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Sustainable Investing: ESG Mutual Funds Performance

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ABSTRACT

Sustainability has become an integrating part of our society as the world faces significant issues related to pollution and resources mismanagement. The finance sector has not been spared. In fact, new forms of investments have been divulgated, following the investors' growing demand for sustainable products. This study aims at analyzing the performance of ESG ("Environmental, Social and Governance") mutual funds, comparing them with a sample of conventional open-end funds. Our data belong to the 2008-2018 period, with a specific focus on European and American equity-focused funds. Multifactor models are the designated tool through which we seek to give empirical evidence to our results. Specifically, I am going to exploit two models, the well-known Carhart 4-factor model, and the Fama and French 5-factor model, for financial performance measurement. Furthermore, I am attempting to assess managerial abilities through the Treynor-Mazuy model and its combination with the Carhart model, with the purpose of verifying if there is a link between financial performance and managerial skills. The final part of the paper comments the results of the regressions, with the goal of offering clear picture of which results that investors should expect when sustainable-wise components have been integrated into the investment strategy.

AKNOWLEDGEMENTS

To my family,
and all the people who helped
and supported me during this journey.

CONTENTS

Chapter 1

Introduction

Sustainability projects have been taken over in the last decades as the issue has been the object of extensive debates in both the public and academic contexts. Social impact, environmental sciences, and good social practices have been given official credit once the United Nations published 17 Sustainable Development Goals back in 2015. That list incorporates a series of goals and targets to be reached by 2030, addressing institutional organizations, policymakers, but also managers and investors. Sustainable investing is a topic which has been around for a few decades and has often been at the center of controversial debates. We can find a significant stake of academic research dedicated to the analysis of alternatives forms of investment as well as the way they influence financial performance. However, the dilemma around financial returns has still to be solved due to the lack of consensus on many levels.

The financial industry increased allocations on alternative forms of investment over the last decade. These investments are characterized by a high sustainability component and are targeted to achieve positive social impact. The criticism focuses on the fact that studies published by these companies are likely to be biased and keen to sponsor sustainability policies and practices in order to gain a broader consensus among investors. If we look at academic research, results are divided between those who assert that ESG/SRI investments hurt performance and those who advocate their positive impact. The issue related to controversial research results and different sustainability definitions is the main cause of confusion in the investor community. It is rather troublesome to find a unanimous definition of sustainable security/fund and specific guidelines to be labeled as such. SRI (Socially Responsible Investing) represents one of the most known forms of sustainable investing. SRI investment

vehicles became popular because they started to address the need of some investors to adapt their portfolios to personal ethical choices. In fact, the most employed strategy aimed at excluding certain "bad" companies from the possible investments' universe. This strategy has been defined as "negative screening" because it is based on the exclusion of companies which did not comply with specific social or environmental criteria: the so-called "sin stocks". Afterward, other strategies have been developed such as "positive screening" and "thematic investing". The evolution of SRI and sustainable-like investments led to the creation of other categories, instruments, corporate solutions and a broader spectrum of such strategies adopted by asset managers and private investors. For this reason, some common boundaries have been drawn to add clarity and define the subsets of sustainable investing styles with their respective goals.

Table 1

VALUE		**VALUES**		
Conventional	**ESG**	**SRI**	**Impact**	**Philanthropy**
Maximize Financial Performance		Balance Financial and Social outcomes	Focus on social outcome	Maximize social outcome

Source: Vert Asset Management

As we can see from *Table 1*, there is a differentiation between socially oriented and return-seeking investments. SRI investing is driven by ethical values. It's characterized by heavy use of "negative screening", which excludes companies or industries whose business goes against specific criteria. For example, tobacco, weapons, and alcoholics are typically filtered out from the sample of potential investments. This type of investing implies a stronger narrowing of the investment options available to asset managers, and it implies a more subjective interpretation among its users. For example, some organizations limit their screen to religious and ethical values, while others focus on health-related issues.

ESG investing maintains the focus on economic returns, while integrating sustainability metrics into its research analysis. It does not exclude specific categories ex-ante, it rather relies on ESG-scores integrated into the research and portfolio selection processes. In fact, an MSCI 2018 paper reports that the majority of surveyed institutional investors expect gains in the long-run risk-return profile of their portfolios. In other words, their expectations assign priority to financial gains rather than the social impact. Moreover, ESG scores do not represent a "constraining" rule, since laggard companies are not excluded at priori, neither companies operating in "non-ethical" industries are filtered out a priori. Therefore, the spectrum of factors and characteristics considered by ESG-investing research is wider, leading to broader applicability of those metrics in security selection. For the sake of my research, I concluded that it is more interesting to carry out a comparative analysis between conventional and ESG mutual funds for two reasons. First, they both share the same priority of achieving satisfactory financial returns. Second, the only difference is the presence of a sustainability mandate and the implementation of ESG analytics into the investment process.

