanca Banca di Credito Finanziario SpA	Italy
MONC.MI	Moncler SpA	Italy
MRCG.DE	Merck KGaA	Germany
MUVGn.DE	Muenchener Rueckversicherungs Gesellschaft in Muenchen AG	Germany
NG.L	National Grid PLC	United Kingdom
NTGY.MC	Naturgy Energy Group SA	Spain
OREP.PA	L'Oreal SA	France
PRTP.PA	Kering SA	France
PRY.MI	Prysmian SpA	Italy
PST.MI	Poste Italiane SpA	Italy
RACE.MI	Ferrari NV	Italy
REDE.MC	Redeia Corporacion SA	Spain
REL.L	RELX PLC	United Kingdom
REP.MC	Repsol SA	Spain
RIO.L	Rio Tinto PLC	United Kingdom
SAF.PA	Safran SA	France
SAN.MC	Banco Santander SA	Spain
SAPG.DE	SAP SE	Germany
SASY.PA	Sanofi SA	France
SCHN.PA	Schneider Electric SE	France
SGEF.PA	Vinci SA	France
SHELL.L	Shell PLC	United Kingdom
SHLG.DE	Siemens Healthineers AG	Germany
SIEGn.DE	Siemens AG	Germany
SRG.MI	Snam SpA	Italy
TEF.MC	Telefonica SA	Spain
TRN.MI	Terna Rete Elettrica Nazionale SpA	Italy
TTEF.PA	TotalEnergies SE	France
ULVR.L	Unilever PLC	United Kingdom
VOWG.DE	Volkswagen AG	Germany

Table 2. Companies included in the Dataset

An exception was made for Daimler Truck Holding AG, ranking 14th for Market Cap in Germany which has not been considered due to the unavailability of data before 2021. Deutsche Börse AG, ranking 16th, has been considered instead.

The following step was the construction of a table containing the names and the main characteristics of the companies to be included in the portfolio. This table has then been used as a starting point to create the dataset for the portfolio benchmark and also to select the companies to include in the various sustainable

strategies, filtering by specific scores or characteristics. Apart from the identifier, the company name, the headquarters and the market cap, other relevant data related to ESG ratings have been extracted from the Workspace, thanks to the LSEG Screening Tool. Essential for creating sustainable investment strategies was the Refinitiv ESG Score of companies, defined as an overall company score based on the self-reported information in the environmental, social and corporate governance pillars, ranging from 0 to 100. Another useful sustainable measure was the Refinitiv ESG Combined Score, that is the ESG Score with an ESG Controversies overlay, meaning the measurement of a company's exposure to environmental, social and governance controversies and negative events reflected in global media. Lastly, information about the company's performance in the E, S and G pillars has been extracted, to better understand the overall ESG Score. The E score, as defined by LSEG Workspace, measures the impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems and reflects the ability of the company to avoid environmental risks and capitalize on environmental opportunities to generate long term shareholder value. The S score takes into consideration the capacity to generate trust and loyalty with the workforce, customers and society and reflects the company's reputation and the health of its license to operate as a way to generate long-term value. The corporate Governance pillar measures the company's systems and processes, which ensure that the board acts in the best interest of the long-term value for shareholders and reflects the ability of the company to direct rights and responsibilities through the creation of incentives, checks and balances.

After the creation of the table with all the companies' characteristics, the dataset for the portfolio construction has been created. Firstly, LSEG Workspace was used to select the period 2018-2023 and extract the historical prices of the 75 companies to be analyzed. The closing prices of all the companies for each trading day were then included in a comprehensive dataset. A data cleaning process has been carried on, thanks to the Excel function *VLOOKUP* to remove incongruences due to different exchange rates deriving from the different Stock Exchange in

which the stocks are traded. After that, some days were also removed from the dataset, being national holidays in all or some of the 5 countries, such as the 15th of August and 2nd of June in Italy, the 3rd of October in Germany, the 8th of May in France, or the Pentecost on the 10th June 2021, the 24th May 2021 and the 29th May 2023 in Germany and France. Special attention has been given to Linde PLC (LIN.OQ), a company based in the UK, but traded on the NASDAQ stock exchange. Being treated in the market of another continent, some exchange dates were different, therefore the #NA of the prices of the stock were substituted with the mean of the price of that stock considering the previous and the following day.

From the dataset containing the closing prices for the 75 companies from the 2nd January 2018 to the 29th December 2023, another dataset was then created with the returns of the stocks. The formula that has been applied to calculate the returns is the compound formula $\ln(P_t) - \ln(P_{t-1})$. Subsequently, the average return for each stock has been found, as well as the associated risk, through the standard deviation of the returns, using $STDV.P$. This dataset was used as a starting point to select portfolios for the different investment strategies that have been applied.

3.2 Investment Strategies

Five different strategies have been developed to answer the research questions and determine whether sustainable investments could have some financial positive impact in terms of lower risk or higher return, aside from the positive non-financial outcomes. Strategy 1 was used as a benchmark, whereas in strategies 2,3,4 and 5 sustainable investment methodologies were applied. The returns of the portfolios for each day have been calculated with the *SUMPRODUCT* function, multiplying the return of each stock by its weight. After that, the average of the returns and the standard deviation of the portfolio were calculated, as well as the associated Sharpe Ratio. With this regard, a good proxy of the risk-free rate was assumed to be 0%, given that the period in consideration is long and the companies are many, various and spread across five different countries. Thus, the

Sharpe ratio was calculated by simply dividing the return of the portfolios by their risk. The first strategy to be considered was a traditional investment strategy, selecting all the 75 companies with high market cap. The portfolio that was created was equally weighted, therefore the weights that were used to calculate the returns of the portfolio were equal to $1/75$. The second and third portfolios were built based on a negative screening strategy, thus excluding companies with an ESG score below a certain level. For strategy 2 the 25 worst-performing companies were excluded from the portfolio, according to their ESG Combined Score. In this case, the weights applied were proportional to the market cap of the companies, calculated as the ratio of the single market cap, compared to the sum of all market caps. Strategy 3, on the other side, excluded the 25 worst-performing companies based on their ESG Score, not considering controversies. Strategy 4 was based on a best-in-class methodology, thus including in the portfolio only the 40 companies with ESG scores higher than 80. Lastly, strategy 5 was a thematic investment considering only the 40 companies with the highest G pillar score, that is, according to previous empirical findings, the pillar that is more related to positive economic return. In strategies 3,4 and 5, three sets of weights have been applied to the portfolios: equal weights, weights proportional to the market cap and weights proportional to the ESG score, to study the differences in risk and return.

The final aim of the portfolio analysis was to compare the risks and returns of the benchmark with the portfolios built with the other strategies and determine the effect that sustainable investments have on risk and return. For strategies 3,4 and 5, the analysis was further deepened and the Excel dataset was adapted and analyzed with MATLAB. Thanks to that, minimum variance analysis has been conducted for the three portfolios, in order to test the ability of sustainable investment strategies to reduce risk. In particular, two sets of weights have been found for each portfolio: one with short sales and one considering only long sales. The results have then been compared to the previous results and the benchmark, highlighting the differences in the Sharpe ratio.

Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
Traditional investment	ESG Combined Negative Screening	ESG Negative Screening	Best-in-class ESG Screening	G Thematic investment
75 stocks	50 stocks	50 stocks	40 stocks	40 stocks
Equal weights	Weights proportional to market cap	Equal weights, proportional to market cap and to ESG score	Equal weights, proportional to market cap and to ESG score	Equal weights, proportional to market cap and to G score

