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## The Performance of ESG funds: an empirical analysis in the United Kingdom

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"It was the mid-1970s, and I was your age. On the back cover of their final issue was a photograph of an early morning country road, the kind you might find yourself hitchhiking on if you were so adventurous.

> Beneath it were the words: 'Stay Hungry. Stay Foolish.' It was their farewell message as they signed off. Stay Hungry. Stay Foolish.

> > And I have always wished that for myself.

And now, as you graduate to begin anew, I wish that for you."

### Abstract

This paper studies, through an empirical analysis, the tie between the financial return and the Environmental, Social and Governance (ESG) orientation of Equity funds in the United Kingdom. This research paper is meant to address the issue related to the existence of a difference in returns between funds that follow ESG principles and their conventional counterparties and whether the ESG orientation is an explicative variable for funds' performance. These empirical results want to challenge the traditional portfolio theory suggesting that as ESG funds have a narrower investment universe, less diversification is possible, and thus portfolios cannot reduce their exposure to idiosyncratic risk, resulting in lower risk-adjusted returns.

Through multi-factor models to overcome the benchmark problem, this empirical analysis discovers that no statistically significant difference is found between the returns of ethical funds and their conventional matched counterpart. Also, ESG orientation is not found to be an explanatory variable for funds' performance.

### **Executive Summary**

In the past few years, socially responsible investments (SRI) have become more and more popular with the flow of money being invested into those funds growing each year: the flow of money into those founds topped \$20bn USD in 2019, four times the flow recorded in 2018<sup>1</sup>. In the same year, there were nearly 500 actively managed funds in the United States that added ESG criteria to their prospectus, to inform investors concerning their ESG investment decisions. This exponential growth could be explained as well by the public opinion that shifted more towards sustainability, allowing companies to make essential steps towards sustainability and investment funds to offer new products to fulfil the needs.

The analysis of such kind of funds is a matter of great interest as it is a class of investment that offers positive externalities on society while granting a financial return to investors. However, many investors questioned themselves whether ethical investments are only an ethical sacrifice, or they offer greater financial returns. This empirical project wants to answer the question whether a divergence is found in the returns among funds that follow an ESG strategy compared with similar funds that do not apply an ESG strategy when selecting the securities to invest into.

To answer this research question, the study has been done through a matched-pair study methodology, as in Bauer *et al.* and Kreander *et al.*: from a sample of active-managed funds in the United Kingdom, each high-scoring ESG fund is matched with a comparable conventional fund and their performance is then analysed through different asset pricing models: Capital Asset Pricing Model, Fama and French and Carhart four-factor model. Their risk-adjusted under- or over-performance is later tested to ascertain whether a statistically significant difference is found between the two samples.

After acknowledging that financial returns are found not to statistically differ between the two types of funds, another regression is performed to ascertain the impact of ESG orientation on funds' abnormal performance. The second hypothesis tests whether the ESG orientation of a fund is an explanatory variable for its performance: our results suggest that we cannot reject the hypothesis stating that financial results are not influenced by the ESG orientation of the fund.

<sup>&</sup>lt;sup>1</sup> Data source: Morningstar

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I started writing this Business Research Project in May 2022, after two years in which the world has been struggling to come out of the pandemic. This paper is the symbolic end of my studies and a life journey that - in the past five years – brought me to Italy, Canada, Scotland, the Czech Republic, and England. Those very meaningful years, experiences, and people I met on my journey will forever be embedded in my heart.

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### List of Abbreviations:

- ESG Environmental, Social and Governance
- EU European Union
- HML High minus low
- MOM-Momentum
- MPT Modern Portfolio Theory
- OECD Organisation for Economic Co-Operation and Development
- OLS Ordinary Least Squares
- SEC Securities and Exchange Commission
- SIF Social Investment Forum
- SMB Small minus Big
- SRI Socially Responsible Investment

### 1. INTRODUCTION

### 1.1 What is ESG Investing and Research Question

In the last years, socially responsible investments (SRI) gained much popularity, flows into investment funds labelled as 'green' or ESG-compliant have recorded impressive inflows each year - the flow of money into those founds topped \$20bn USD in 2019, four times the flow recorded in 2018<sup>2</sup>. Governments, providers of financial products are looking to regulate and develop new products to meet the demand.

This change in investment preferences and greater attention given to green investments could be linked to a change in public opinion that has started to become more and more aware of the sustainability matter. The world's largest corporations started providing investors updated data on their green commitments while making some efforts to decrease their environmental footprints. Being able to offer financial returns aligned with social and environmental value is the new challenge for fund managers as not only financial returns are considered important but also how they are achieved and what the social and environmental effects are.

Although many investors take into consideration already the direct and indirect externalities when deciding the companies to invest into, the financial return is still their most important concern (McLachlan and Gardner, 2004). A previous survey done by Sparkes in 1998 found out that only 35% of investors would still invest in such securities if the return was only slightly lower than the one of conventional funds. Nowadays, the question that many economists have asked themselves is whether socially responsible investment involves an ethical sacrifice or is able to offer the same financial rewards as conventional investing.

This paper wants to expand previous literature that focused on the analysis of the performance of ethical funds. Previous research has mainly focused on the comparison of the abnormal returns obtained from a sample of ESG-compliant investment funds with a matched-pair conventional counterpart, to see whether ESG funds' abnormal returns differ statistically from conventional funds; whether ethical investing could offer investors a different return.

The analysis of this group of assets is a matter of great interest and importance in modern society, as it is a class of investments that might not only lead to financial returns but also

<sup>&</sup>lt;sup>2</sup> Morningstar, "Global Sustainable Fund Flows Report". Available at: <u>https://www.morningstar.com/lp/global-esg-flows</u>

contribute to the improvement of society in general: this double return therefore constitutes a new form of development of social well-being by pushing companies to act in a sustainable and correct way. As both ethical and conventional funds have the same final ambition of maximising the returns offered to investors, having as only difference the ethical investing orientation, this empirical study will assess the abnormal returns for both classes of funds, later comparing them through a matched-pair analysis – a Paired matched T-Test – to look for a statistically significant difference.

The research questions of this empirical study investigate whether abnormal returns provided to investors by ESG funds are different from the ones obtained from a similar unconstrained fund and whether the ESG orientation is an explanatory variable for a fund's abnormal return: Does investing in funds that have an outstanding ESG ranking provide investors different, higher or lower risk-adjusted returns than investing in similar conventional funds? The research questions find also solid links to the Modern Portfolio Theory, which will be described more in details in the next subchapter: ethical funds have a restricted range of asset to select their investments from and thus shall perform both a positive (choosing the best-ESG performing assets) and negative (eliminating companies operating in controversial business areas) screenings concerning the assets in which the funds will invest. These entrance screens restrict the possibilities for funds' managers to lower the risk of the single stocks through diversification in different fields, thus ethical funds shall offer lower risk-adjusted returns.

For this study to be carried out, from a list of more than 350 funds, a sample of 18 active managed equity funds located in the United Kingdom with an outstanding ESG rating has been used, properly matched for size, age and investment universe with a respective non-ESG fund (a fund with a low ESG rating). For the computation of risk-adjusted financial returns, the Capital Asset Pricing Model (CAPM), the Fama and French three-factor model and the Carhart four-factor model were used.

The rest of this paper is organised in this order: later in this introduction, more information is provided concerning which ESG rank is used and how it is computed, as well as what criteria ESG funds are expected to follow. In the following subchapter, more information concerning the research question and its link to Modern Portfolio Theory is provided as well.

Several studies have tried responding the same research question by tracing the link between ethical funds, their returns and risks matched with a conventional fund: in Chapter 2, past

literature for the matter will be revised, but so far, the results can be considered inconclusive given that no standard method to evaluate the performance of SRI funds has been used. Chapter three provides knowledge about the dataset, how it was gathered, which financial models were used for performance evaluation and which hypotheses were tested. Finally, in the last two chapters, the results of the empirical study are provided and discussed.

### 1.2 A Brief history of ESG Investing and its link with stakeholders' theory

Sustainable investing started in the political climate of 1960, it was performed massively in the past 20 years, but it dates back many more years. It started with religious groups such as Muslims, Quakers and Methodists who needed to use their ethical parameters to screen the assets in which they wanted to invest. For example, portfolios held by individuals of Islamic religion shall comply with the Shariah. Religious codes brought firstly the desire for investors to shape their portfolios with assets that respected their personal beliefs.

The first mutual fund that could be defined ESG in modern term was created in 1971, following the anti-war movement concerned the Vietnam war: *Pax Sustainable Allocation Inv*, the first sustainable mutual fund ever established, and it is still possible to invest in it today. In the following years, during the 1980s in the United States, shareholders activism started to demand companies to behave more ethically: those movements pushed the US government to shape public policy accordingly. In 1984, the US Forum for Sustainable and Responsible Investing is established. In 1997, the signing and ratification of Kyoto Protocol<sup>3</sup> contributed to switch the public opinion toward awareness of sustainability.

Still, during the 1990s, the availability of ESG compliant funds to invest into is limited. Funds on the market employ a mix of negative and positive screening techniques known as 'best in class': a comparison of the environmental, social and governance practices of a sample of companies relative to its industry peers to later pick the best ones. As during the last decade of the century there has been an adoption of ESG good practices from corporations, in May 1990, the first Socially Responsible Investing Index was launched: the aim of the index is to provide exposure to companies bearing high MSCI ESG ratings<sup>4</sup> after performing a negative screening aimed at deleting companies with strong environmental impacts and/or operating in

<sup>&</sup>lt;sup>3</sup> Britannica, Kyoto Protocol

<sup>&</sup>lt;sup>4</sup> MSCI Institute, MSCI KLD 400 Social Index

controversial areas (tobacco, gambling, alcohol). This index selected companies with the highest ESG ratings in each sector, keeping the standard sector weights of the parent index. It represent an important milestone as for the first time, investors could rely on a guide to choose their investments.

In the late 1990s, more sustainable funds were created: in 1994, ESG funds held assets worth around \$1.9bn<sup>5</sup>. The real change happened in the 2000s when the United Nations published the Global Compact in which the phrase 'ESG Investing' is officialised for the first time. This voluntary initiative enables companies to take part in it through a commitment to best business practices in the areas of human rights, labour, and the environment. The United Nations offered advice and recommendation to companies concerning how to incorporate ESG best practices into their operations and asset management. In the 2010s, the Paris Agreement on Climate Change and the permission from the US Department of Labor for pension plans to invest in socially responsible investments - if the strategy will help the plan to reach its economic and financial objectives - brought CalPERS, the largest public pension fund in the US to adopt a five-years plan to incorporate ESG principles into its investment strategy.

In the past five years, the push for ESG investing reached new – never seen before – levels: in 2018, the CEO of BlackRock, the biggest investment management company in the world, urged companies to be accountable for their impact on the society, advising CEOs to minimize negative environmental and social impacts and plan for a transition towards net-zero emission and digital.