Chapter 2

ESG Investments

2.1 ESG Finance

In the last years, there has been a rising concern over environmental, integration, and sustainability-related issues. Climate change, natural disasters, governance misbehaviors, labor integration, and other issues converged in the public debate around ESG investing. While the market for "sustainable" investments was growing at a significant rate, a set of new products and services have been created for a growing share of investors whose interests ranged from making money to making a positive impact in the society.

ESG is a tag which stands for "Environmental, Social and Governance". Nowadays, it is used to classify a variety of investment vehicles, financial products, and institutions which conform to specific criteria. These criteria can be grouped under three fundamental pillars: integrity, value, and impact. ESG integration can be defined as the explicit combination of those criteria and traditional financial analysis through a systematic approach. Its long-term objective is value-creation for investors, and hence, it differentiates from SRI because it does not attempt to mix financial and social objectives. It follows that studies on ESG and SRI investment vehicles should be distinguished because they are most likely to lead very different results coming from the lack of purpose alignment. In fact, Zadeh and Serafeim (2017) surveyed a sample of senior investment professionals from non-SRI funds to investigate the reasons behind the adoption of ESG information. The first motive has been found to be the relevance to investment performance, followed by client demand and product strategy. However, ESG classifications became an important portfolio selection tool for both investors and financial intermediaries. Popular financial services providers

(e.g. Bloomberg, MSCI…) created custom rating systems for companies to help organizations and privates to build ESG portfolios. These screening tools analyze each company's activities and processes: environmental impact, labor management, corporate governance, gender diversity, privacy, and data security.

Investors are not the only ones who contributed to the promotion of ESG values. In the last years, a lot of studies have been published on that matter, and most of the forecasts agree on the fact that ESG-investments are set to expand. ESG analytics featured significant improvements in the last years. One of the leading firms is Sustainaytics, which provides firms with an array of services aimed at integrating ESG criteria in the investment policy, managing compliance risk, and supporting portfolio screening. The development of these services, notorious companies such as Bloomberg and MSCI developed a series of benchmark tools in order to address the needs of ESG-savvy investors. Sustainaytics works directly with another important research provider: MSCI, which is riding the encouraging trends. They declare on their website that 67% of Millennials believe that investing represents a way to express social, political and environmental values. Moreover, it has been forecasted that a $30 trillion wealth transfer from baby boomers to 90M of millennials will happen over the next ten years it is straightforward to foresee a boom of the market for ESG investments. For these reasons, the euphoria driving money into new investment vehicles is justified by the shift in investors preferences and awareness.

2.2 ESG Investment Styles

The proliferation of ESG practices led to the implementation of different investment styles. We can group them into seven categories, all of them reserving great importance to environmental, social and governance factors while maintaining long term sustainable returns as the main goal.

The first is labeled "*best-in-class*", and it is carried out by selecting the best performing assets, identified by ESG metrics, within a specific investment universe.

A more proactive approach is called "*engagement & voting*", by which they exploit engagement actions and active ownership to influence firms' behavior and disclosure. It is usually achieved through voting of shares and negotiation with companies over ESG issues, hence it is a long-term process. Another proactive approach is called "*impact investing*". Those investments are directed to companies or funds with the purpose of creating a positive impact from the social and environmental point of view. It differentiates from philanthropy because they retain asset ownership with the goal of obtaining positive financial outcomes. One of the most representative strategies is the "*ESG integration*". It's based on the coverage of ESG considerations alongside financial metrics in traditional financial analysis. The whole process aims at assessing the impact of ESG practices on companies' performance, and the potential effects on investment decisions. Another important strategy is "*exclusion*". As the name suggests, it removes from consideration companies, sectors, or countries from the investments universe of potential choices. The typical targets of this practice are weapons, pornography, tobacco, and animal testing. The opposite investment style is labeled "*sustainability-themed*". It is focused on investments in themes or assets related to the development of sustainability. Moreover, it addresses specific ESG issues such as climate change, environmental impact and health. Funds employing this strategy usually carry out an ESG analysis or assets screening. The last category is labeled "*norms-based screening*". It indicates the screening of investments conforming to international standards and norms covering ESG aspects. For instance, the most relevant set of norms is the United Nations 17 principles of sustainability.