Table 3. Investment Strategies

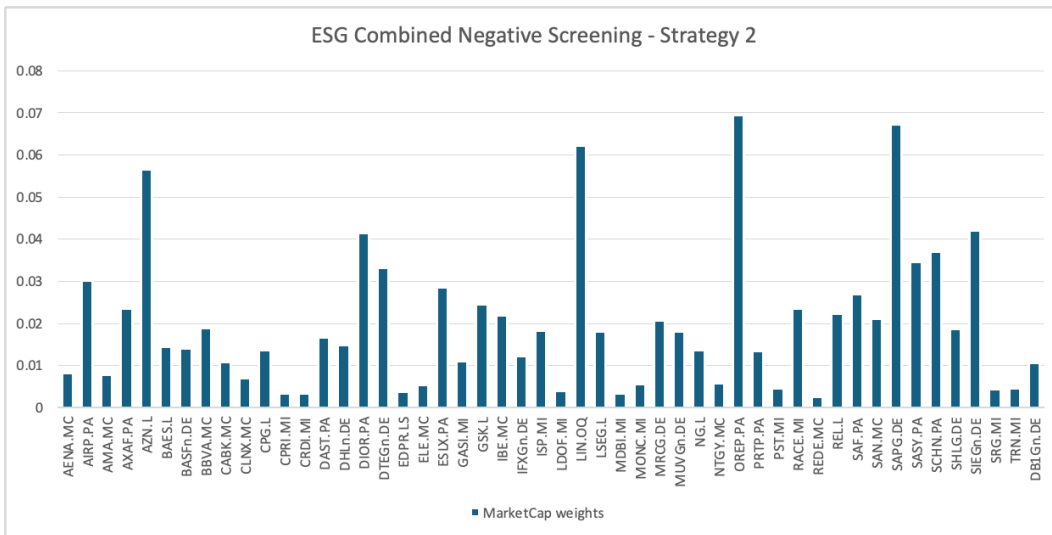


Figure 7. ESG Combined Negative Screening stocks and weights

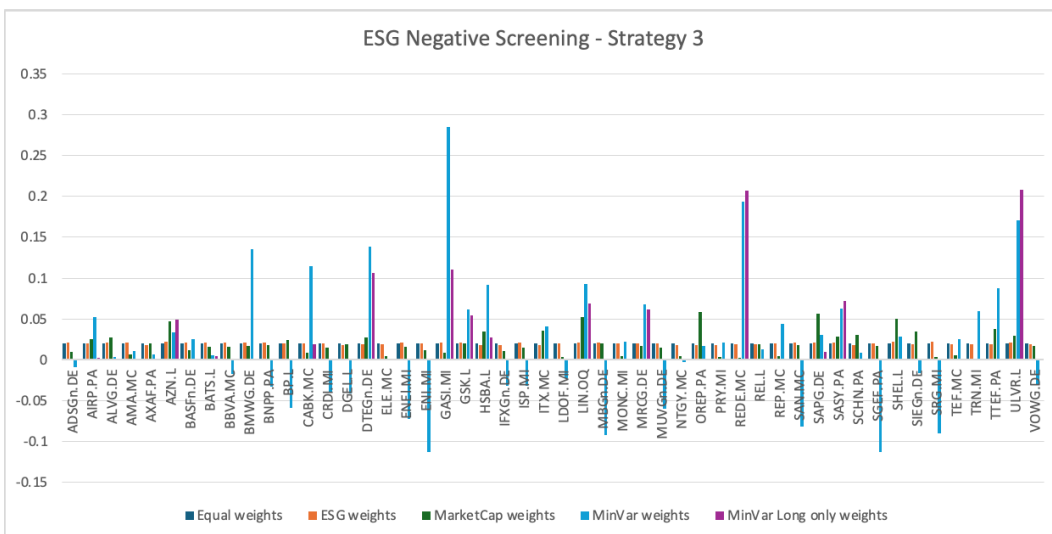


Figure 8. ESG Negative Screening stocks and weights

Table 3 summarizes the five strategies with their main characteristics and the graphs in Figures 7, 8, 9 and 10 present the stocks included in the portfolios of the various strategies. The height of the different bars for each stock represents the weight of that stock in the portfolio, depending on the specific analysis taken into consideration.

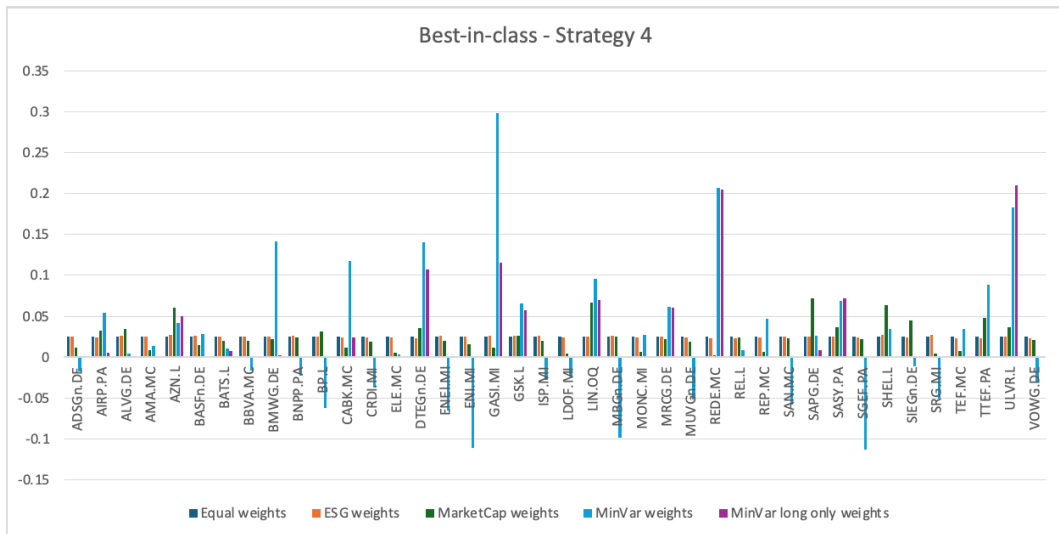


Figure 9. Best-in-class Positive Screening stocks and weights

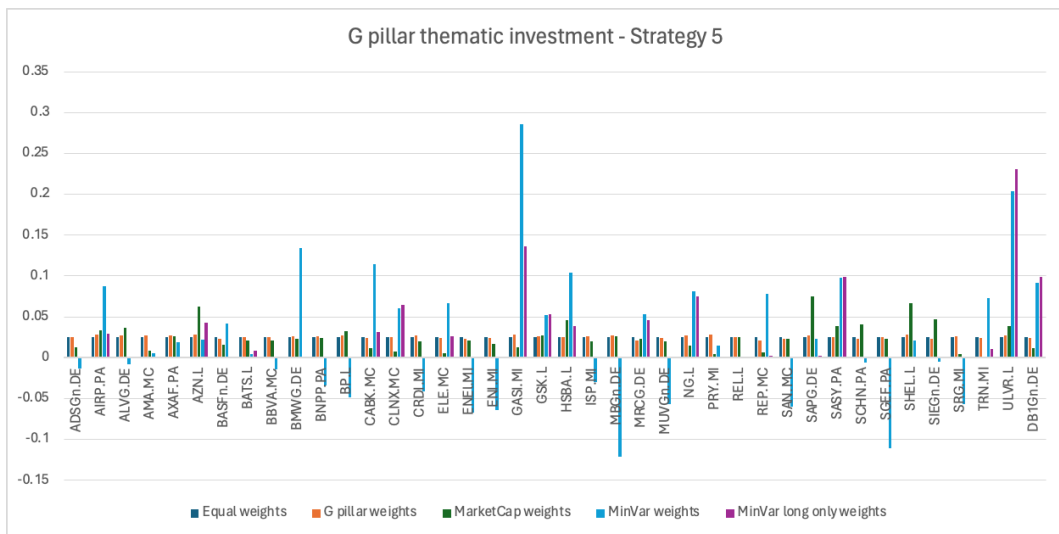


Figure 10. G Pillar Thematic investment stocks and weights

With regards to the stocks included in the portfolios, it is visible that the stocks with the highest weights in Strategy 2 are different from the other strategies. In particular, among the 50 stocks of portfolio deriving from the ESG Combined Negative Screening, that is Strategy 2, only four stocks have a weight that is bigger than 0.05. In particular, OREP.PA, meaning the French cosmetic company L'Oreal SA, has a weight of 0.0696 and it is the stock with the highest influence in the portfolio. Right below there are two German companies: the software provider SAP (SAPG.DE) with 0.0672 and the chemical company LINDE (LIN.OQ) with 0.0623 and then the biopharmaceutical British company AstraZeneca with 0.0565.

In strategies 3, 4 and 5 the companies with the highest or lowest weights are similar, therefore it is possible to expect returns and risks that follow the same patterns and that do not differ too much from each other. More specifically, considering the weights from the minimum variance analysis from MATLAB, Assicurazioni Generali SpA (GASI.MI) and Unilever PLC (ULVR.L) are the companies included in all three strategies that are assigned the highest weights. In particular, GASI.MI is assigned to a weight higher than 0.028 in all three strategies. Also the partially-state-owned Redeia Corporacion SA (REDE.MC), included only in strategies 3 and 4, has a relevant weight in the portfolio. Those three stocks have the highest weights also excluding short sales, therefore considering only positive weights. On the other hand, Eni SpA (ENI.MI), Mercedes Benz Group AG (MBGn.DE) and the French construction company Vinci SA (SGE.PA) are the companies with the lowest negative weights without any short sales constraints.