Because of the change in public opinion, only in 2019, flows into US sustainable funds topped \$20bn, recording a four-fold increase compared to 2018. In Europe, an exponential growth is recorded as well: only in 2020, more than five hundreds new ESG funds were established, summing up to more than three hundred thousand of sustainable funds.

This growth is linked to three main reasons: individuals became more aware and demanded more ethical products from investment companies; governments and international organisation started to integrate sustainability into the public regulatory framework; finally, research has contributed to enlighten this topic researching whether ESG investment can help investors to offer them lower volatility while bringing excess returns.

<sup>&</sup>lt;sup>5</sup> Morningstar, ESG Investing Comes of Age

Morningstar may be considered the most important provider of financial information when it comes to ESG ratings. It has performed research<sup>6</sup> concerning this trend in ESG investing, finding out that 72% of the US population has at least a 'moderate interest' in sustainable investing and there is not a statistically significant difference across different generations (Millennials and Generation X) when it comes to preference concerning sustainable investing.

This switch towards ESG investing just described, and the major attention given to ethical and environmental matters that has been recorded in the past years is linked to changes in society and investor preferences. The value creation is not focused only anymore on the financial return maximisation, but it takes into accounts more players than before, everyone that will be impacted by the company's operations. As this switch towards ethical investing is a result of the popularity gained by the stakeholders' view, before analysing researching over the performance of ethical funds, it might be in the interest of the reader to present a small digression concerning the stakeholders' view.

Freeman (1983) investigated the debate between the shareholder and stakeholder theories, in relation to value creation. Shareholders' theory which is based on neoclassical economics is about the maximization of a firm profits and profitability, taking into consideration only the shareholders' goals (Levitt, 1958). On the other hand, stakeholders' theory has more subjects involved, thus companies shall include ESG principles in their operations to match the interests of the society as well (Donaldson & Preston, 1995).

In the past years, a switch towards the stakeholders' theory has been recorded. Companies are now guided by the 'meta-objective' of achieving and maintaining the necessary conditions over time to adequately meet the expectations of their various stakeholders, internal and external (Caroli & Gotta). As investors started to give more attention to different variables, funds had to adjust and put in place different screens to filter the companies they invest into.

<sup>&</sup>lt;sup>6</sup> Morningstar, Are your Clients ESG Investors?

### 1.3 What is meant by an ESG Fund and ESG Rank

Before analysing the performance of ESG funds, for the purpose of this empirical analysis it is interesting to research on the meaning of Environmental, Social and Governance (ESG) attribute.

As of today, no specific, universal, definition of what an ESG fund is or what characteristics it shall possess to be considered such, exists. This lack of widely accepted parameters is related both to which parameters are used to differentiate between ESG and conventional funds and how to correctly evaluate the level of sustainability using a rank. According to the definition given by the Securities and Exchange Commission (SEC) of the United States, "funds may consider a wide range of factors that are consistent with their objectives and strategies when selecting investments. This can include ESG, which stands for environmental, social, and governance". The strategies used by funds to screen out companies based on their ESG commitment can be either positive (selecting companies with policies or commitments aimed at minimising their impact or companies with outstanding records governance principles or transparency) or negative (refrain from investing in companies operating in controversial fields like tobacco, oil, mining etc.)

The UK Social Investment Forum, Green and Ethical Investment, in its course for Financial Advisers (2009) defines each parameter.

- The environmental component focuses on the externalities generated by a firm on the environment, like its pollution output. It takes into account as well the risks companies may be subjected to due to climate change, how companies are ready to stand changes in the cost of raw materials, extreme events, new regulations etc.
- The social factor is related to how the company relates to issues like diversity, inclusion, respect for human rights and human capital. Some companies like the ones operating in the apparel industry or having factories in third-world countries are exposed to this issue.
- The governance factor focuses on how the company is managed and if its corporate governance is transparent enough in terms of independency, remuneration.

ESG investing is related both to financial and social returns. Ideally, it would be able to provide investors financial returns while efficient capital markets would be able to allocate investors'

resources to companies contributing to a positive impact on our society. ESG factors might also be taken into consideration when assessing risks and opportunities of an investment, especially in a medium- or long-term investment horizon.

As ESG investing became popular, companies, funds and providers of financial data developed models to assign sustainability ratings to each company and fund. The ESG assessment is now an essential part of the investment prospectus of any company, as investors want to know what steps the company is taking towards sustainability. Later in this empirical study, ESG ratings provided by Morningstar are used. The choice of Morningstar as provider of ESG rating instead of the more famous but more general financial data providers like Refinitiv or Bloomberg is due to the specific attention Morningstar gives to sustainability issues in the financial data it provides. As explained in Appendix 1, through Morningstar and its filters I was able to specifically select funds with specific ESG characteristics, creating two comparable samples.

As the Morningstar Sustainability Rating is the main criteria used to discern input data, it is worth to spend some phrases to explain how it is computed. As stated on Morningstar, the Morningstar Sustainability Rating is calculated through a bottom-side-up judgement of the securities held within a fund (portfolio). Such rank has been introduced in 2016 but updated in 2021 to take into consideration as well the Sustainalytics' Country Risk Ratings, an evaluation of the socioeconomic situation of the country: it is based on an evaluation of the current stock a capital a country has and its ability to manage wealth according to ESG principles. The rating is computed through several steps ending into an output from zero to five. Higher the rank, higher the ESG component of the portfolio.

The rating of each portfolio is the product of a five-step process. The first step concerns the determination whether the portfolio is suitable for ranking: not every fund on Morningstar has such rating as to be eligible, the ratio Eligible holdings / Qualified holdings must be at least 67%. The tool refers to 'Qualified holdings' as the portion of the assets inside the fund exposed to ESG risk and 'Eligible holdings' as the securities (assets) for which a risk-rating framework exists. This step and the calculation of Qualified and Eligible Holdings is aimed to avoid situations in which there could be a part of a fund's ESG risk not rated.

After determining which funds to rate, the second step performed by Morningstar concerns the computation of the Portfolio Corporate Sustainability *Score* and the Portfolio Sovereign Sustainability *Score*, they are each an asset-weighted average of ESG ratings at company-level

and country-level. The third step is to compute the Historical Corporate Sustainability Score and Historical Sovereign Sustainability Score; in this case, they are not equal weighted as more-recent portfolios are weighted more heavily.

In the fourth step, the Portfolio Corporate Sustainability *Rating* and the Portfolio Sovereign Sustainability *Rating* is computed through the ranking of the respective Corporate and Sovereign Historical Sustainability *Scores*. Every score in each Morningstar Global Category is ranked using a Normal distribution: the best 5% of the distribution gets a rating of five, the maximum, meaning the lowest risk. The worst 10% gets one, meaning the highest risk. Morningstar also gives much importance to past performance: if the fund's Historical Corporate or Sovereign Sustainability Score are higher than determined values, the fund will not be able to get certain positive scores. The last step consists in combining the two scores (Portfolio Corporate and Portfolio Sovereign Sustainability ratings), weighting them for the contribution. The result is then rounded to the closer integer: higher the rating, lower is the ESG risk the fund faces. The Sustainability rating is issued monthly. (Morningstar, 2022)

### 1.4 The performance of ESG funds and the link with Modern Portfolio Theory (MPT)

The research question assessed by this empirical study is strictly linked with the Modern Portfolio Theory and the diversification opportunities that a restricted investment universe offers. Even tough an outstanding ESG score does not represent a fixed constraint (no company is excluded *at priori*) it is assumed that higher the ESG rating and thus the number of screenings, smaller is the number of companies and the different sectors a fund can diversity itself into.

Fund managers have two decisions to make: how much money to invest in each stock (optimal diversification problem) based on the level of risk they want to bear and the asset-allocation problem. Modern Portfolio Theory (MPT) assumes that investors face two different types of risks: idiosyncratic risk and non-diversifiable risk, also known as market risk. While it is possible for investors to get rid of idiosyncratic risk through diversification, investors shall get compensated with a financial return for the non-diversifiable risk they decide to bear. This is due to the fact that it is not possible to eliminate market risk in full: even picking stock randomly and creating a well-diversified portfolio, different stocks will suffer the same ups and downs after the same major event, as market risk affects all stock, to some extent. Market risk will always be non-zero due to non-zero variances (correlation coefficient) between stocks. On the other hand, if two stocks were only subject to specific risk, their covariances would then

be zero: in this hypothetical case, if we added such stocks to our portfolio, the portfolio variance equation would converge to zero. Almost all stocks available in the market are influenced by events and macroeconomic shocks – a change in interest rates, for example – thus they bear a positive covariance. In a well-diversified portfolio, even if the average variance of stock returns is zero, the average covariance can never be zero by adding extra stock. (K. Cuthbertson, D. Nitzsche, K. Cuthbertson, 2009)

As previously said in this paper, ESG funds that have a higher sustainability rating shall have put in place some screen policies to discern the assets to invest into and the assets not to be inserted in the fund's pool of assets. This can be sum up saying that funds are adding constraints to their process of assets' selection. Ethical funds have narrower investment opportunities due to the required constraints, reducing *de facto* the possibility of diversification and bearing a higher idiosyncratic risk. According to the modern portfolio theory just described, as there is less chance of a wide diversification to reduce idiosyncratic risk, the risk-adjusted performances of the fund shall worsen (Michelson *et al*, 2004). Also, the total exclusion of certain industries (alcohol, tobacco, oil, mining, etc.) from a fund that has the aim of retaining a high ESG score increases the variance of the fund, especially in a short-term horizon. In Regalli *et al.* (2005) an analysis of the difference in risk - quantified using the variance – between ethical and non-ethical funds is performed, finding out the presence of an ethical sacrifice to be borne by investors: the divergence among the variance of a conventional fund without constraints and the variance of an exclusively ESG portfolio.

The link between diversification, risk and returns explained by the MPT is strictly linked to our research question, the analysis of ethical and non-ethical funds' performance, having, the formers, some constraints in their asset selection process.

### 2. Literature Review

The socially responsible investment funds' market has undergone significant growth in recent years. This growth was evidenced by the expansion in the number of funds and by the amount of total asset under management. Therefore, it becomes essential to understand whether this new kind of financial products has a different financial return and thus offer an "ethical sacrifice" or an "ethical premium" for a SRI investor. ESG investing and its performance has already been analysed from different points of view and perspectives. The different types of studies performed focus on different topics: the reasons that bring investors to invest in ethical funds, which ESG screenings these funds have put in place or whether the high ESG score obtained by a company is empirically observable from the social and environmental impact of its operations.

Hvidkjær in 2017 performed a wide review of past literature related to ESG investing; as explained in his analysis, previous studies fall into two categories. The first group of studies analyses whether an optimal portfolio is buildable taking into consideration ESG principles, thus without being able to diversify fully. The second group of studies which is the one more related to this research project, investigates the performance of an ethical fund through comparison, either with a market benchmark or a pair-matched conventional fund.