Zadeh and Serafeim (2017) also examined the implementation of different ESG-related investment styles and how they are perceived. Negative screening is regarded as the least beneficial while full integration and engagement are thought having a

higher marginal contribution, although they are all employed in equal frequency. Several ESG styles practices, especially screening, are driven by product and ethical considerations. Conversely, integration is pushed by relevance to investment performance. These approaches can be grouped into three different investment frameworks (Figure 2.1) which, in turn, can be associated with three distinct objectives (Figure 2.2).

Figure 2.1

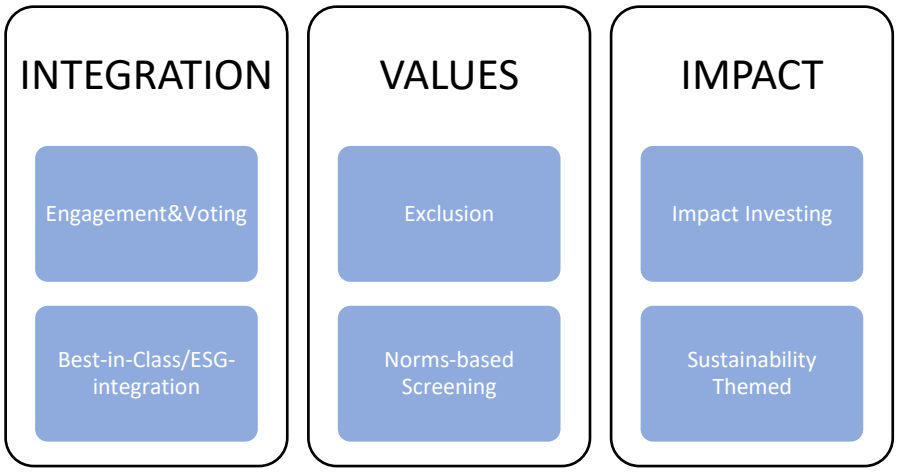
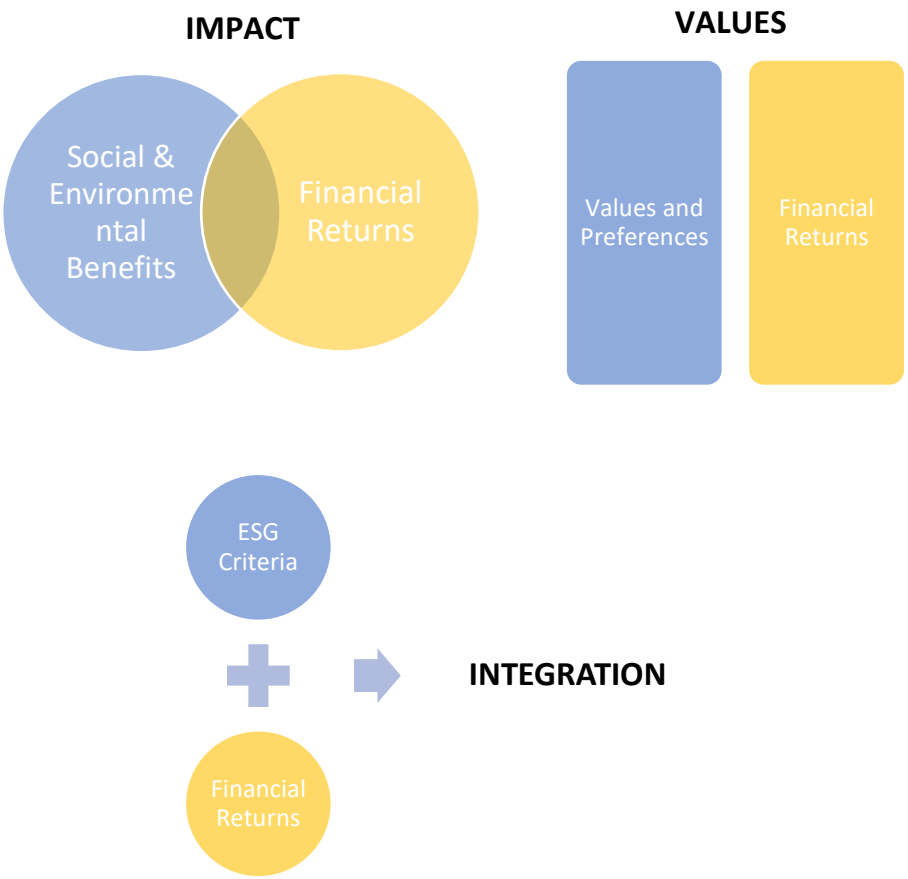


Figure 2.2 represents graphically the concept that I tried to discuss before. “Impact” is depicted as the intersection of two spheres representing two distinct drives of investment activity, and therefore it finds expression in strategies such as thematic investing. “Values”, is represented as two blocks which separately co-exist into the same investing framework, generating arguably less-effective strategies like negative screening.