After the in-sample examination, a sub-period analysis has also been developed. Differently from the in-sample, that is the application of a model to describe the past, the sub-period analysis was carried out to analyze the differences in risk, return and Sharpe ratio between the three sub-periods. The strategies to which the sub-period analysis was carried out were the benchmark, strategy 2 and strategy 3, considering the weights associated with the most positive results in terms of return

and standard deviation. For each strategy, the return and risk were calculated independently for the three sub-periods, meaning 2018-2019, 2020-2021 and 2022-2023. Examining the differences, it was possible to determine the responses of the portfolios to different historical events. This part of the study aimed at testing the resilience and effectiveness of sustainable investment strategies during the crisis, in comparison to traditional strategies.

4 - ANALYSIS OF THE RESULTS

The results of the empirical analysis are hereby presented, comparing risks and returns of the benchmark, that is the traditional equally-weighted investment strategy based on the whole portfolio of 75 companies, with the other 4 strategies. To have a clearer comparison, the Sharpe ratio for each case is also calculated, being a simple and understandable risk-adjusted performance measure. The purpose of this analysis is to determine whether sustainable investment strategies could achieve financial success, in terms of high economic return and low risk. Given the possibility that the financial performance of ESG investments may be relatively lower than traditional investment strategies, this analysis also aims to determine whether ESG-conscious investors could reasonably accept the lower financial performance in exchange for sustainable positive and transparent outcomes. In this chapter, the real case analysis will confirm whether sustainable investments could lead to positive financial results, taking into consideration the five aforementioned different strategies, number of companies and weights.

4.1 Traditional and ESG Investments Comparison

The first comparison to be analyzed is between strategy 1, the traditional strategy used as a benchmark, and strategy 2, which is an ESG Combined negative screening strategy that takes into account a portfolio of 50 companies with the highest ESG combined scores and weights proportional to their market cap. As summarized by Table 4, this comparison immediately provides positive support for ESG investment strategies in terms of positive financial outcomes. In particular, the ESG negative screening strategy, despite including fewer stocks than the traditional strategy, brings both higher portfolio returns and lower risk. Consequently, the Sharpe ratio of strategy 2 is also higher than the one of the benchmark. Moreover, examining the returns of the single stocks, without considering weights, the average is higher in the second strategy. A possible explanation may be the fact that the ESG Negative Screening does not take into

account controversies, which may affect also the financial returns, besides Environmental, Social and Governance factors. Thus, excluding the worst-performing companies, the average returns of the single stocks increase, as well as the portfolio return. It is therefore possible to say that strategy 2 confirms that Sustainable investments may bring significantly higher returns, lower risk and therefore a consistently higher Sharpe ratio and be preferable to traditional investment strategy.

	Strategy 1	Strategy 2
	Traditional Strategy	ESG Combined Negative Screening
<i>Number of companies</i>	75	50
<i>Average Return</i>	0.0244%	0.0304%
<i>Weights</i>	Equally-weighted	Proportional to Market Cap
<i>Portfolio Return</i>	0.0244%	0.0382%
<i>Portfolio Risk</i>	1.1814%	1.1412%
<i>Sharpe ratio</i>	0.02069	0.03345

Table 4. Strategy 1 and Strategy 2

Also strategy 3 is an ESG Negative Screening, but in this case, the screening was based on the ESG score, therefore the companies included in the portfolio are different. As presented in Table 5, three different sets of weights were applied, but in no case the risk was found lower than the traditional portfolio and neither the return was higher. Despite these results do not directly lead to the same conclusion as strategy 2, in the case in which the weights were set proportional to the market cap, the Sharpe ratio did not significantly differ from the one of the traditional strategies. It is therefore legitimate to say that investors may choose this strategy and sacrifice a small portion of the profit, being the return little significantly smaller than the traditional strategy, to have transparent extra-financial benefits.

	Strategy 1	Strategy 3		
	Traditional Strategy	ESG Negative Screening		
<i>Number of companies</i>	75	50		
<i>Weights</i>	Equally-weighted	Equally-weighted	Proportional to ESG	Proportional to Market Cap
<i>Portfolio Return</i>	0.0244%	0.0148%	0.0145%	0.0219%
<i>Portfolio Risk</i>	1.1814%	1.2374%	1.2389%	1.2115%
<i>Sharpe ratio</i>	0.02069	0.01199	0.01174	0.01805

Table 5. Strategy 3

On the other side, Strategy 4, which is the best-in-class positive screening and Strategy 5, the thematic G pillar investment, did not offer positive support to the previous findings, as presented in Tables 6 and 7. The returns of the portfolios are lower than the benchmark in all scenarios and the risk is higher. In both Strategies, as for Strategy 3, when considering weights proportional to Market Cap, the Sharpe ratio is higher than with equal weights and weights proportional to the ESG total score or the specific G pillar score.

Even if Diltz (1995), as presented in Chapter 1, suggested that the effect of under-diversification of the stock market has little effect on the performance of the SRI portfolio, this theory may not be applied to the specific case of this study. An important thing to consider while examining Strategies 4 and 5 is that the number of companies included in sustainable investments is consistently lower than the benchmark: 40 compared to 75. As a result, in the best-in-class screening and the thematic G pillar investment, the diversification effect by the correlation of the stocks in the portfolio is not as effective as in the benchmark and the firm-specific risk is higher, increasing the total risk of the portfolio.

	Strategy 1	Strategy 4		
	Traditional Strategy	Best-in-class Positive Screening		
<i>Number of companies</i>	75	40		
<i>Weights</i>	Equally-weighted	Equally-weighted	Proportional to ESG	Proportional to Market Cap
<i>Portfolio Return</i>	0.0244%	0.0116%	0.0116%	0.0190%
<i>Portfolio Risk</i>	1.1814%	1.2596%	1.2600%	1.2283%
<i>Sharpe ratio</i>	0.02069	0.00923	0.00923	0.01544

Table 6. Strategy 4

	Strategy 1	Strategy 5		
	Traditional Strategy	Thematic G Pillar Strategy		
<i>Number of companies</i>	75	40		
<i>Weights</i>	Equally-weighted	Equally-weighted	Proportional to G pillar	Proportional to Market Cap
<i>Portfolio Return</i>	0.0244%	0.0150%	0.0154%	0.0172%
<i>Portfolio Risk</i>	1.1814%	1.2253%	1.2540%	1.2291%
<i>Sharpe ratio</i>	0.02069	0.01220	0.01229	0.01396

Table 7. Strategy 5

To further improve strategy 3 and to overcome the diversification problem of strategies 4 and 5, MATLAB has been used to conduct a minimum variance analysis. The purpose of this in-depth study was to find weights to reduce the risk of sustainable strategies and create portfolios on the minimum variance frontier, in order to test the ability of ESG strategies to reduce risk. The original dataset of the prices has been adapted and then elaborated in MATLAB, thanks to which the prices and the returns have been calculated. From the returns, the expected return vector has been calculated, as well as the covariance matrix, the unit vector of the size of the number of stocks included in the portfolio and the inverse of the covariance. From these values, the matrix for the portfolio optimization has been derived, multiplying the transposed expected return vector by the inverse of the covariance and by the expected return vectors. The minimum variance portfolios

have then been determined and for this purpose, the *quadprog* function has been used. For each strategy, two different sets of weights have been determined: for the case in which short sales were allowed, and for the case with the short sales constraints. Those weights were then applied to the strategies to find return and risk, as well as the Sharpe ratio. The results are shown in Table 8.