As the research question of this study is focused on evaluating statistically significant divergences between risk-adjusted abnormal returns from ethical and unconstrained funds, this chapter is meant to analyse previous specific research on the matter. In the following pages, a deep review of previous research questions and results has been performed. However, although the literature reviewed has addressed the same or similar question as this empirical project, they used diverse methodologies to answer the same research question (different asset pricing models, different sample of funds from different countries, using different timeframes) not resulting in a unique answer.

### 2.1 Bauer *et al.'s* (2005) study on ethical mutual fund performance and investment style

The study "International evidence on ethical mutual fund performance and investment style" from Bauer *et al* (2005) investigates over the financial returns and investment decisions of

ethical mutual funds in the United States, United Kingdom, and Germany, where the mutual fund industry is younger and smaller, over a timeframe from 1995 to 2001. The authors want to address the research question whether the return on the market of ESG compliant funds has been higher than their matched conventional counterparts. The authors used a sample made of 103 domestic equity funds and 4384 conventional ones from Morningstar (US), EIRIS (UK) and Ecoreporter (Germany), gathering as well returns including of any distributions and management fees. As a reference group, the authors created another portfolio made of conventional equity funds that did not put in place ethical-picking strategies when performing asset selection. In this research and in most of the studies, the matched pair analysis model was used to compare ethical and conventional funds, then using a statistical analysis for paired data. Each ethical fund is combined with an unethical fund of equal size, market, and age. The purpose of this combination is to eliminate the subjective characteristics of the funds as much as possible, so that the differences in the financial performance depend only on the ESG orientation of the fund.

The authors used both the CAPM single-factor model and the Carhart four-factor model to analyse each fund's performance. A four-factor model is useful to overcome the benchmark problem, adding three risk proxies: the market risk, the divergence in performance between portfolios containing small and large cap shares, the divergence between high and low book-to-market ratios and the momentum effect. As market proxy, the Worldscope index is used, covering 98% of market capitalisation.

Among the main findings obtained from the authors:

- 1. The authors find no proof of a statistically meaningful divergence in financial performance between ESG and conventional funds when controlling for size, book-to-market and momentum, after the matching procedure as well.
- 2. ESG funds are less exposed to the variability of the return of market versus unethical funds.
- 3. ESG funds are highly exposed to small businesses, and they are growth oriented.

The empirical results are slightly different according to which asset pricing model is used. When evaluating the under or over- performance recorded over the expected risk-adjusted return using the CAPM, the authors make two conclusions: there is no statistically meaningful difference in the Jensen's Alpha between the two kinds of funds; secondly, as explained from the market betas, ESG funds appear to have lower betas than their conventional counterpart: ethical funds are less sensitive to market shocks.

United Kingdom - Domestic	Alpha	Market	R^2 (adj)
Ethical	-0,22	0,82	0,8
Conventional	-1,02	0,94	0,92
Difference	0,8	-0,12	0,09
United Kingdom - International			
Ethical	1,71	0,76	0,68
Conventional	0,32	0,84	0,9
Difference	1,39	-0,08	0,02

Table 1: Bauer et al., Results of CAPM estimation

However, as explained in previous literature (Fama and French, 1993) a single index model might not be able to explain the fund performance, and the differences in the Alpha could be related to external factors other than the ESG element. As reported by the authors, when using a four-factor model, the R^2 (adj) coefficient increases, as multi factor models offer a better explanation. When evaluating the fund's performance through the Carhart four-factor model, the authors confirm the finding concerning a lower market beta, meaning ethical funds are less exposed to market risk than conventional ones. However, statistically, the difference in returns between ethical and conventional funds is still insignificant even when controlling as well for size, book-to-market, and momentum effects.

United Kingdom -						
Domestic	4-factor Alpha	Market	SMB	HML	Momentum	R^2 (adj)
Ethical	0,37	0,83	0,47	-0,05	0,04	0,93
Conventional	-1,41	0,94	0,31	0,3	0,1	0,89
Difference	1,78	-0,11	0,16	-0,35	0,06	0,27
United Kingdom -						
International						
Ethical	2,26	0,8	0,71	-0,12	0,13	0,8
Conventional	0,37	0,85	0,05	0,06	-0,02	0,91
Difference	1,89	-0,05	0,65	-0,18	0,15	0,19

Table 2: Bauer et al., Results of Fama-French estimation

Through Bauer *et al.* analysis, it is possible to understand some features of ethical funds: they are smaller in size with higher expense ratio. Conventional funds are also, on average, older.

An interesting result of Bauer's analysis is the change of performance in the timeframe analysed: during the timeframe between 1990 and 1993, the majority of ESG funds granted investors a risk-adjusted return which is lower when analysed in comparison with the one produced by conventional ones. In the timeframe, the underperformance recorded is statistically significant. However, during the following months, ethical funds provided a better performance – always risk-adjusted - than their conventional peers. Among the explanation provided for this phenomenon, the authors suppose that ethical funds were able to catch up due to learning. Also, Phalippou and Gottschalg (2009) argue that private equity funds with expertise appear to perform better when compared to first-time funds, which can be made sense of by a learning impact: a ton of abilities are required, which foster over the long haul and with experience. Furthermore, looking at the results it is possible to discern that ESG funds from the United Kingdom and Germany appear to invest more into small caps shares, while ESG funds in the United States prefer investing in large caps.

Finally, the same evaluation is performed again using an ethical benchmark: as ethical funds are expected to invest in ethical companies, their portfolios shall be made up of different kind of stocks than conventional funds. At this point, an ethical market index could be more suitable to explain the financial returns of ESG funds, thus the alphas. Funds' performance was benchmarked as well using the Down Jones Sustainability Global Index (US) and the Ethical balanced index from EIRIS (UK): results show that ethical indices do not explain in a more precise way the returns. Standard indices result in higher R^2 (adj) meaning the regression using a standard market index is able to explain more variability from the sample.

The results proposed are very interesting for researchers and investors: not only there is no statistically observable difference in return between ethical-oriented and conventional funds, but the choice of ethical assets is able to provide investors in ESG funds less volatility and lower market betas.

### 2.2 Performance of Ethical and Non-Ethical Funds: A Matcher Pair Analysis by Kreander *et al. (2005)*

The study concerning the performance of ESG compliant funds compared to non-ethical ones by Kreander *et al.* (2005) is another of the most prominent research on the matter. The paper addresses the issue whether the investment strategies put in place by ethical funds result in investors losing a part of the gains they could probably have earned if they invested into conventional funds. To answer this question, this other empirical study from Kreander *et al.* observes the returns as well obtained in the marked from ethical and non-ethical funds over a timeframe of three years.

The authors address four empirical questions:

- 1. Whether ESG funds offer a risk-adjusted financial performance statistically equal to the one of a benchmark portfolio
- 2. Whether ESG funds present a statistically different risk-adjusted financial return when compared to conventional funds
- 3. Whether ESG funds and normal funds have different market timing ability
- 4. Finally, the authors explain what dependent variables are affecting a fund's return and whether the ESG orientation is among them.

From a sample of 80 funds, their financial performance was analysed, gathering 156 weekly observations (every Wednesday, to compensate the weekend effect) for 40 ESG and 40 conventional matched pairs of funds. Dividend payments were taken into consideration as well. As this study is done using funds from the United Kingdom, Sweden, Germany, the Netherlands, Norway, Switzerland and Belgium, difference in currency exchange are taken into consideration.

The matching procedure has been done to minimise differences and biases related to funds' age, amount of assets under management (size), domicile, and investment universe. Each fund was matched with another one from the same country, with a comparable age, size, and investment area. Concerning the evaluation of financial returns, Kreander *et al.* uses the Sharpe Ratio, the Treynor Ratio and the Jensen's Alpha (CAPM). The utilisation of the former ratios and the latter model is questionable as the Sharpe Ratio is focused only on the standard deviation of an asset, representing its risk, instead of linking the risk of the security with the market. The Treynor Ratio and the Capital Asset Pricing Model do take into consideration the market risk, but the CAPM is a single-factor model: adding more factors would result in a higher explanatory power, correction of CAPM pricing errors; also, adding additional factors would allow the researcher to better isolate the effect of ESG factor when comparing different funds. To overcome the limits of the CAPM, the performance is analysed as well through an estimator to assess the market timing, designed by Henrikkson-Merton: when fund managers

time the market, the CAPM might not be reliable anymore as the Beta coefficient is constant in the regression while in the market it changes constantly. Finally, a cross sectional regression taking into consideration size, age and investment universe is estimated to analyse the reasons behind the differences in fund performance.

The average weekly return for ethical funds observed by the authors is equal to 0.18%, slightly higher than the return got from their conventional counterparties, 0.16%. This result is significant at 10% but not at 5%. Looking at the standard deviations, it is observable that non-ethical funds reported higher volatility than conventional ones: the average beta in the ESG sample is 0.62 while it is 0.79 for the comparison group. This difference in betas result significant at 5%.

When evaluating the funds using the Jensen's alpha, ESG funds recorded an average alpha of 0.05% while non-ethical ones had 0.03%; although 18 ethical funds recorded higher risk-adjusted financial performance than their counterparts, this difference was not significant. The analysis concerning market timing performed through the Henriksson Merton (HM) model studied whether funds' managers were able to quicky adjust the level of risk according to the actual conditions in the market. No fund is observed to have a significant positive market timing ability: 13 ESG and 10 non-ESG funds had inversely correlated market timing factors: managers instead of moving towards higher betas when the market was performing well, did the opposite.

Overall, the research from Kreander *et al.* does not discover a statistically meaningful difference concerning the performance of different types of funds in the sample. Surprisingly, as well in the study from Bauer *et al.*, a lower market risk is recorded for ethical funds, being also statistically significant. Also, the results of the market timing analysis explain that in the cases where ESG funds records a lower performance than conventional ones, it is due to market timing ability. The authors conclude saying that no penalty or punishment is found for investors who chose to invest in ethical companies. Indeed, from the sample the authors find out that in the timeframe analysed, it also likely that ethical funds outperform conventional ones, despite the restricted investment universe they must select stocks from, even though this result is not statistically relevant. Thus, ESG funds might be a better option for risk-averse investor, as both betas and volatility are lower.

These empirical findings support previous results obtained by Hamilton *et al.* (1993) and Mallin *et al.* (1995) which were not able to discover a statistically meaningful difference between conventional and ethical funds.

Finally, the study from Kreander *et al* tried to justify the recorded divergences in cross-sectional assessment parameters, the Jensen's Alpha.

$$Alpha = \lambda_1 + \lambda_2 Size + \lambda_3 Age + \lambda_4 ESG + \epsilon$$

Through a regression using as variables the fund size, age, and a dummy variable for the ethical attributes of the fund (ethical or conventional), the authors found that none of the used variables appears to be significant: the ESG status of a fund is not able to explain the Jensen's Alpha. The insignificance of the ethical status is strictly linked to previous research that concluded that no statistically noticeable difference is found in the returns among the two different kinds of funds.