Figure 2.2



Finally, integration is the combination of two pillars aimed at maximizing the performance for investors who seek financial performances with the will of considering personal ethical values. With regards to recent developments, the last Global Sustainable Investment Review offers some interesting insights on ESG-approaches' trends for the period 2016-2018. We can see from Figure 2.3 below, exclusion remains the most widely used strategy, totaling $19.8 Trillion in assets. The second most used option is ESG-integration, which, by the way, grew at a faster rate in the last couple of years and reached $17.5 Trillion assets under management.

Figure 2.3

Souce: 2018 Global Sustainable Investment Review

Sustainability-themed, best-in-class, and impact investing are still laggards in terms of assets, however, they have displayed a significant growth of 125%, 270%, and 80% respectively. In the middle, we find norms-based investing which is the only one displaying a negative growth over the past years.

2.3 ESG Mutual Fund Industry

The mutual fund industry followed a growing trend pushed by new investment norms a growth in investors' demand. A whopping number of new "sustainable" mutual funds have been started by asset managers, 382 in 2018 alone. Morningstar officially reports $1.2 trillion in assets under management, twice as large as ten years ago. This significant growth is fueled by three main reasons. The first: as time pass, the individuals representing future financial decision-makers are demanding more of these products. Not only that, but they are also requesting long-established companies and businesses to adapt. Secondly, regulators and governments are

embracing this vision by integrating sustainability criteria into the political and regulatory framework. Thirdly, there's widening evidence that ESG research and analytics can dodge certain investment risks and bring excess returns. On the other hand, the lack of a uniform rating system prevents institutions from fairly comparing ESG investments across companies, countries, and jurisdictions. In fact, Zadeh and Serafeim (2017) explained in their survey that the main obstacles to the adoption of ESG criteria are the lack of comparability, reliability, quantifiability, and timeliness. For these reasons, financial supervisors are pushing towards a tighter control to deter companies from using the "ESG" label as a pure marketing tool. Instead, regulators are pushing for them to show consistently the required characteristics for being classified as such. Their portfolios must consist of equity or bonds with a high degree of environmental, social and governance features whose reliability needs to be tested and certified. Ratings have been playing a fundamental role in this acknowledgment process. Data providers such as MSCI, Morningstar, and Bloomberg developed scores and screening tools in order to designate funds as sustainability leaders, average, or laggards. It is usually achieved by assessing the ESG score of the portfolio's components and compare them to its peers. ESG assessment is often combined with controversy scores in order to hold companies accountable for negative operations against sustainability principles. The main drawback of these ratings is that they reflect the present situation of the fund. They do not reflect the potential changes and hence it is difficult to assess their persistence. One possible bad scenario for an investor could be the discovery of a downgrading of companies in which he/she invested, and which are not regarded as sustainable as before. For this reason, investors need to decide a priori whether they want to prioritize financial returns or positive social impact, otherwise, it might damage its investment strategy.

2.4 Controversies

The dilemma evolves around the key question which investors have been asking themselves: ‘‘Does the market recognize, and thus reward, ESG values?’’

There’s no unanimous choir over this topic, however, both pros and cons have been wildly discussed among professionals. One of the arguments promoting skepticisms says that the stock market is likely to undervalue ESG investments because they are ‘‘intangibles’’, and hence they are hard to evaluate. I would say that it is an arguably incorrect observation because the market has often shown how intangibles and R&D projects led to high valuations as a premium for growth potential, as in the case of technology companies. A more accredited argument centers around portfolio-diversification theory. As we already mentioned, one of the main ESG-related strategies is ‘‘negative screening’’. A process through which ESG-laggards are identified and excluded from the group of potential firms during the portfolio selection process. Therefore, some professionals argued that ESG practices eliminate the diversification benefits by restricting the universe of potential investments. On the other hand, other people working in the industry replied that this drawback needs to be weighted off against another potential benefit: lower risk. As I mentioned before, the implementation of an ESG investment strategy implicitly causes a drop in the riskiness of the portfolio because one is simply less likely to invest in companies who might suffer major losses due to tail events (e.g. corporate scandals, regulatory adjustments, environmental disasters, sanctions, etc.). Those who advocate socially responsible investing, highlight also the fact that the stock market underreacts to ESG events. Consequently, firms which experience such events tend to be undervalued, and strategic investments in those firms can generate abnormally high returns. Supporters of the same theory argue that since ESG popularity has increased over time, ESG stocks might be affected by a growing demand which would eventually push up their prices.