	Strategy 1	Strategy 3	
	Traditional Strategy	ESG Negative Screening	
<i>Weights</i>	Equally-weighted	Minimum Variance Long only	Minimum Variance Short allowed
<i>Portfolio Return</i>	0.0244%	0.0120%	0.0170%
<i>Portfolio Risk</i>	1.1814%	0.9111%	0.8164%
<i>Sharpe ratio</i>	0.02069	0.01312	0.02080

	Strategy 1	Strategy 4	
	Traditional Strategy	Best-in-class Positive Screening	
<i>Weights</i>	Equally-weighted	Minimum Variance Long only	Minimum Variance Short allowed
<i>Portfolio Return</i>	0.0244%	0.0126%	0.0145%
<i>Portfolio Risk</i>	1.1814%	0.9123%	0.8295%
<i>Sharpe ratio</i>	0.02069	0.01385	0.01749

	Strategy 1	Strategy 5	
	Traditional Strategy	Thematic G Pillar Strategy	
<i>Weights</i>	Equally-weighted	Minimum Variance Long only	Minimum Variance Short allowed
<i>Portfolio Return</i>	0.0244%	0.0177%	0.0153%
<i>Portfolio Risk</i>	1.1814%	0.9337%	0.8546%
<i>Sharpe ratio</i>	0.02069	0.01891	0.01787

Table 8. Strategies 3,4 and 5 following the Minimum Variance Analysis

In all the three Strategies taken into consideration, the minimum variance analysis has effectively reduced the portfolio risk of the sustainable investments, compared to the benchmark. Especially, with short sales allowed, the risk has been decreased to a value lower than 0.8% in all cases, consequently decreasing also the risk exposure in the medium-long term. The returns of the portfolio still settled below the ones of the traditional investment strategy, as an expected consequence of the reduced risk premium, but apart from some negative variations, there were also some improvements compared to the previous analysis. Moreover, the reduced risk may indicate less exposure to controversies and higher returns in the long term. As far as the Sharpe ratios are concerned, in Strategy 3 with short sales allowed, the value was even higher than the benchmark, meaning that this strategy may be preferable to the traditional strategy. In the best-in-class screening with short sales and the thematic investment strategy, the values of the Sharpe ratios increased and came closer to the one of the traditional strategy, making these strategies more attractive to investors.

All things considered, it is evident that sustainable investment strategies could lead to both high economic returns, in certain cases even higher than traditional strategies and low risk, often lower than traditional investments. Considering a reliable risk-adjusted performance measure that takes the risk and returns into consideration, meaning the proxy of the Sharpe ratio, the effectiveness of sustainable strategies is highlighted. More specifically, in the ESG Negative Screening strategies, namely strategies 2 and 3, the Sharpe ratio assumed a higher value than the traditional strategy. In strategies 4 and 5 the Sharpe ratio was not too far from the one of the traditional strategy, even though the number of companies included in the portfolio was consistently lower. Analyzing the data, it is then possible to say that, choosing the right weights and strategy, it is feasible to obtain higher financial performance from sustainable investments. In any case, it is reasonable to accept slightly lower financial outcomes, given the non-financial positive results that are not quantitatively taken into consideration in this analysis.

4.2 Sub-period analysis

After the in-sample analysis, a sub-period study was also been carried on, to examine the behavior of strategies 1, 2 and 3 in the three sub-periods. Strategy 1 is the traditional investment equally-weighted strategy used as a benchmark and strategy 2 is the ESG Negative Screening considering controversies and with weights proportional to the market cap. Strategy 3 is the other ESG Negative Screening based on ESG score considering the weights deriving from the minimum variance analysis with no short sales constraint, that is the only case in which, in the whole period, the Sharpe ratio was found higher than the traditional investment. Period 2018-2019 should represent the pre-pandemic era, period 2020-2021 the Covid pandemic and the beginning of the energy crisis and period 2022-2023 the recovery and the wars in Ukraine and Palestine. For the analysis, the risk and return of the three strategies were calculated for each of the sub-periods, in order to analyze the differences.

Table 9 presents the results of the calculations for the returns of the three portfolios in the three sub-periods, applying the same weights. As could have been expected, the returns of all the investments started decreasing in the biennium 2020-2021, due to an increase in uncertainty and market volatility, the economic recession and interest rate cuts by the central banks. In particular, strategy 2 performed better than the other two strategies in all the three sub-periods and was able to maintain a high level of return even during the pandemic. Strategy 3, on the other side, in 2020-2021 suffered a decrease of more than half the value of 2018-2019, but during the last 4 years the return did not undergo substantial variations, decreasing by just 0.0032%. These things considered, it is then possible to conclude that Covid pandemic significantly influenced the returns of all types of investments, but despite that, the strategy that over the three-period of time performed better was the ESG Negative Screening based on the combined ESG score. The graph in Figure 11 presents the variations of returns of the strategies over time and highlights the primacy of strategy 2.

Return	Strategy 1	Strategy 2	Strategy 3
	Traditional Strategy	ESG Combined Negative Screening	ESG Negative Screening Short
2018-2019	0.0316%	0.0497%	0.0281%
2020-2021	0.0262%	0.0445%	0.0135%
2022-2023	0.0156%	0.0205%	0.0103%

Table 9. Sub-period analysis of Returns for Strategies 1,2 and 3

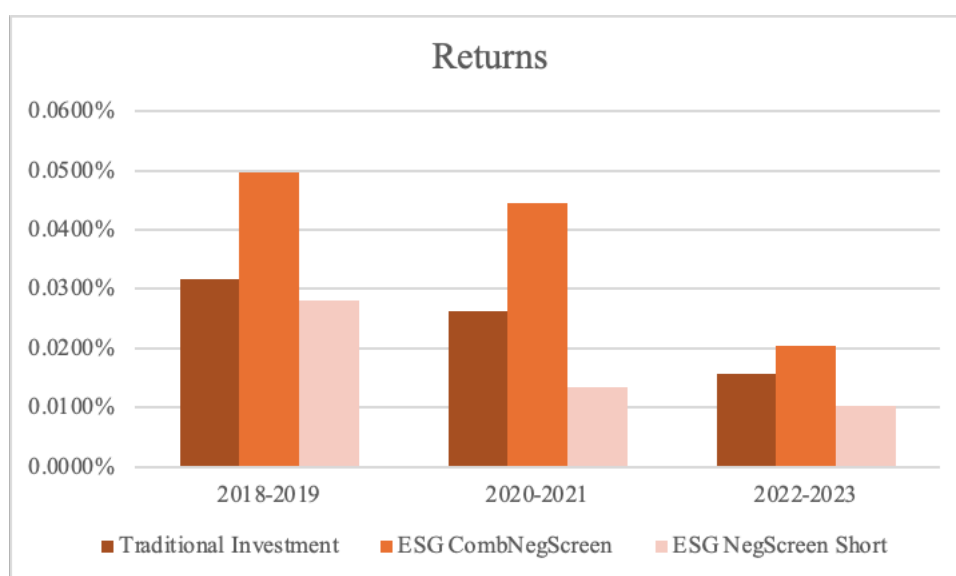


Figure 11. Variations of Returns in time for Strategies 1,2 and 3

Considering the risk, as was to be expected, the ESG Negative Screening with Short Sales performed best in all three sub-periods as the weights of the portfolio were specifically calculated to reduce the variance at a minimum. In all three strategies, the risk substantially increased in the biennium 2020-2021, due to the Covid pandemic and the growth of the systemic undiversifiable risk of the market. Despite that, Strategy 3 managed to keep the risk below 1% even in this uncertain period. Both the risks associated with Strategies 1 and 2 faced a relevant increase in value in 2020-2021, but the increase in risk associated with the ESG Screening was about 84%, compared to the traditional strategy in which the risk increased by

104%. This 20% difference in increase in risk may be interpreted as a sign of higher stability of the sustainable investment strategies and better ability to keep the risk relatively low and reduce uncertainties even during a crisis. In the last period 2022-2023, the risk of the three strategies decreased and settled at a level above the pre-pandemic period, with the risk of the ESG Negative Screening being a little but not significantly higher than the one of the benchmark. Table 10 and Figure 12 present the analysis of the risk for strategies 1,2 and 3.

Risk	Strategy 1	Strategy 2	Strategy 3
	Traditional Strategy	ESG Combined Negative Screening	ESG Negative Screening Short
2018-2019	0.7863%	0.8024%	0.6715%
2020-2021	1.6028%	1.4768%	0.9768%
2022-2023	0.9939%	1.0352%	0.7680%

Table 10. Sub-period analysis of Risks for Strategies 1,2 and 3

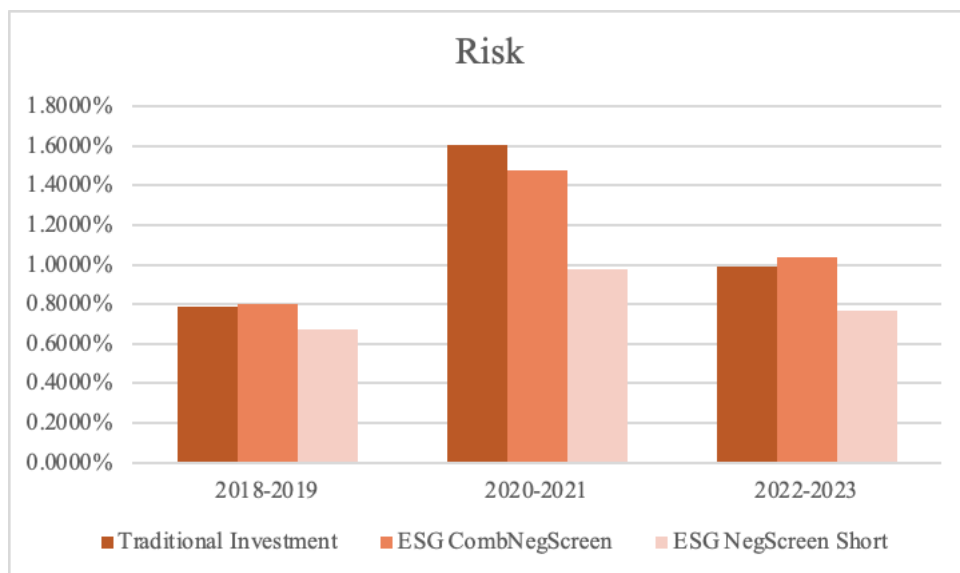


Figure 12. Variations of Risk in time for Strategies 1,2 and 3

The results about risk and return may be merged by analyzing the Sharpe ratio for the three strategies in the sub-periods, as presented in Table 11 and Figure 13.