### 2.3 The link relationship between the number of social screenings and financial performance in Barnet *et al.* (2006) study

Unlike the first two research presented in this chapter which focused on the relation between ethical investing and financial performance, Barnet *et al* (2006) performs an analysis related to the number of social screening strategies put in place and their impact on financial performance. The authors research on the question whether the loss in performance of ethical funds due to a narrower diversification can be offset as a higher number of social screenings results in better stock-picking.

The study wants to test the hypothesis whether the reduction in diversification and thus the lower risk-adjusted performance as described by Markowitz is compensated by a better management able to generate equal or higher financial returns as stocks in which ethical funds invest are selected after taking into consideration specific screening criteria. This is due to the fact that the MPT by *Markowitz* does not take into account the possibility for an ethical firm to use its ESG component to create extra value for shareholders: although SRI funds have a smaller pool of stocks to choose from, ethical assets could be superior in terms of financial

return, risk or volatility. This is supported as well by the stakeholder theory<sup>7</sup> which states that the more all stakeholders – including ordinary citizens - are taken into consideration when deciding a firm's strategy and the better a firm can manage communication with all the people having a stake, higher its financial returns will be.

The hypothesis tested by Barnet *et al.* questions whether the link between the number of ethical screens and the financial returns for the funds implementing such screening(s) is curvilinear, U-shaped. From the Social Investment Forum (SIF), authors gather data concerning 67 ethical funds and their monthly financial performance. Data from the SIF provide information concerning the type of screenings put in place as well. The risk-adjusted return of each ethical fund is the predicted, dependent variable while the intensity of screening is the independent variable. The SIF differentiates between 12 different types of policies concerning stock screenings that funds put in place: exclusion of some industries due to its affiliations, labour policies, community investment, relations, etc. Thus, screening intensity varies from one (minimum) to twelve (maximum): larger the intensity of screening, smaller the universe of potential stocks. The authors, as standard for such type of research, control as well for factors that can affect the returns: fund age, fund size and whether the fund is in the United States or abroad.

The authors find out that many of the screenings put in place by ethical funds were used as well in conjunction with others. Most of the screenings were performed relatively to the environmental performance and equal employment records. Concerning the link between the number of screens and the financial return of an ethical fund, the authors do not find any linear association between the intensity of the ESG orientation and the financial return of the fund. A positive link would support the stakeholder theory according to which companies and thus funds embodying ESG criteria in their investment decisions have gains when it comes to financial returns compared to conventional funds; on the contrary, a negative correlation would mean that the more a fund practices ethical screening, the less ability to diversify it retains, resulting in lower returns.

However, when evaluating the same relationship using a curvilinear relationship, the authors find support for their hypothesis: the financial performance at first becomes lower when the

<sup>&</sup>lt;sup>7</sup> Caroli M., Gotta C., (2021), Economia e gestione delle imprese. *McGraw-Hill Education*.

number of screenings performed increases, reaching a point of minimum when seven screens are performed, then increasing until the maximum screening intensity, at 12 screens. However, even when the maximum number of screens is put in place, the study observes that such funds will suffer from a lower performance of about 0.2% a month when compared to funds employing only one screen. If it comes clear that the screening cannot come without costs and thus the MPT is supported by this empirical analysis, Barnet *et al.* observe that the choice of some screenings over others has the ability of impacting the returns positively: funds investing in companies that follow environmental criteria are linked with lower risk-adjusted financial returns, funds that did not invest in firms that were not compliant with the norms of equal employment had a lower return of about 0.29% per month, while mutual funds that invested in companies that worked on positive relationships with their communities, performed better.

The outcome of the study from Barnet *et al.* proves two different facts: if shareholders are concerned only about the financial performance of the assets they invest into, then socially responsible investment might harm their expected return. However, as explained by stakeholder's theory, *some* companies can perform better *due* to their ethical orientation, and ethical parameters can help fund's managers to perform stock selection. Such ethical constraints, if implemented correctly during the stock-picking process, might guarantee slightly higher returns: indeed, the financial performance of companies chosen after various screening may balance and overcome the costs borne due to lost diversification.

### 3. Methodology and Data

This section explains which data and methodology have been used to answer the two research questions proposed and explained in detail as statistical hypotheses later in this chapter. The method followed to perform the research is similar as the one used in previous works from Bauer *et al.* (2005) and Kreander *et al.* (2005). This paper expands their findings taking as sample a more recent timeframe while performing a risk-adjusted analysis of their performances using multi-factors models.

The financial return of two different funds may differ for several reason. Thus, to reliably perform a comparison on the return between an ethical and a less ethical fund, a matched-sample analysis is used. As already seen in the literature review, through the matching criteria is possible to "eliminate the effect of specific characteristics" (Mallin, Saadouni, Briston, 1995). Through this matching criterion, we are able minimize the specific effects of age and size on a fund's performance.

From a Morningstar dataset containing more than one hundred funds active in the United Kingdom, a sample of 18 ethical funds and 18 less ethical funds has been gathered. In Appendix 1, a matched-paired list of the funds is presented, as well a detailed description regarding the selection and how the matching process was performed. Appendix 2 and Appendix 3 report statistical information concerning the two funds. More information concerning the characteristics of the two samples is reported later among the empirical results.

Subsequently, financial performance data (Net asset value) has been obtained for each fund in both samples. The data is obtained from Refinitiv (formerly Thompson Reuters) for a timeframe between 1<sup>st</sup> January 2013 to 31<sup>st</sup> December 2017.

The rate of return was calculated for each fund using the following formula:

$$Monthly \ return = \frac{NAV(t) - NAV(t-1)}{NAV(t-1)}$$
(1)

NAV (t) = Net asset value for the month NAV (t-1) = Previous month net asset value

At this point, I can test for the first hypotheses:

### $H_{0,1}$ : There is no difference in the abnormal return between each matched pair of ethical and non-ethical funds

This first hypothesis tested is an extended version of the one in previous studies for two reasons: previous research often did not adjust financial returns for risk or used only a single-index asset pricing model, limiting the analysis only to the observation of how many ESG funds in the sample performed better and whether the funds' alphas were statistically significant. Also, past research did not perform a two-sided paired T-test to ascertain whether a significant difference exists between the abnormal returns of ethical and non-ethical funds. Through this test, we are able to detect whether the financial returns offered to investors from ESG and conventional funds are statistically the same.

For a proper comparison of the performance of different funds, we shall take into consideration the difference in the risk such funds bear. Different funds present returns linked to different level of risk. Although past literature limited its analysis to a single-factor model, this empirical study employs two different multi-factors asset pricing models: the Fama and French with three factors and the Carhart model with four.

$$Rit - Rft = \alpha it + \beta I (RMt - Rft) + \beta 2 SMBt + \beta 3 HMLt + \epsilon it$$
(2)

Rit = return of fund *i* at time *t* Rft = risk free rate at time *t* RMt = market return at time *t* HML = High minus low SMB = Small minus big

Equation 2 represents the Fama and French three-factor model. Other than the market risk, Nobel Laureate Eugene Fama and Kenneth French added two more factors: the size effect (SMB) as smaller companies are found to outperform bigger companies and the value premium (HML), as value stocks are likely to outperform bigger stocks. The beta represents the fund's exposure to market risk.

$$Rit - Rft = \alpha_{it} + \beta_1 (R_M t - R_f t) + \beta_2 SMBt + \beta_3 HMLt + \beta_4 MOMt + \epsilon_{it}$$
(3)

In equation 3, the Carhart four-factor model is reported. It represents an evolution of the Fama&French model with three factors, controlling as well for an additional term: a cross-sectional momentum factor (MOM) capturing the Jegadeesh and Titman (1993) momentum anomaly. Statistically, if the additional factor is relevant, the explanatory power of the regression grows. The momentum factor explains the inertia of a price keeping increasing or decreasing, sustaining itself. All factors are related to the UK for the analysed timeframe.<sup>8</sup> In both models, the first term, the Alpha, is the intercept and it represents the over- or underperformance of a fund. The value of the excess return may be positive, negative or zero. If a fund will earn more than its expected risk-adjusted return, the alpha is going to be positive. When the alpha is significant and positive, the fund has produced a higher return than what it would have been expected to do for its level of risk, size, value, and momentum effects.

*Rft* is the return of a UK default-free government bond and *Rm* is the return of the relevant equity index for each month. As Index, I used the monthly returns of the FTSE All-Share Index as it is the benchmark all the funds in the sample relate to, according to Morningstar. The FTSE All-Share is a capitalisation-weighted benchmark having inside more than six hundred and fifty of the more than two thousand companies currently listed on the London Stock Exchange. This Index represents at least 98% of the UK's companies market capitalisation and is considered the best performance measure of the London Equity market. (FTSE Russel)

Hypothesis one is tested among the Alphas of each matched fund, ethical and non-ethical. Through a T-Test of difference between pairs we can ascertain whether a statistically significant difference exists between the over- or under- performances in both samples. This test generates a t-value as output. The test is repeated twice, using the Alphas obtained through the models with both three and four factors. Results are discussed in the next chapter.

After having analysed the differences in risk-adjusted performance of both samples, it is interesting to perform another hypothesis test concerning whether the sustainability score is an explanatory variable for funds' abnormal returns. If the first hypothesis test observed whether the abnormal returns between ethical and non-ethical funds differed statistically, now we can test whether the ESG or conventional orientation of a fund has an impact on its under- or over-performance.

<sup>&</sup>lt;sup>8</sup> Gregory, A. Tharayan, R. And Christidis, A. (2013) 'Constructing and Testing Alternative Versions of the Fama– French and Carhart Models in the UK', Journal of Business Finance & Accounting. Data has been updated and is available for download from the authors for the 2013-2017 period. Data is related to the United Kingdom.

#### $H_{0,2}$ : Abnormal financial performance is not dependent on ethical (ESG) rankings

To test this second and last hypothesis, as in Kreander *et al.* (2005), a new regression in which the ESG orientation is a variable able to explain funds' under- or over-performance was created. The first hypothesis was based on a time series but, in this case, a panel-data analysis is required in which the ethical ranking is treated as a dummy variable, to differentiate ESG funds from non-ESG funds.

$$Alpha = \lambda_0 + \lambda_1 Size_i + \lambda_2 Age_i + \lambda_3 ESG_i + \epsilon_i$$
(4)

Alpha = Fund's Jensen alpha Size = Fund's size Age = Fund's age ESG = Dummy variable, "1" is the fund is ethical; "0" if conventional

Through this regression, which expand what was tested in the first hypothesis, this empirical study can discern whether the ESG orientation of the funds is an explanatory variable for the funds' alpha. The dummy variable indicates the presence of the ethical orientation of a fund that might be expected to impact the dependent variable.

For the model to be reliable, the six assumptions behind the Ordinary Least Square (OLS) were tested (*Borra*, *Di Ciaccio*, 2021). To ascertain this reliability, the model was tested as well through the Variance Inflation Factor (VIF) test.

Discussion concerning test results is addressed in the next chapter.