Sharpe ratio	Strategy 1	Strategy 2	Strategy 3
	Traditional Strategy	ESG Combined Negative Screening	ESG Negative Screening Short
2018-2019	0.04016	0.06190	0.04183
2020-2021	0.01634	0.03010	0.01378
2022-2023	0.01574	0.01983	0.01341

Table 11. Sub-period analysis of the Sharpe ratios for Strategies 1,2 and 3

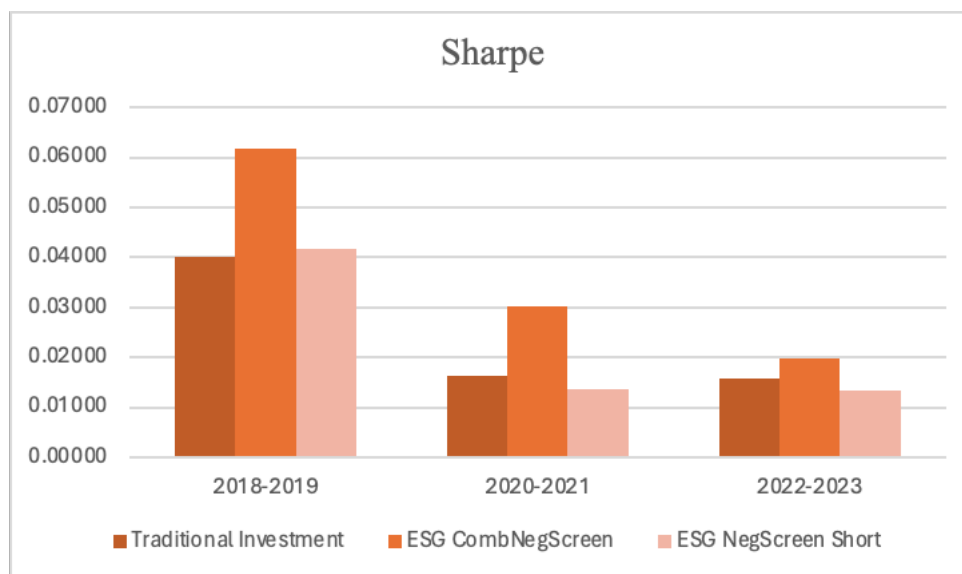


Figure 13. Variations of the Sharpe ratios in time for Strategies 1,2 and 3

Sharpe ratio, being a risk-adjusted performance measure, is considered of high importance in evaluating the effectiveness of the strategies and in analyzing the behaviors of the investments in the last six years, which have been characterized by economic recession, inflation, crisis, wars and high uncertainties, therefore high variations both in risk and returns. With this regard, the ESG Negative Screening strategy is the one that has achieved the highest Sharpe ratio in all three periods, thanks to the previously mentioned highest sub-period returns and the relatively low risk associated. Focussing on the ESG Negative Screening of strategy 3, it managed to achieve a higher Sharpe ratio of the benchmark in 2018-2019. In the other period the value was right below the one of the traditional strategy.

In all three strategies, there has been a substantial decrease in the value of the Sharpe ratio starting from 2020-2021, due to an increase in the level of systemic risk from one side and the economic recession that lowered the returns on the other. For strategies 1 and 3 the value of the ratio stabilized in the last four years, whereas for the other ESG Negative Screening, it kept decreasing and converged to a similar level of the other two, while remaining higher.

All things considered, the ESG Combined Negative Screening of strategy 2 is the one that allowed to achieve the highest returns and low level of risk, reflected in the highest Sharpe ratio in all the three sub-periods. Particularly relevant is the effectiveness of the strategy also during the unprecedented crisis of Covid-19, in which the traditional strategy used as a benchmark and as a prototype for traditional investments performed poorly with a decrease in returns and the highest volatility. Worth noting is also that the ESG Negative Screening of strategy 3 did perform better in terms of risk mitigation in the three periods and its Sharpe ratio in the three sub-periods is comparable to the one of the benchmark. It is then possible to conclude that sustainable strategies are not less performative than traditional strategies and may also perform better during the crisis, significantly reducing the risk associated with the investment while achieving a positive economic return.

Despite the positive key findings of this study in support of sustainable investments, it is important to acknowledge some limitations that may have influenced the interpretation of these results. First of all, ESG data may vary consistently from one provider to the other. In this study, ESG data have been extracted from the LSEG provider and it is possible to extend the results on a general basis, but it is not certain that the conduction of the same analysis with the same stocks but with data from other providers would lead to the same results. Secondly, the companies included in the analysis have been selected only based on their market cap and the selection of companies on a different basis, such as the highest Price to book, may lead to different conclusions. Thirdly, the period taken into consideration, going from 2018 to 2023 is characterized by many anomalous shocks in the economy and the society, such as the Covid Pandemic and two wars close to the EU area. These shocks may have caused the risks and returns of both the traditional strategy and the sustainable strategies to converge in reaction to those shocks, not providing a completely significant picture. Lastly, the initial screening of the whole set of companies in Italy, France, Germany, the UK and Spain, into a dataset containing only the 15 companies with the highest market cap in each country, may not be representative of the situation in each other country in the world, despite being a fair representation of the EU situation.

5 - CASE STUDY: B CORP

After reviewing the literature on sustainable investing and analyzing different portfolio strategies, this brief chapter explores the case of B Corporations. They are presented as real-case prototypes for ideally sustainable companies that have achieved a high level of sustainability within their company, having a positive impact on the environment and society.

5.1 Overview of B Corporations

In the context of Corporate Social Responsibility and the inclusion of Sustainability in business practices, some companies try to demonstrate their positive impact through certifications. In recent years, a new movement has emerged, aiming to integrate social and environmental priorities into their business models and economic activities. B Corporations embody this concept, as they are for-profit businesses that form a global movement promoting the positive externalities of companies. These corporations are evaluated based on their total revenues as well as their impact on society, the environment, stakeholders, and employees (Di Cesare & Ezechieli, 2017).

The B Corp movement originated in the USA in 2006, with its milestone being the B Lab, which is a non-profit network aiming at transforming the global economy to benefit all people, communities, and the planet. Their first significant action was the development of the B Impact Assessment (BIA), which is the most comprehensive protocol for measuring businesses' impact. It is a freely accessible online and confidential assessment tool that verifies whether a company meets the requirements to become a Certified B Corp. It is also used by many other companies to improve their impact and become more sustainable. The BIA supports companies in three phases: the Assessment of the Impact with 50-250 questions, the Comparison through a report containing relevant insights for future optimization and benchmarking with industry peers, and the Improvement of

performance through tracking of goals. The scored portion is the fundamental element of BIA, representing the positive impact that the company has on stakeholders. Negative outcomes are not included but are collected in the disclosure questionnaire and assessed through the Risk Standards. This approach ensures objectivity and balance in the evaluation process. (BIA Knowledge Base)

The B Impact Assessment objectively and dynamically evaluates all aspects of business operations and models. It is continuously updated and relies on other certifications and impact measurements to create a comprehensive framework. Furthermore, this innovative Impact Assessment enables standardization and comparability while customizing weightings for each company based on its size, geographic location, and industry. This allows companies to focus on the issues they may face and improve upon them (B Impact Assessment Knowledge Base). B Lab has established additional requirements for large companies, defined as those with more than \$5B in annual revenue, recognizing societal obligations beyond the BIA and the risk assessment resulting from the scale and influence of these companies. These standards are called Multinational Company Standards and require minimum positive practices to be in place. (B Lab)

BIA is based on the principles of Sustainable Development and Corporate Social Responsibility, that were presented in Chapter 1. The assessment consists of 50-250 questions covering six main areas: business model and economic performance, governance, workers, community, environment, and customers. Companies that answer the proposed questions and achieve a minimum score of 80 points may request verification by B Lab. If they pass the meticulous screening, they can be certified as B Corporations. To clarify, Figure 14 presents an example of a high B Impact Score for a B Corporation, in this case, Ricola Group AG, compared to the minimum score for B Corps and to the median Score for ordinary businesses. (B Lab)

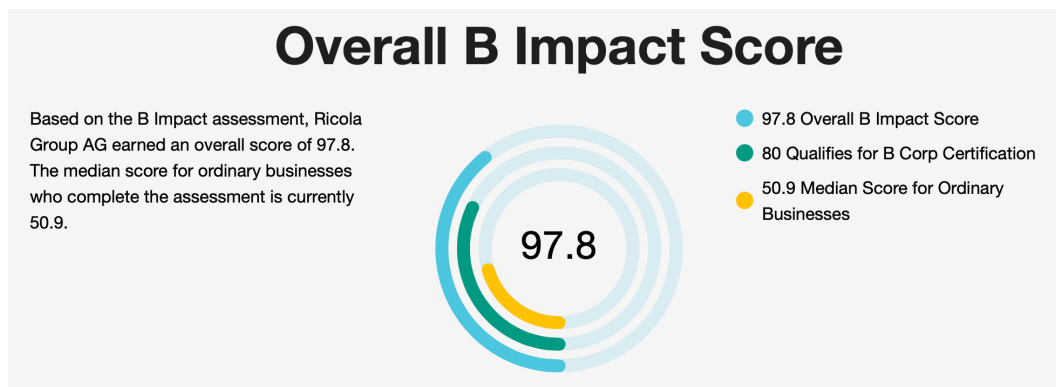


Figure 14. Example B Impact Score for the Company Ricola Group AG

In 2019, Del Baldo defined B Corporation as a model of enterprise that combines the vision and mission of a non-profit organization with the profit objective of for-profit organizations. B Corporations may be of any type, size or sector, and they share a common mission to reshape traditional business by focusing not only on the positive financial outcomes of their operations but also on the benefits they bring to people and the environment. Certifications of B Corporations by B Lab have been increasing each year since its inception in 2006, and to date, 8392 around the world have been certified as B Corporations (B Lab, accessed 17th May 2024). To manage these different pools of companies around the world, B Lab has set up what it calls the B Global Network, which operates at a local level on every continent and includes regional B Corp communities and partnerships. A particularly important role in promoting the principles of B Corporations is played by the B Movement-Builders. This is a coalition of leading multinational companies with annual revenues of at least \$1 billion and a strong commitment to the B Corp cause, that are working in partnership to have a concrete impact on the global business environment. Danone is a representative example of this category and serves as a role model for the other Builders. B Corporations are inspired by the Theory of Change, which guides them in transforming the economic system into a more inclusive, equitable and regenerative global economy that prioritizes stakeholders, not just shareholders. They are therefore the embodiment of Edward Freeman's Stakeholder Theory.

The certification for B Corporations must be renewed every three years, following a new assessment of the BIA, which includes three main requirements. Firstly, the social and environmental performance requirement, which involves the B Impact Assessment, the Risk Assessment, and the Multinational Company Standards. Secondly, transparency, meaning allowing information about their performance to be publicly available on B Lab's database. Thirdly, companies should make a legal commitment to change their corporate governance structure and achieve the status of a benefit corporation. It is important to note that Benefit Corporations are not always recognized by the jurisdiction, but they started being accepted in Europe in 2016 when Italy first recognized the Benefit Corporations, known as Società Benefit, as a legal form (Di Cesare, Ezechieli 2017). Concerning the Italian case, they are defined as companies that, in addition to the purpose of sharing profits while exercising their economic activity, “pursue some aims of common benefit and operate in a responsible, sustainable and transparent manner towards people, communities, territories, the environment and other stakeholders” (Società Benefit, March 2024).

Considering all these aspects, it is evident that achieving sustainability and prioritizing stakeholders is not a far-fetched idea. There are numerous examples of successful companies that have achieved a high level of sustainability while meeting the aforementioned criteria and generating positive financial returns. Among others, successful companies such as Nespresso, San Pellegrino S.p.A., L'Occitane Group, Danone, Unilever, Patagonia, Alpro, and Illycaffè S.p.A. have achieved the B Corporation certification. These companies demonstrate that, in addition to the empirical studies confirming a positive relationship between sustainability and financial success, many companies have been able to confirm this relationship in practice. Therefore, B Corporations could serve as an example for all companies to follow in order to achieve a more sustainable and long-lasting economy.

5.2 B Corporations and SDG

As the world increasingly values the Sustainable Development Goals (SDGs) and businesses seek to align their operations with these targets, B Corporations are fundamental to collective action to transform the global economic system. Thanks to the B Global Network, many initiatives related to the 2030 Agenda and working towards achieving the SDGs are being undertaken around the world. Taking action on climate, a group of B Corp formed the B Corp Climate Collective to address the current climate crisis and support businesses' climate action. One important tool they developed is the B Climate Tools Base, in partnership with Oxford University to help in tracking carbon footprint & greenhouse gas emissions. In terms of other Sustainable Development Goals, the B Corporations Global Network has several actions in place to address income inequality, racial discrimination and gender inequality. (B Lab)

B Lab has developed the SDG Action Manager to assist businesses in integrating SDG action into their strategies. This innovative tool combines the B Impact Assessment with the 10 principles of the United Nations Global Compact, a voluntary agreement to implement sustainability principles and align business operations with the principles of human rights, labor, anti-corruption, and the environment (UN Global Compact). The SDG Action Manager is a web-based impact management tool designed to assist all companies, not just B Corporations, in setting and tracking their progress towards achieving the 17 Sustainable Development Goals (SDGs). The tool helps businesses identify the SDG targets that are most relevant and addressable to them, assess the impact of their operations, business model, and supply chain on the SDGs, set goals, and determine the necessary actions to achieve those goals. The tool begins with a Baseline Module, which is based on the principles of the UN Global Compact. It then expands into 16 submodules, each corresponding to one of the 16 SDGs. The 17th SDG, Partnership for the Goals, is a shared and widespread target and therefore does not have a corresponding submodule.

An example of the Homepage of the SDG Action Manager is presented in Figure 15. Following the same structure as BIA, each module features a series of questions that suggest concrete actions for businesses to take in order to improve their positive impact on specific goals. The modules also provide additional resources for monitoring progress and benchmarking. Beginning with the Baseline questions related to the fundamental responsibilities of firms regarding human rights, labor, the environment, and anti-corruption, companies can then concentrate on the SDGs that are most relevant to them and on which they can have a significant impact. (SDG Action Manager Technical guide)



Figure 15. Example SDG Action Manager Homepage

The SDG Action Manager integrates the B Impact Assessment with a focus on the Sustainable Development Goals and it is a useful and innovative tool for companies to embed SDGs into their business strategies. Regarding the previously analyzed ESG scores, B Corporations have surpassed mere ESG factors, by prioritizing people and the planet in their business models, alongside with profit. They not only include Environmental, Social and Governance (ESG) factors in their business, but they also base their enterprise entirely on those values, while not forgetting the importance of economic feasibility and financial returns. By managing their ESG impact, they aim to build a long-term, resilient business that is integrated with the surrounding community and environment. In other words, B Corp Certification and ESG standards are not substitutes, on the contrary, are complementary impact measurement frameworks that help companies become more sustainable. This insight into B Corporation is, therefore, the perfect conclusion of this thesis, being a real case study of worldwide-known companies that successfully integrated sustainability in their actions, while being financially successful.

CONCLUSION

In response to the increasing urge for action toward a more sustainable future and the growing emphasis on integrating sustainability within the global investment sector, this study undertook a comprehensive analysis of the evolution of Environmental, Social, and Governance (ESG) factors and sustainable investments. This analysis extended beyond theoretical considerations, applying these principles to portfolio analysis to evaluate their practical implications and effectiveness.

Sustainable investing is a continuously growing sector encompassing a variety of subtopics. The initial integration of extra-financial concerns in economic decisions was through Corporate Social Responsibility (CSR) initiatives, which are voluntary efforts to enhance societal welfare in the “doing well while doing good” process. The practical inclusion of CSR principles into investment decisions laid the foundation for Socially Responsible Investing (SRI), an investment methodology that incorporates ethics and welfare considerations. With this regard, many studies have been made and they did not reveal a significant difference in financial performance between traditional investments and SRI.