### 4. Empirical results

This chapter provides the results for both tested hypotheses, using different performance measures (asset pricing models). It contains a description as well of how models were applied, and a statistical analysis of the results obtained. Descriptive statistics concerning observation samples reveal that Sample A (ESG funds) has an average size of 723bn and an average age of 17.03 years, while the values for Sample B (conventional funds) are respectively, 717bn and 17.20 years. The matching procedure was meant to create two samples as homogeneous as possible to reduce biases and improve comparability.

The ethical sample reported on average a financial return of 0.90%, while the traditional funds in the sample reported an average of 0.92%. The average coefficient of variation of ethical funds is 2.92%, which is slightly lower when compared to the average coefficient of variation of non-ethical funds, 2.98%. Thus, in the timeframe, ethical funds recorded a slightly lower return than conventional ones, recording a slightly lower volatility as well. However, as explained already, when evaluating performance, a risk-adjusted analysis is needed.

While working on the first hypothesis and expanding research done by Bauer *et al.* (2005) and Kreander *et al.* (2005), the model's intercept (Alpha) has been computed for each ethical and non-ethical fund, through the Fama and French three-factor model and the Carhart four-factor model. In the following table, the alpha for each fund is reported. An asterisk has been added where the result is significant at 5% level. Two asterisks when at 10%.

#	Alpha	T-stat	MKT	SMB	HML	Alpha	T-stat	MKT	SMB	HML
1	0,001	1,2291	0,9858	0,239	-0,1301	-0,000384	-0,307331	0,93256	0,332769	-0,18635
2	0,002	2,0348*	1,0661	0,309	-0,1119	0,00208434	0,9952890	1,18295	0,786380	0,075429
3	0,003	2,1035*	1,022	0,237	-0,1806	0,00406762	2,734096*	0,975827	0,213230	0,046501
4	0,003	1,8370**	1,0469	0,766	-0,1273	0,00223873	0,001348	0,936073	0,248466	-0,08970
5	6E-04	0,3959	0,9384	-0,08	-0,176	0,00211808	0,0013484	0,957398	0,340136	-0,1672
6	4E-04	0,3343	0,868	0,434	-0,2352	0,00189093	1,2007431	1,023564	-0,01753	-0,00271
7	0,003	1,6146	1,0396	0,762	-0,0913	0,00344755	2,734337*	0,964130	0,207724	-0,20324
8	0,004	2,7362*	0,9241	0,022	-0,513	0,001966	1,4537746	0,891799	0,209665	-0,26829
9	-4E-04	-0,248	0,9000	0,083	-0,2777	0,00293022	1,2964598	1,260888	0,932722	-0,02237
10	0,006	2,9104*	0,9473	0,317	0,19524	0,00213586	1,3128555	1,05185	0,4565	-0,04994
11	7E-04	0,4330	0,9907	-0,01	-0,0856	5,2555E-05	0,0294225	0,771199	0,796403	-0,17620
12	-2E-04	-0,1334	0,9942	0,343	-0,4049	0,00074771	0,5623670	1,004479	0,41146	0,07477
13	0,003	2,3294*	1,0270	0,292	-0,3211	0,00165516	1,2400313	1,025545	0,422325	-0,14466

Table 3: Fama-French three-factor model estimation results

14	0,003	2,0512*	0,9264	0,117	-0,5069	0,00467376	3,096962*	0,953565	0,609438	0,050091
15	0,004	2,1725*	1,063	0,58	-0,2989	-0,0002719	-0,164292	1,033011	0,443133	-0,20716
16	0,005	3,4695*	1,0017	0,301	0,08490	0,0054591	3,945926*	0,988809	0,323226	-0,194531
17	0,004	3,0314*	0,7820	-0,07	-0,3618	0,00405745	3,172900*	1,015041	0,353157	0,158049
18	0,005	3,2649*	0,9620	0,117	-0,4019	0,00440222	2,912017*	1,04825	0,558140	0,059628

Most funds (16 out of 18) in both samples were able to beat the market. In two cases, both samples recorded negative Alphas (both significant at 5% and 1% level). From the analysis of performance adjusted for risk, we discover that the average alpha of the ethical sample is 0.26%, while the average alpha for non-ethical funds is 0.24%, meaning ethical funds in the sample were able to offer on average slightly better returns for their risk level than their conventional matched counterpart.

Looking at the specific funds in the sample, ethical funds recorded a better risk-adjusted performance in 8 cases, while non-ethical funds recorder a better risk-adjusted perform in 10 cases: 44% of ESG oriented funds recorded better returns than their matched non-ethical counterpart. The alpha is significant for 11 funds in sample A and 6 in sample B, at either 5% or 10%.

From the Fama-French regression, when it comes to the Beta factor, we obtain results concerning market sensitivity like the ones presented in literature: ethical funds present on average lower market betas (in 11 cases), meaning they are less sensible to changing market conditions than conventional ones.

Subsequently, to provide an answer to Hypothesis one, a T-Test of difference between pairs is performed between the Alpha of each fund in both samples, to see whether a statistically meaningful difference between the under- or over- performance related to the level of risk is found. This test can detect whether the mean difference between a matched pairs of measurements is non-zero. For pair-matched sample to differ significantly at 5% level, the T-Stat shall be higher than the value of 1.96.

Not only from the empirical analysis of the funds' performance does not appear to exist a punishment for investors who invest into ethical stocks, and it is almost as likely that ethical funds will outperform conventional ones, but as a T-stat of 0.4594 is recorded, we cannot reject the hypothesis stating that *no statistically observable difference is discovered in abnormal returns between the ethical and conventional samples*.

The same procedure has been repeated using the Carhart model, this time controlling for four factors. When adding the momentum factor, we adjust as well for price trends, using a regression able to explain more of the variability and thus provide better estimations. In the following table, coefficients from the Carhart model are shown.

#	Alpha	T-stat	MKT	SMB	HML	UMD	Alpha	T-stat	MKT	SMB	HML	UMD
1	0,002	1,6269	0,9792	0,2361	- 0,148	-0,047	- 0,0005	-0,3995	0,9343	0,333	- 0,1815	0,0123
2	0,0022	2,1276*	1,0636	0,3077	- 0,119	-0,018	0,0047	2,36814*	1,1522	0,775	- 0,0086	-0,214
3	0,0026	1,9131**	1,0231	0,2375	- 0,178	0,0067	0,0038	2,41097*	0,9788	0,214	0,0546	0,0206
4	0,0029	1,7317**	1,0468	0,7657	- 0,128	-0,001	0,003	2,14413*	0,9269	0,245	۔ 0,1149	-0,064
5	0,0017	1,189	0,9244	-0,09	- 0,215	-0,098	0,0014	0,97351	0,9664	0,343	- 0,1427	0,0624
6	0,0014	1,0336	0,8573	0,4293	- 0,266	-0,078	0,0033	2,10766*	1,0065	-0,02	۔ 0,0493	-0,119
7	0,0032	1,6205	1,0371	0,7606	۔ 0,098	-0,017	0,0037	2,75556*	0,9612	0,207	- 0,2114	-0,021
8	0,0042	2,4144*	0,9274	0,023	- 0,504	0,0225	0,002	1,35591	0,8919	0,21	-0,268	0,0008
9	- 0,0001	-0,058	0,896	0,0817	- 0,289	-0,028	0,004	1,69662**	1,2479	0,928	-0,058	-0,091
10	0,006	2,8115*	0,9452	0,3159	0,189	-0,015	0,0024	1,40821	1,0482	0,455	۔ 0,0598	-0,025
11	0,0023	1,4707	0,9714	-0,017	- 0,139	-0,135	0,0013	0,7279	0,7559	0,791	- 0,2181	-0,106
12	- 0,0003	-0,195	0,9956	0,3438	- 0,401	0,0093	0,0023	1,85311**	0,9855	0,404	0,023	-0,132
13	0,0033	2,2381*	1,0261	0,2921	- 0,324	-0,007	0,0017	1,21594	1,0246	0,422	۔ 0,1472	-0,006
14	0,0022	1,6307	0,9315	0,1194	- 0,493	0,035	0,0053	3,34502*	0,9459	0,607	0,0292	-0,053
15	0,0043	2,0852*	1,0619	0,5794	- 0,302	-0,008	0,0005	0,2895	1,0237	0,44	۔ 0,2325	-0,064
16	0,006	4,2333*	0,9882	0,2957	0,048	-0,094	0,0052	3,50434*	0,9925	0,325	- 0,1846	0,0253
17	0,0042	3,1342*	0,7776	-0,077	- 0,374	-0,031	0,0052	4,0243*	1,0017	0,348	0,1217	-0,092
18	0,0036	2,3238*	0,9803	0,1242	- 0,352	0,1271	0,0053	3,40366*	1,0371	0,554	0,0292	-0,077

Table 4: Carhart four-factor model estimation results

When adding the momentum factor, ethical funds are found on average to record a lower riskadjusted return than conventional ones: only seven ethical funds in the sample recorded a better risk-adjusted performance than their matched counterpart, being most intercepts statistically significant. In 11 cases, ethical funds recorded a lower market risk, confirming the results obtained through the Fama-French estimation: ethical funds present a lower exposure to changing market conditions. The results related to a lower beta coefficient are in line with the ones obtained in past literature.

At this point, the same T-test of difference between pairs is performed also on the alphas obtained through the Carhart 4-factor model: with a t-stat of -0.29, in this case as well we cannot reject the null hypothesis concerning the absence of a statistically observable divergence in the over- or under- performance between ESG and conventional funds.

With data gathered from both asset pricing models, we can answer the first research question of this empirical project, finding out that during the timeframe analysed, funds putting in place strategies to invest in ethical firms did not offer investors a different abnormal return for their level of risk than their pair-matched counterpart.

At this point, ascertained that no difference in returns is recorded, I tested the second hypothesis, to find out whether the ESG orientation of a fund might be a predictor variable for its abnormal return (Jensen's Alpha). As a panel regression is needed, data had to be rearranged.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004049	0.000846	4.786735	0.0000
SIZE	7.10E-13	3.37E-13	2.106404	0.0431
AGE	-8.59E-08	9.82E-08	-0.874714	0.3882
ESG	-0.000235	0.000633	-0.371007	0.7131

Table 5: ESG as explanatory variable for fund performance. Estimation results.

The output from EViews shows that the ESG orientation and age as specific properties of funds in the sample are not statistically significant variables able to explain the funds' performance, with the ESG dummy variable having the highest P-value. On the other hand, the size coefficient is an explanatory variable for funds' abnormal return, significant at both 5% and 10% level. This result means that we cannot reject the second null hypothesis stating that *the abnormal returns of a fund are not linked to its ESG rank*: the empirical results show that the ESG orientation does not have an impact on the Alphas.

In line with the previous finding of the absence of a statistical divergence in returns between ethical and non-ethical funds, from our sample, we ascertain that ESG orientation is not enough to explain the excess return that might be related to other factors like stock-picking abilities of the fund's manager, macroeconomic conditions. Furthermore, a Variance Inflation Factor (VIF) test is performed on this regression (results available in Appendix 4) to ascertain whether the variables included in the regression suffer from multicollinearity: as all regressors have a VIF lower than 2, we can state that there is no correlation among the regressors.

### 5. Discussion and conclusions

This empirical project started with a description of the growth of the ethical funds' market and the description of such securities, later moving to perform empirical research to ascertain whether ethical financial products were able to offer their investors different financial returns than conventional ones and whether the ethical orientation impacted the excess returns.

The switch towards ESG investing, and the major attention given to ethical and environmental matters that has been recorded in the past years is a topic of great interest nowadays: only in 2019, flows into US sustainable funds topped \$20bn, recording a four-fold increase compared to 2018<sup>9</sup>. In Europe, an exponential growth is recorded as well: only in 2020, more than five hundreds new ESG funds were established, summing up to more than three hundred thousand sustainable funds. It was this unprecedented growth and attention to the sustainability matter that brought me to research over this topic: such an analysis might be useful for investors who would like to switch towards ethical investing but are concerned about the losses in diversification and returns. This paper might be interesting as well for ordinary citizens interested in the impact of green investments.

The results obtained and presented in the previous chapter are in line with previous studies described in the chapter concerning literature review that offered a research framework to start from and extend through a more recent timeframe and multi-factor models. When testing the first hypothesis *"There is no difference in the abnormal return between each matched pair of ethical and non-ethical funds"* no statistically significant difference in the alphas of funds is found applying the T-Test for matched pairs on the alphas obtained either through a three- or four-factor model, meaning that although ethical companies might have good externalities on society, for an investor there is no difference when it comes to returns. When analyzing each fund's Alpha, we discover that using either the Fama&French model or the Carhart model, ethical funds in our sample are almost as likely to outperform non-ethical ones - they outperform non-ethical in almost half cases - however many alphas are not significant either at 10% or 5% levels.

As said already, this difference in alphas between different type of funds is found not to be statistically significant and thus may be due to chance, fund's specific characteristics,

<sup>&</sup>lt;sup>9</sup> Morningstar, "The Morningstar Sustainable Investing Handbook".

managers' stock-picking abilities. We can indeed repeat that no prize or punishment is given to ethical funds' investors. A smaller investment universe and thus a higher idiosyncratic risk does not have an impact on funds' performance and does not result in statistically significant lower returns.

Also, using either asset pricing models, when it comes to market risk, we ascertain that ethical funds present, on average, lower market betas. ESG funds are less exposed to changing market conditions and bear less volatility: the securities inside ethical funds in our sample are less exposed to external shocks. It is interesting to note that on average both samples were able to beat the market benchmark in almost all cases (having an average return of 0.92%, while the market benchmark is equal to 0.56%).

After having proved that no difference in returns is found, this empirical study investigated as well whether the ESG component had an impact and thus was an explanatory variable for the abnormal return. This second hypothesis is strictly linked to and expands the first one. Through this second hypothesis test, performed through a panel data analysis, we can ascertain whether *the ESG orientation of a fund is an explanatory variable for funds' excess performance*.

The result of the regression is in line with the outcomes of the first hypothesis test: the ESG orientation is not an explicative variable for the fund's performance, an outstanding ESG rating is not able to explain the funds' alphas: the ethical orientation does not impact the performance.

As in previous research, this research project utilized a matched pair investigation to assess the performance of a sample with an outstanding ESG score when compared to a less ethical matched counterpart. However, looking at both previous literature and the complete results of this empirical study, it is clear for the reader how difficult is it to research over such a topic. The results concerning the difference in performance and the impact of the ESG component are strictly linked to which asset pricing method is used, the timeframe analyzed, the selection of the study sample, the index used as benchmark, whether management fees and dividends are included.

The reader would have probably understood at this point that both this research paper and past literature rely on strong assumptions concerning the creation of the sample to be taken in consideration and the matching procedure. These presumptions represent the main shortcomings since they can have direct impacts on the outcomes of the research: a different sample, in a different country over a different timeframe might have brought different results. Another critical assumption made when selecting the sample is considering the ESG score and the size as constant values in the timeframe analyzed.

These final comments do not want to discredit the results of the dissertation, but advice future research on the shortcomings to try fixing them by using a larger sample, using a five-factor model to control for more parameters, try to get rid of the matching process or expand the second hypothesis further, controlling for more regressors. The matching procedure is at the same time one of the key variables at the basis of this study but also one of the major potential flaws. It is an important component in the study as it allows us to properly compare securities having different characteristics, but on the other hand, the matching procedure for investment universe, size, country, and age might not adjust for other funds' specific characteristics having an impact on the performance, and it might be improved to better isolate the ethical status. Finally, more detailed future research could observe the size of each fund and their ESG rankings not as constant variables but taking into consideration their changes over time.

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### Appendix Appendix 1 – Fund sample construction

The data needed to execute this empirical study has been gathered following a three-step procedure. First, through Morningstar, I was able to create two different portfolios containing ethical and traditional funds. The 'Sample A' refers to the sample containing funds with a high sustainability rating while 'Sample B' is the sample of conventional funds.

Through Morningstar, I was able to gather a list of funds with the same 'Domicile: United Kingdom', 'Sustainability rating date  $\leq 1$  year ago', 'Morningstar rating overall:  $\geq 3$ ', 'Base currency: Pound Sterling (GBP)' and 'Morningstar Global Category: UK Equity Large Cap'. The last filter had to be added to make the funds comparable based on their Morningstar Sustainability Rating; as explained before, the Morningstar Sustainability Rating is computed using the Normal Distribution for funds in the same Global Category. These characteristics apply to both sample A and sample B. The difference among the two samples is related to the degree of sustainability of the funds: in sample A, the Morningstar Sustainability Rating was 'Above Average' and the indicator of low carbon designation was set up as 'YES'. On the other hand, in sample B, the Morningstar Sustainability Rating was 'Below Average' and the other indicator has been removed. The decision to focus only on funds operating in the United Kingdom has the aim of creating two samples that are as homogeneous as possible.

The key variable that drives the empirical study performed in this empirical research is the Morningstar Sustainability Rating and two more indicators related to the performance concerning sustainability. The overall sustainability rating provided by Morningstar is one of the most widely used indicators to measure the overall ESG performance of companies held in an investment fund. The score is between one 'Low' and five, with five being 'High'.

After the creation of Sample A and Sample B, each ethical fund (Sample A) was matched with a conventional fund (Sample B) considering size, age and geographical investment region of the fund. The age match is needed to mitigate the survivorship bias, as it would be incorrect to compare funds whose activity started at different times in the past. Also, the size matching is essential because smaller funds are found to outperform larger funds, as reported in the study from Gallagher. Also, I noticed that most of ethical funds are smaller when compared with non-ethical ones. Before starting the screening process, I checked as well for funds that have been terminated: I deleted them from both samples as I would have financial data only for a part of the timeframe. The aim of this matching is to have two samples that are comparable, without the bias provoked by the effect of specific funds' characteristics. In some specific and isolated cases, matching criteria had to be relaxed to find comparable funds. After the matching procedure, I obtained two matching portfolios.

#	Fund Name (A)	#	Fund name (B)
1A	AXA Framlington UK Equity	1B	ES R&M UK Equity Income
2A	AXA Framlington UK Sust Z	2B	abrdn UK High Alpha Equity P1
3A	Schroder UK Alpha	3B	Lazard UK Omega
4A	EdenTree Responsible & Sust	4B	Barclays UK Equity
5A	abrdn UK Income Equity	5B	Aegon UK Equity
6A	EdenTree UK Equity	6B	Scottish Widows UK Tracker
7A	Premier Miton Responsible UK Eq	7B	Aviva Investors UK Lstd Eq
8A	BNY Mellon Sust UK Opports	8B	LF Canlife UK Equity
9A	Threadneedle UK Equity Alpha	9B	abrdn UK Value Equity
10A	LF Liontrust UK Focus	10B	abrdn UK High Income Equity
11A	abrdn UK Equity	11B	Unicorn UK Income
12A	Janus Henderson UK Responsible	12B	M&G UK Select GBP
13A	Fidelity UK Select	13B	BlackRock UK Special Situations
14A	BNY Mellon UK Equity	14B	Fidelity UK Opportunities
15A	Liontrust UK Ethical	15B	Santander UK Growth Unit Trust
16A	JOHCM UK Dynamic	16B	Ninety One UK Alpha
17A	Trojan Income	17B	JOHCM UK Equity Income
18A	Royal London Sustainable Leaders	18B	Fidelity Special Situations

### Appendix 2 – Sample A: descriptive statistics

#	Fund name (A)	Fund size (GBP)	Fund Inception date	Fund age (days)
1A	AXA Framlington UK Equity	67.170.408,45 GBP	23/02/09	3964
2A	AXA Framlington UK Sust Z	118.745.349,01 GBP	22/06/11	3115
3A	Schroder UK Alpha	119.000.378,10 GBP	03/12/12	2585
4A	EdenTree Responsible & Sust	165.997.751,64 GBP	10/09/99	7418
5A	abrdn UK Income Equity	223.514.494,66 GBP	11/04/88	11587
6A	EdenTree UK Equity	234.563.763,28 GBP	01/03/88	11628
7A	Premier Miton Responsible UK Eq	257.973.262,52 GBP	28/07/86	12210
8A	BNY Mellon Sust UK Opports	285.469.258,98 GBP	27/09/12	2652
9A	Threadneedle UK Equity Alpha	350.633.832,83 GBP	08/05/06	4986
10A	LF Liontrust UK Focus	449.791.023,23 GBP	29/09/03	5938
11A	abrdn UK Equity	569.846.868,80 GBP	19/12/05	5126
12A	Janus Henderson UK Responsible	586.113.149,97 GBP	15/05/95	8997
13A	Fidelity UK Select	681.428.866,97 GBP	09/11/87	11741
14A	BNY Mellon UK Equity	791.809.881,13 GBP	09/10/12	2640
15A	Liontrust UK Ethical	930.453.162,62 GBP	10/05/99	7541
16A	JOHCM UK Dynamic	1.699.107.357,11 GBP	23/10/09	3722
17A	Trojan Income	2.477.752.239,21 GBP	03/02/05	5445
18A	Royal London Sustainable Leaders	4.020.975.734,70 GBP	26/11/12	2592
	Fund Size			Fund age (days)
Mean	/23633024,8		Mean	6219,1
Standard Error	218224588,8		Standard Error	781,0596982
Median	326274369,6		Median	5285,5
Standard Deviation	975930029,7		Standard Deviation	3493,005159
Sample Variance	9,52439E+17		Sample Variance	12201085,04
Kurtosis	6,774384589		Kurtosis	-1,07526387
Skewness	2,54845918		Skewness	0,574859765
Range	3953805326		Range	9990
Minimum	67170408,45		Minimum	2220
Maximum	4020975735		Maximum	12210
Sum	14472660496		Sum	124382
Count	20		Count	20