The evolution of SRI has led to the prominence of Environmental, Social, and Governance (ESG) criteria, which are now key metrics for evaluating company performance and making investment decisions. The amount of studies about ESG criteria and their relationship with financial performance is massive and mainly showed a non-negative relationship that is stable over time. Worth noting is also the positive correlation between these ESG factors and the Sustainable Development Goals (SDGs), proving the extra-financial positive impact that ESG factors may have. With this regard, B Corporations are a real-case prototype of certified ideally sustainable companies that were able to achieve a high level of sustainability and make important steps toward SDG achievement while being financially successful.

Despite their innovative aspects, sustainable investment practices are grounded in traditional investment strategies and portfolio theory. Concepts such as risk and return, portfolio optimization, the Markowitz model, and the Capital Asset Pricing Model are crucial for assessing the efficiency of sustainable investments. While ESG factors evaluate extra-financial aspects, economic efficiency must still be measured using traditional methodologies and key risk-adjusted performance metrics like the Sharpe Ratio. Depending on the rating agency, there are different ways to calculate traditional and sustainable indices, and different ESG investing strategies may be applied to those indices.

Building on the foundation of the literature and the theoretical background, this study conducted a portfolio analysis to determine whether sustainable investment strategies based on ESG could positively impact risk and return while achieving a transparent non-financial impact. Data from LSEG were used to create a dataset with the main characteristics of the companies to select the stocks in the portfolios. The analysis covered the period 2018-2023 and compared various sustainable investment strategies against a traditional equally-weighted benchmark.

Among the strategies, the ESG combined negative screening with weights proportional to the market cap, showed positive results of risk, return and Sharpe ratio, making this sustainable strategy preferable to the benchmark. Other strategies, such as ESG negative screening, best-in-class ESG positive screening, and G-pillar thematic investment, exhibited varied results. Generally, these strategies had higher risks and lower returns, but minimum variance analysis significantly improved their performance, often approaching or exceeding traditional strategies in terms of lower risk and higher Sharpe ratio. A sub-period analysis has also been conducted, which highlighted the persistence of positive results for the ESG negative screenings during the Covid-19 pandemic period and the Ukrainian and Palestine conflicts, where traditional investments experienced a more pronounced drop in return and increase in risk.

In conclusion, the sustainable investment strategies considered in this study generally achieved positive financial returns while reaching high ESG scores, which certify a positive non-financial impact. Some strategies even surpassed traditional investments in risk-return performance. Moreover, sustainable strategies often exhibited lower risk, with minimum variance analysis enhancing their effectiveness in risk reduction. Furthermore, during the crisis period of 2020-2021, ESG screening strategies managed to successfully reduce risk despite the challenging economic context. During crisis periods, ESG screening strategies notably mitigated risk despite challenging economic conditions. Given the comparable risk and return profiles, sustainable strategies are a legitimate means to achieve economic benefits while positively contributing to ESG issues.

BIBLIOGRAPHY

- (1) Abate, G., Basile, I., & Ferrari, P. (2021). *The level of sustainability and mutual fund performance in Europe: An empirical analysis using ESG ratings*. Corporate Social Responsibility and Environmental Management. <https://doi.org/10.1002/csr.2175>
- (2) Atz, U., Van Holt, T., Liu, Z. Z., & Bruno, C. C. (2023). *Does sustainability generate better financial performance? Review, meta-analysis, and propositions*. Journal of Sustainable Finance & Investment, 13(1), 802-825. <https://doi.org/10.1080/20430795.2022.2106934>
- (3) B Lab, UN Global Compact. (2020). *SDG Action Manager Technical Guide*. Retrieved from <https://assets.ctfassets.net/sdg-am-technical-guide-en-us.pdf>
- (4) Berry, T. C., & Junkus, J. C. (2013). *Socially responsible investing: An investor perspective*. Journal of Business Ethics, 112(4), 707–720 <https://www.jstor.org/stable/23433678>
- (5) Bello, Z.Y. (2005). *Socially responsible investing and portfolio diversification*. Journal of Financial Research, 28(1), 41–57
- (6) Bermejo Climent, R., Figuerola-Ferretti Garrigues, I., Paraskevopoulos, I., Santos, A. (2021). *ESG Disclosure and Portfolio Performance*. Risks, 9(10), 172. <https://doi.org/10.3390/risks9100172>
- (7) Billio, M., Costola, M., Hristova, I., Latino, C., and Pelizzon, L. (2021). *Inside the ESG Ratings: (Dis)agreement and Performance*. Corporate Social Responsibility and Environmental Management, 28(5), pp. 1426-1445. <https://doi.org/10.1002/csr.2177>
- (8) Boffo, R., and R. Patalano (2020). *ESG Investing: Practices, Progress and Challenges*. OECD Paris, www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf
- (9) Calveras, A., Ganuza, J.-J., & Llobet, G. (2007). *Regulation, corporate social responsibility and activism*. Journal of Economics & Management Strategy, 16, 719-740. <https://doi.org/10.1111/j.1530-9134.2007.00155.x>
- (10) Charlo, M. J., Moya, I., & Munoz, A. M. (2017). *Financial performance of socially responsible firms: The short- and long-term impact*. Sustainability, 9, 1622. <https://doi.org/10.3390/su9091622>

- (11) Clow, R. (1999). *Money that grows on trees*. Institutional Investor, 33(10), 212–215.
- (12) Commission of the European Communities. (2001). *Green Paper: Promoting a European Framework for Corporate Social Responsibility*.
- (13) Corporate Governance Institute. (2024, 8th March). *What is the difference between CSR and ESG?* The Corporate Governance Institute. Retrieved from <https://www.thecorporategovernanceinstitute.com/insights/lexicon/what-is-the-difference-between-csr-and-esg/>
- (14) Del Baldo, M. (2019). *Acting as a benefit corporation and a B Corp to responsibly pursue private and public benefits: The case of Paradisi Srl (Italy)*. International Journal of Corporate Social Responsibility, 4(1), 1-18. <https://doi.org/10.1186/s40991-019-0046-2>
- (15) Diez-Cañamero, B., Bishara, T., Otegi-Olaso, J. R., Minguez, R., & Fernández, J. M. (2020). *Measurement of Corporate Social Responsibility: A Review of Corporate Sustainability Indexes, Rankings and Ratings*. Sustainability, 12(5), 215. <https://doi.org/10.3390/su12052153>
- (16) Di Cesare, P., & Ezechieli, E. (2017). *Le Benefit Corporation e l'evoluzione del Capitalismo*. I libri di Ca' Foscari 4. <http://doi.org/10.14277/6969-188-1/LCF-4-4>
- (17) Diltz, J. D. (1995a). *Does social screening affect portfolio performance?* Journal of Investing, 4, 64–69.
- (18) Diltz, J. D. (1995b). *The private cost of socially responsible investing*. Applied Financial Economics, 5(2), 69–77
- (19) Eastman, M. T., Horrocks, P., Singh, T., & Kumar, N. (2018). *Institutional Investing for the SDGs: A Joint Discussion Paper from MSCI and the OECD*. Retrieved from https://www.msci.com/documents/10199/239004/Institutional_Investing_for_the_SDGs.pdf
- (20) Edmans, A. (2011). *Does the Stock Market Fully Value Intangibles? Employee Satisfaction and Equity Prices*. Journal of Financial Economics, 101(3), 621-640. SSRN: <https://ssrn.com/abstract=985735>
- (21) Elton, E. J., Gruber, M. J., Brown, S. J., & Goetzmann, W. N. (2014). *Modern Portfolio Theory and Investment Strategies*. Wiley.