### Appendix 3 – Sample B: descriptive statistics

#	Fund name (B)	Fund size (GBP)	Fund Inception date	Fund age (days)
1B	ES R&M UK Equity Income	72.359.905,16 GBP	03/02/09	3984
2B	abrdn UK High Alpha Equity P1	107.954.128,73 GBP	14/05/12	2788
3B	Lazard UK Omega	113.437.824,99 GBP	01/10/07	4475
4B	Barclays UK Equity	185.577.011,78 GBP	07/12/05	5138
5B	Aegon UK Equity	219.813.855,62 GBP	12/08/85	12560
6B	Scottish Widows UK Tracker	259.428.598,38 GBP	31/10/96	8462
7B	Aviva Investors UK Lstd Eq	292.119.386,70 GBP	13/11/98	7719
8B	LF Canlife UK Equity	286.869.460,30 GBP	28/05/12	2774
9B	abrdn UK Value Equity	368.125.821,95 GBP	29/09/05	5207
10B	abrdn UK High Income Equity	436.847.398,84 GBP	18/09/98	7775
11B	Unicorn UK Income	545.661.930,96 GBP	25/05/04	5699
12B	M&G UK Select GBP	623.309.862,16 GBP	01/10/02	6301
13B	BlackRock UK Special Situations	684.126.848,71 GBP	14/03/81	14172
14B	Fidelity UK Opportunities	733.402.578,40 GBP	07/02/14	2154
15B	Santander UK Growth Unit Trust	909.952.503,45 GBP	01/03/95	9072
16B	Ninety One UK Alpha	1.705.931.004,05 GBP	17/01/07	4732
17B	JOHCM UK Equity Income	2.577.483.271,37 GBP	30/11/04	5510
18B	Fidelity Special Situations	3.795.234.186,90 GBP	15/10/12	2634
	Fund size			Fund age (days)
Mean	717198334,1		Mean	6280
Standard Error	211314824,8		Standard Error	816,328736
Median	332007996,3		Median	5358,5
Standard Deviation	945028625,9		Standard Deviation	3650,733091
Sample Variance	8,93079E+17		Sample Variance	13327852,11
Kurtosis	5,840718516		Kurtosis	0,004869497
Skewness	2,42420247		Skewness	0,877468595
Range	3722874282		Range	12596
Minimum	72359905,16		Minimum	1576
Maximum	3795234187		Maximum	14172
Sum	14343966682		Sum	125600
Count	20		Count	20

### Appendix 4 – ESG as funds' alpha explanatory variable; regression result and Variance Inflation Factor (VIF) test results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004049	0.000846	4.786735	0.0000
SIZE	7.10E-13	3.37E-13	2.106404	0.0431
AGE	-8.59E-08	9.82E-08	-0.874714	0.3882
ESG	-0.000235	0.000633	-0.371007	0.7131

Variable	Coefficient	Uncentered	Centered
	Variance	VIF	VIF
C	7.15E-07	7.139937	NA
SIZE	1.13E-25	1.749706	1.067034
AGE	9.65E-15	4.830667	1.067577
ESG	4.01E-07	2.001209	1.000605

#### SUMMARY

In the last years, socially responsible investments (SRI) gained much popularity, flows into investment funds labelled as 'green' or ESG-compliant have recorded impressive inflows each year - the flow of money into those founds topped \$20bn USD in 2019, four times the flow recorded in 2018. Governments, providers of financial products are looking to regulate and develop new products to meet the demand. Although many investors take into consideration already the direct and indirect externalities when deciding the companies to invest into, the financial return is still their most important concern. A previous survey done by Sparkes in 1998 found out that only 35% of investors would still invest in such securities if the return was only slightly lower than the one of conventional funds. Nowadays, the question that many economists have asked themselves is whether socially responsible investment involves an ethical sacrifice or is able to offer the same financial rewards as conventional investing. The research questions of this empirical study investigate whether abnormal returns provided to investors by ESG funds are different from the ones obtained from a similar unconstrained fund and whether the ESG orientation is an explanatory variable for a fund's abnormal return: Does investing in funds that have an outstanding ESG ranking provide investors different, higher or lower risk-adjusted returns than investing in similar conventional funds?

Sustainable investing started in the political climate of 1960, it was performed massively in the past 20 years, but it dates back many more years. It started with religious groups such as Muslims, Quakers and Methodists who needed to use their ethical parameters to screen the assets in which they wanted to invest. For example, portfolios held by individuals of Islamic religion shall comply with the Shariah. Religious codes brought firstly the desire for investors to shape their portfolios with assets that respected their personal beliefs. The first mutual fund that could be defined ESG in modern term was created in 1971, following the anti-war movement concerned the Vietnam war: *Pax Sustainable Allocation Inv*, the first sustainable mutual fund ever established, and it is still possible to invest in it today. In the following years, during the 1980s in the United States, shareholders activism started to demand companies to behave more ethically: those movements pushed the US government to shape public policy accordingly. In 1984, the US Forum for Sustainable and Responsible Investing is established. In 1997, the signing and ratification of Kyoto Protocol contributed to switch the public opinion toward awareness of sustainability. In the late 1990s, more sustainable funds were created: in 1994, ESG funds held assets worth around \$1.9bn. The real change happened in the 2000s

when the United Nations published the Global Compact in which the phrase 'ESG Investing' is officialised for the first time. This voluntary initiative enables companies to take part in it through a commitment to best business practices in the areas of human rights, labour, and the environment. The United Nations offered advice and recommendation to companies concerning how to incorporate ESG best practices into their operations and asset management. In the 2010s, the Paris Agreement on Climate Change and the permission from the US Department of Labor for pension plans to invest in socially responsible investments - if the strategy will help the plan to reach its economic and financial objectives - brought CalPERS, the largest public pension fund in the US to adopt a five-years plan to incorporate ESG principles into its investment strategy. In the past five years, the push for ESG investing reached new – never seen before – levels: in 2018, the CEO of BlackRock, the biggest investment management company in the world, urged companies to be accountable for their impact on the society, advising CEOs to minimize negative environmental and social impacts and plan for a transition towards net-zero emission and digital. Because of the change in public opinion, only in 2019, flows into US sustainable funds topped \$20bn, recording a four-fold increase compared to 2018. In Europe, an exponential growth is recorded as well: only in 2020, more than five hundreds new ESG funds were established, summing up to more than three hundred thousand of sustainable funds.

This growth is linked to three main reasons: individuals became more aware and demanded more ethical products from investment companies; governments and international organisation started to integrate sustainability into the public regulatory framework; finally, research has contributed to enlighten this topic researching whether ESG investment can help investors to offer them lower volatility while bringing excess returns.

As ESG investing became popular, companies, funds and providers of financial data developed models to assign sustainability ratings to each company and fund. The ESG assessment is now an essential part of the investment prospectus of any company, as investors want to know what steps the company is taking towards sustainability. Later in this empirical study, ESG ratings provided by Morningstar are used. The choice of Morningstar as provider of ESG rating instead of the more famous but more general financial data providers like Refinitiv or Bloomberg is due to the specific attention Morningstar gives to sustainability issues in the financial data it provides. The research question assessed by this empirical study is strictly linked with the Modern Portfolio Theory and the diversification opportunities that a restricted investment

universe offers. Even tough an outstanding ESG score does not represent a fixed constraint (no company is excluded *at priori*) it is assumed that higher the ESG rating and thus the number of screenings, smaller is the number of companies and the different sectors a fund can diversity itself into.

Fund managers have two decisions to make: how much money to invest in each stock (optimal diversification problem) based on the level of risk they want to bear and the asset-allocation problem. Modern Portfolio Theory (MPT) assumes that investors face two different types of risks: idiosyncratic risk and non-diversifiable risk, also known as market risk. While it is possible for investors to get rid of idiosyncratic risk through diversification, investors shall get compensated with a financial return for the non-diversifiable risk they decide to bear. This is due to the fact that it is not possible to eliminate market risk in full: even picking stock randomly and creating a well-diversified portfolio, different stocks will suffer the same ups and downs after the same major event, as market risk affects all stock, to some extent. Market risk will always be non-zero due to non-zero variances (correlation coefficient) between stocks. On the other hand, if two stocks were only subject to specific risk, their covariances would then be zero: in this hypothetical case, if we added such stocks to our portfolio, the portfolio variance equation would converge to zero. Almost all stocks available in the market are influenced by events and macroeconomic shocks – a change in interest rates, for example – thus they bear a positive covariance. In a well-diversified portfolio, even if the average variance of stock returns is zero, the average covariance can never be zero by adding extra stock. ESG funds that have a higher sustainability rating shall have put in place some screen policies to discern the assets to invest into and the assets not to be inserted in the fund's pool of assets. This can be sum up saying that funds are adding constraints to their process of assets' selection. Ethical funds have narrower investment opportunities due to the required constraints, reducing de facto the possibility of diversification and bearing a higher idiosyncratic risk. According to the modern portfolio theory just described, as there is less chance of a wide diversification to reduce idiosyncratic risk, the risk-adjusted performances of the fund shall worsen (Michelson et al, 2004). Also, the total exclusion of certain industries (alcohol, tobacco, oil, mining, etc.) from a fund that has the aim of retaining a high ESG score increases the variance of the fund, especially in a short-term horizon. In Regalli et al. (2005) an analysis of the difference in risk - quantified using the variance – between ethical and non-ethical funds is performed, finding out the presence of an ethical sacrifice to be borne by investors: the divergence among the

variance of a conventional fund without constraints and the variance of an exclusively ESG portfolio.

Hvidkjær in 2017 performed a wide review of past literature related to ESG investing; as explained in his analysis, previous studies fall into two categories. The first group of studies analyses whether an optimal portfolio is buildable taking into consideration ESG principles, thus without being able to diversify fully. The second group of studies which is the one more related to this research project, investigates the performance of an ethical fund through comparison, either with a market benchmark or a pair-matched conventional fund. The study "International evidence on ethical mutual fund performance and investment style" from Bauer et al (2005) investigates over the financial returns and investment decisions of ethical mutual funds in the United States, United Kingdom, and Germany, where the mutual fund industry is younger and smaller, over a timeframe from 1995 to 2001. The authors want to address the research question whether the return on the market of ESG compliant funds has been higher than their matched conventional counterparts. The authors used a sample made of 103 domestic equity funds and 4384 conventional ones from Morningstar (US), EIRIS (UK) and Ecoreporter (Germany), gathering as well returns including of any distributions and management fees. As a reference group, the authors created another portfolio made of conventional equity funds that did not put in place ethical-picking strategies when performing asset selection. In this research and in most of the studies, the matched pair analysis model was used to compare ethical and conventional funds, then using a statistical analysis for paired data. Each ethical fund is combined with an unethical fund of equal size, market, and age. The purpose of this combination is to eliminate the subjective characteristics of the funds as much as possible, so that the differences in the financial performance depend only on the ESG orientation of the fund.