- (22) Escrig-Olmedo, E., Muñoz-Torres, M. J., & Fernandez-Izquierdo, M. A. (2010). *Socially responsible investing: sustainability indices, ESG rating and information provider agencies*. *International Journal of Sustainable Economy*, 2(4), 442-461. <https://doi.org/10.1504/IJSE.2010.035490>
- (23) European Commission, Directorate-General for Financial Stability, Financial Services and Capital Markets Union, (2021). *Study on sustainability-related ratings, data and research*. Publications Office of the European Union. <https://data.europa.eu/doi/10.2874/14850>
- (24) Fabozzi, F. J., & Grant, J. L. (2001). *Equity Portfolio Management*. Wiley
- (25) Freeman, R.E., & McVea, J. (2005). *A stakeholder approach to strategic management*. In *Blackwell Handbook of Strategic Management* (pp. 183-201). <https://doi.org/10.1111/b.9780631218616.2006.00007.x>
- (26) Freeman, R.E. (1984). *Strategic Management: A Stakeholder Approach*. Marshfield, MA, USA: Pitman Publishing Inc.
- (27) Friedman, M. (1970). *A Friedman doctrine: The social responsibility of business is to increase its profits*. *The New York Times Magazine*, 13(1970), 32-33.
- (28) Friede, G., Busch, T., & Bassen, A. (2015). *ESG and financial performance: Aggregated evidence from more than 2000 empirical studies*. *Journal of Sustainable Finance & Investment*, 5(4), 210-233. <https://doi.org/10.1080/20430795.2015.1118917>
- (29) Giese, G., Lee, L.-E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). *Foundations of ESG Investing: How ESG Affects Equity Valuation, Risk, and Performance*. *The Journal of Portfolio Management*, 45(5), 69-83. <https://doi.org/10.3905/jpm.2019.45.5.069>
- (30) Global Sustainable Investment Alliance. (2023). *Global Sustainable Investment Review (GSIR)*, Sixth Edition. <https://www.gsi-alliance.org/wp-content/uploads/2023/12/GSIA-Report-2022.pdf>
- (31) Gratcheva, E. M., Emery, T., Wang, D. (2020). *Demystifying Sovereign ESG*. Report, World Bank, Equitable Growth, Finance and Institutions Insight, December.

- (32) Hoepner, A. G. F., Rezac, M., & Siegl, K. S. (2011). *Does Pension Funds' Fiduciary Duty Prohibit the Integration of Environmental Responsibility Criteria in Investment Processes?: A Realistic Prudent Investment Test*. <https://doi.org/10.2139/ssrn.1930189>
- (33) Holbrook, M.B., & M.B. Hulbert (2002). *Postmodern Consumer Research: The Study of Consumption as Text*. SAGE Publications.
- (34) Holbrook, M.B. (2003). *Rethinking the Concept of Brand Equity*. In Review of Marketing Research (pp. 51-81). Emerald Group Publishing Limited.
- (35) Holmes, L., & Watts, R. (2000). *Corporate Social Responsibility: Making Good Business Sense*. World Business Council for Sustainable Development.
- (36) Kiyamaz, H. (2019). *Factors influencing SRI fund performance*. Journal of Capital Markets Studies, Vol. 3 No. 1, pp. 68-81. <https://doi.org/10.1108/JCMS-04-2019-0016>
- (37) Khaled, R., Ali, H., & Mohamed, E. K. A. (2021). *The Sustainable Development Goals and corporate sustainability performance: Mapping, extent and determinants*. Journal of Cleaner Production. <https://doi.org/10.1016/j.jclepro.2021.127599>
- (38) Kotler, P., & Lee, N. (2005). *Corporate Social Responsibility: Doing the Most Good for Your Company and Your Cause*. Hoboken, NJ: John Wiley.
- (39) Kumar, N. C. A., Smith, C., Badis, L., Wang, N., Ambrosy, P., & Tavares, R. (2016). *ESG factors and risk-adjusted performance: A new quantitative model*. Journal of Sustainable Finance & Investment, 6(4), 292-300. <https://doi.org/10.1080/20430795.2016.1234909>
- (40) Lean, H. H., & Pizzutilo, F. (2020). *Performances and risk of socially responsible investments across regions during crisis*. International Journal of Finance & Economics. Advance online publication. <https://doi.org/10.1002/ijfe.1975>
- (41) Lean, H. H., Ang, W. R., & Smyth, R. (2015). *Performance and performance persistence of socially responsible investment funds in Europe and North America*. North American Journal of Economics and Finance. <https://doi.org/10.1016/j.najef.2015.09.011>

- (42) Liang, H., & Renneboog, L. (2020, September 24). *Corporate Social Responsibility and Sustainable Finance: A Review of the Literature*. European Corporate Governance Institute – Finance Working Paper No. 701/2020
- (43) Lopez-de-Silanes, F., McCahery, J. A., & Pudschedl, P. C. (March 4, 2022). *Institutional Investors and ESG Preferences*. European Corporate Governance Institute - Law Working Paper No. 631/2022. <http://dx.doi.org/10.2139/ssrn.4049313>
- (44) Managi, S., Okimoto, T., & Matsuda, A. (2012). *Do socially responsible investment indexes outperform conventional indexes?* Applied Economics Letters, 19(10), 989–992. <https://doi.org/10.1080/09603107.2012.665593>
- (45) MSCI ESG Research. (January 2024). *MSCI SDG Alignment Methodology*. Retrieved from <https://www.msci.com/documents/1296102/15233886/MSCI+SDG+Alignment+Methodology.pdf>
- (46) Pedersen, L.H., Fitzgibbons, S., Pomorski, L. (2021). *Responsible investing: The ESG-efficient frontier*. Journal of Financial Economics, 142(2), 572-597. <https://doi.org/10.1016/j.jfineco.2020.11.001>
- (47) Renneboog, L., Ter Horst, J. and Zhang, C. (2008) *Socially responsible investments: Institutional aspects, performance, and investor behaviour*. Journal of Banking and Finance, Vol. 32, No. 9, pp.1723–1742.
- (48) Revelli, C., & Viviani, J.-L. (2014). *Financial performance of socially responsible investing (SRI): what have we learned? A meta-analysis*. Business Ethics: A European Review. <https://doi.org/10.1111/beer.12076>
- (49) Roncalli, T. (2022). *Handbook of Sustainable Finance*. <http://dx.doi.org/10.2139/ssrn.4277875>
- (50) Schueth, S. (2003). *Socially responsible investing in the United States*. Journal of Business Ethics, Vol. 43 No. 3, pp. 189-194.
- (51) Sen, S., Bhattacharya, C.B., & Korschun, D. (2006). *The role of corporate social responsibility in strengthening multiple stakeholder relationships: a field experiment*. Journal of the Academy of Marketing Science, 34, 158–166. <https://doi.org/10.1177/0092070305284978>
- (52) Servaes, H., & Tamayo, A. (2013). *The Impact of Corporate Social Responsibility on Firm Value: The Role of Customer Awareness*. Management Science, 59(5), 1045–1061. <http://www.jstor.org/stable/23443926>

- (53) Social Investment Forum (SIF) (2009) *What is Socially Responsible Investing (SRI)?* Available at: <http://www.socialinvest.org/resources/sriguide/srifacts.cfm>
- (54) Sparkes, R., & Cowton, C. J. (2004). *The Maturing of Socially Responsible Investment: A Review of the Developing Link with Corporate Social Responsibility*. *Journal of Business Ethics*, 52(1), 45–57. <http://www.jstor.org/stable/25075231>
- (55) Tobin, J. (1958). *Liquidity Preference as Behavior toward Risk*. *Review of Economic Studies* XXVI, pp. 65–86
- (56) Uzsoki, D. (2020). *Sustainable Investing Today*. In *Sustainable Investing: Shaping the future of finance* (pp. 3–7). International Institute for Sustainable Development (IISD). <http://www.jstor.org/stable/resrep22000.4>
- (57) Vogel, D. (2005). *Is there a market for virtue?: The business case of corporate social responsibility*. *California Management Review*, 47(4), 19-45. <https://doi.org/10.1177/000812560504700401>
- (58) UN DESA. (2023). *The Sustainable Development Goals Report 2023: Special Edition - July 2023*. New York, USA: UN DESA. Retrieved from <https://unstats.un.org/sdgs/report/2023/>
- (59) European Sustainable Finance Observatory (2023). *EU Taxonomy: An introduction to sustainable finance*. European Commission. Retrieved from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-introduction-sustainable-finance_en

SITOGRAPHY

- (60) *B Corporation*. (Retrieved April 2024), from <https://www.bcorporation.net>
- (61) *B Impact Assessment Knowledge Base*. (Retrieved April 2024), from <https://kb.bimpactassessment.net>
- (62) *Bloomberg ESG data*. (Retrieved March 2024), from <https://www.bloomberg.com>
- (63) *London Stock Exchange Group FTSE Russell's ESG Scores* (Retrieved March 2024), from <https://www.lseg.com>
- (64) *MSCI ESG Ratings* (Retrieved March 2024), from <https://www.msci.com>
- (65) *S&P Global*. (Retrieved March 2024), from <https://www.spglobal.com>
- (66) *Societa Benefit*. (Retrieved March 2024), from <https://www.societabenefit.net>
- (67) *Sustainable Development Goals*. (Retrieved February 2024), from <https://sdgs.un.org/goals>
- (68) *Sustainalytics*. (Retrieved March 2024), from <https://www.sustainalytics.com>
- (69) *UN Global Compact*. (Retrieved April 2024), from <https://unglobalcompact.org>