The authors used both the CAPM single-factor model and the Carhart four-factor model to analyse each fund's performance. A four-factor model is useful to overcome the benchmark problem, adding three risk proxies: the market risk, the divergence in performance between portfolios containing small and large cap shares, the divergence between high and low book-to-market ratios and the momentum effect. As market proxy, the Worldscope index is used, covering 98% of market capitalisation. The authors find no proof of a statistically meaningful divergence in financial performance between ESG and conventional funds when controlling for size, book-to-market and momentum, after the matching procedure as well. ESG funds are

less exposed to the variability of the return of market versus unethical funds and are highly exposed to small businesses, being growth oriented. An interesting result of Bauer's analysis is the change of performance in the timeframe analysed: during the timeframe between 1990 and 1993, the majority of ESG funds granted investors a risk-adjusted return which is lower when analysed in comparison with the one produced by conventional ones. In the timeframe, the underperformance recorded is statistically significant. However, during the following months, ethical funds provided a better performance – always risk-adjusted - than their conventional peers. Among the explanation provided for this phenomenon, the authors suppose that ethical funds were able to catch up due to learning.

The study concerning the performance of ESG compliant funds compared to non-ethical ones by Kreander et al. (2005) is another of the most prominent research on the matter. The paper addresses the issue whether the investment strategies put in place by ethical funds result in investors losing a part of the gains they could probably have earned if they invested into conventional funds. To answer this question, this other empirical study from Kreander et al. observes the returns as well obtained in the marked from ethical and non-ethical funds over a timeframe of three years. From a sample of 80 funds, their financial performance was analysed, gathering 156 weekly observations (every Wednesday, to compensate the weekend effect) for 40 ESG and 40 conventional matched pairs of funds. Dividend payments were taken into consideration as well. As this study is done using funds from the United Kingdom, Sweden, Germany, the Netherlands, Norway, Switzerland and Belgium, difference in currency exchange are taken into consideration. Overall, the research from Kreander et al. does not discover a statistically meaningful difference concerning the performance of different types of funds in the sample. Surprisingly, as well in the study from Bauer et al., a lower market risk is recorded for ethical funds, being also statistically significant. Also, the results of the market timing analysis explain that in the cases where ESG funds records a lower performance than conventional ones, it is due to market timing ability. The authors conclude saying that no penalty or punishment is found for investors who chose to invest in ethical companies. Indeed, from the sample the authors find out that in the timeframe analysed, it also likely that ethical funds outperform conventional ones, despite the restricted investment universe they must select stocks from, even though this result is not statistically relevant. Thus, ESG funds might be a better option for risk-averse investor, as both betas and volatility are lower.

Finally, the study from Kreander *et al* tried to justify the recorded divergences in crosssectional assessment parameters, the Jensen's Alpha. Through a regression using as variables the fund size, age, and a dummy variable for the ethical attributes of the fund (ethical or conventional), the authors found that none of the used variables appears to be significant: the ESG status of a fund is not able to explain the Jensen's Alpha. The insignificance of the ethical status is strictly linked to previous research that concluded that no statistically noticeable difference is found in the returns among the two different kinds of funds.

To perform the study in this thesis, from a Morningstar dataset containing more than one hundred funds active in the United Kingdom, a sample of 18 ethical funds and 18 less ethical funds has been gathered. Subsequently, financial performance data (Net asset value) has been obtained for each fund in both samples. The data is obtained from Refinitiv (formerly Thompson Reuters) for a timeframe between 1<sup>st</sup> January 2013 to 31<sup>st</sup> December 2017. This paper tested two hypotheses. In the first hypothesis, I tested whether there is no difference in the abnormal return between each matched pair of ethical and non-ethical funds. This first hypothesis tested is an extended version of the one in previous studies for two reasons: previous research often did not adjust financial returns for risk or used only a single-index asset pricing model, limiting the analysis only to the observation of how many ESG funds in the sample performed better and whether the funds' alphas were statistically significant. Also, past research did not perform a two-sided paired T-test to ascertain whether a significant difference exists between the abnormal returns of ethical and non-ethical funds. Through this test, we are able to detect whether the financial returns offered to investors from ESG and conventional funds are statistically the same. Hypothesis one is tested among the Alphas of each matched fund, ethical and non-ethical. Through a T-Test of difference between pairs we can ascertain whether a statistically significant difference exists between the over- or under- performances in both samples. This test generates a t-value as output. The test is repeated twice, using the Alphas obtained through the models with both three and four factors. Results are discussed in the next chapter.

The second hypothesis tested in this paper, checks whether the abnormal financial performance (the alpha) is not dependent on ethical (ESG) orientation of the fund. To test this second and last hypothesis, as in Kreander *et al.* (2005), a new regression in which the ESG orientation is a variable able to explain funds' under- or over-performance was created. The first hypothesis was based on a time series but, in this case, a panel-data analysis is required in which the ethical ranking is treated as a dummy variable, to differentiate ESG funds from non-ESG funds.

When it comes to results, our ethical sample reported on average a financial return of 0.90%, while the traditional funds in the sample reported an average of 0.92%. The average coefficient of variation of ethical funds is 2.92%, which is slightly lower when compared to the average coefficient of variation of non-ethical funds, 2.98%. Thus, in the timeframe, ethical funds recorded a slightly lower return than conventional ones, recording a slightly lower volatility as well. However, as explained already, when evaluating performance, a risk-adjusted analysis is needed. Most funds (16 out of 18) in both samples were able to beat the market. In two cases, both samples recorded negative Alphas (both significant at 5% and 1% level). From the analysis of performance adjusted for risk, we discover that the average alpha of the ethical sample is 0.26%, while the average alpha for non-ethical funds is 0.24%, meaning ethical funds in the sample were able to offer on average slightly better returns for their risk level than their conventional matched counterpart. Subsequently, to provide an answer to Hypothesis one, a T-Test of difference between pairs is performed between the Alpha of each fund in both samples, to see whether a statistically meaningful difference between the under- or over- performance related to the level of risk is found. This test can detect whether the mean difference between a matched pairs of measurements is non-zero. For pair-matched sample to differ significantly at 5% level, the T-Stat shall be higher than the value of 1.96.

Not only from the empirical analysis of the funds' performance does not appear to exist a punishment for investors who invest into ethical stocks, and it is almost as likely that ethical funds will outperform conventional ones, but as a T-stat of 0.4594 is recorded, we cannot reject the hypothesis stating that *no statistically observable difference is discovered in abnormal returns between the ethical and conventional samples*. The same test has been performed again with the abnormal returns obtained from the Carhart model: in this case as well, we get to the same result.

After having ascertained that no difference in returns is recorded, I tested the second hypothesis, to find out whether the ESG orientation of a fund might be a predictor variable for its abnormal return (Jensen's Alpha). As a panel regression is needed, data had to be rearranged. The output from EViews shows that the ESG orientation and age as specific properties of funds in the sample are not statistically significant variables able to explain the funds' performance, with the ESG dummy variable having the highest P-value. On the other hand, the size coefficient is an explanatory variable for funds' abnormal return, significant at both 5% and 10% level.

This result means that we cannot reject the second null hypothesis stating that *the abnormal returns of a fund are not linked to its ESG rank*: the empirical results show that the ESG orientation does not have an impact on the Alphas.

In line with the previous finding of the absence of a statistical divergence in returns between ethical and non-ethical funds, from our sample, we ascertain that ESG orientation is not enough to explain the excess return that might be related to other factors like stock-picking abilities of the fund's manager, macroeconomic conditions.

The results obtained and presented in the previous chapter are in line with previous studies described in the chapter concerning literature review that offered a research framework to start from and extend through a more recent timeframe and multi-factor models. When testing the first hypothesis *"There is no difference in the abnormal return between each matched pair of ethical and non-ethical funds"* no statistically significant difference in the alphas of funds is found applying the T-Test for matched pairs on the alphas obtained either through a three- or four-factor model, meaning that although ethical companies might have good externalities on society, for an investor there is no difference when it comes to returns. When analyzing each fund's Alpha, we discover that using either the Fama&French model or the Carhart model, ethical funds in our sample are almost as likely to outperform non-ethical ones - they outperform non-ethical in almost half cases - however many alphas are not significant either at 10% or 5% levels.

As said already, this difference in alphas between different type of funds is found not to be statistically significant and thus may be due to chance, fund's specific characteristics, managers' stock-picking abilities. We can indeed repeat that no prize or punishment is given to ethical funds' investors. A smaller investment universe and thus a higher idiosyncratic risk does not have an impact on funds' performance and does not result in statistically significant lower returns.

Also, using either asset pricing models, when it comes to market risk, we ascertain that ethical funds present, on average, lower market betas. ESG funds are less exposed to changing market conditions and bear less volatility: the securities inside ethical funds in our sample are less exposed to external shocks. It is interesting to note that on average both samples were able to beat the market benchmark in almost all cases (having an average return of 0.92%, while the market benchmark is equal to 0.56%).

After having proved that no difference in returns is found, this empirical study investigated as well whether the ESG component had an impact and thus was an explanatory variable for the abnormal return. This second hypothesis is strictly linked to and expands the first one. Through this second hypothesis test, performed through a panel data analysis, we can ascertain whether *the ESG orientation of a fund is an explanatory variable for funds' excess performance*.

The result of the regression is in line with the outcomes of the first hypothesis test: the ESG orientation is not an explicative variable for the fund's performance, an outstanding ESG rating is not able to explain the funds' alphas: the ethical orientation does not impact the performance.

As in previous research, this research project utilized a matched pair investigation to assess the performance of a sample with an outstanding ESG score when compared to a less ethical matched counterpart. However, looking at both previous literature and the complete results of this empirical study, it is clear for the reader how difficult is it to research over such a topic. The results concerning the difference in performance and the impact of the ESG component are strictly linked to which asset pricing method is used, the timeframe analyzed, the selection of the study sample, the index used as benchmark, whether management fees and dividends are included.

The reader would have probably understood at this point that both this research paper and past literature rely on strong assumptions concerning the creation of the sample to be taken in consideration and the matching procedure.

These presumptions represent the main shortcomings since they can have direct impacts on the outcomes of the research: a different sample, in a different country over a different timeframe might have brought different results. Another critical assumption made when selecting the sample is considering the ESG score and the size as constant values in the timeframe analyzed.

These final comments do not want to discredit the results of the dissertation, but advice future research on the shortcomings to try fixing them by using a larger sample, using a five-factor model to control for more parameters, try to get rid of the matching process or expand the second hypothesis further, controlling for more regressors. The matching procedure is at the same time one of the key variables at the basis of this study but also one of the major potential flaws. It is an important component in the study as it allows us to properly compare securities having different characteristics, but on the other hand, the matching procedure for investment

universe, size, country, and age might not adjust for other funds' specific characteristics having an impact on the performance, and it might be improved to better isolate the ethical status. Finally, more detailed future research could observe the size of each fund and their ESG rankings not as constant variables but taking into consideration their changes over time.