Finally, some researchers focused on a more technical analysis of socially responsible investments. We all agree that a perfectly elastic demand curve would align performances of ESG stocks with those of conventional companies. However, Barnett and Salomon (2005) analyzed the financial and social performance link within SRI mutual funds. They found out that not every type of social screen contributes positively to the overall portfolio performance, and therefore, they indirectly give credits to both advocated and critics of sustainable investments. Moreover, they individuated the main danger in "getting stuck in the middle", which means not devoting to any of the two alternatives (i.e. either screening out or sticking with diversification). They argue that, if an investor is not able to stick with either one of the two alternative paths, he/she is most likely to end up experiencing unsatisfactory outcomes. After these premises, we can conclude that the debate around the validity of an SRI/ESG-investment strategy is destinated to continue, given the fact that a unanimous opinion has still to be formed. Nevertheless, I would conclude that investors need to be consistent and coherent in their investment choice because the risk of swinging from one strategy to the other could be very dangerous.

Chapter 3

Methodology

3.1 Literature Review

A comprehensive review of the empirical literature on ESG investing has been carried out in Hvidkjær (2017). According to its analysis, the previous research can be classified into three categories, distinguished by the frequency of the methodology and the nature of the hypothesis tested. The first group addresses the issue of whether it is possible to build an optimal portfolio relying on ESG principles. The associated methodology is the most used and it consists of portfolio-selection by means of ESG signals. Subsequently, a back-testing review is carried out to check for valuable information. The second approach, which most closely resembles my study, pursues the analysis of the performance of ESG funds relative to some benchmark (usually a conventional fund). This is of special interest because it allows to studying the impact of ESG integration on a specific investment vehicle (e.g. mutual funds). Nonetheless, it embeds also a significant drawback. In fact, the outcomes of this kind of research are often confounded by some specific factors such as fee structure and managerial abilities. Abilities such as stock-picking, market timing, and style-timing are a product of an actively managed fund and hence they imply the implementation of specific strategies. It follows that it is necessary to carry out a comparative analysis of managerial skills in order to obtain valid research. Here come into play the multi-factor models which we are going to implement later. Another problem is linked to market crisis effects. Varma and Nofsinger (2012) proved that SR mutual funds underperform conventional ones in non-crisis periods because SR characteristics lower funds riskiness. Hence, I ran separate regressions to control for crisis periods

and add robustness to the empirical results. One other popular approach is to conduct event studies where stock market reactions are examined in relation to ESG-related actions taken by companies. There is significant evidence that the stock market reaction to ESG initiatives is not positive. However, it seems that this might be biased by specific agency problems. In fact, managers might want to take part in sustainability programs because of personal interest and status, without prioritizing shareholders will. On the other hand, we need to account for the possibility that other events might be happening within the selected event window, and that it could mine the robustness of our results.

We can isolate some general findings among the diversity of ESG-related academic literature. Hong and Kacperczyk (2009) analyze the performance of "sin" stocks, that is, stocks of companies operating in sectors which are usually discarded by ESG investors (e.g. tobacco or weapons). The notorious Merton (1987) theories argued that, when a significant stake of investors ignores a group of stocks, they are likely to trigger a price decline which later translates into higher future returns. This hypothesis has been empirically proven to be true by Hong and Kacperczyk. In fact, they found evidence that sin stocks perform better than their peers by 3-4% per year. Another key result shows that ESG companies showcasing a high ESG rating are prone to high future returns. However, the magnitude of this effect oscillated according to the time period considered. This correlation has been found to be the strongest in the 1991-2004 period and after 2012, while returns are more aligned with conventional stocks in 2005-2012. Moreover, studies such as Kempf and Osthoff (2007) and Statman and Glushkov (2007) found that different ESG factors affected differently the performance of the portfolio. For example, high community and employee relations led to the highest returns, while diversity and environment seemed not to affect outcomes in a considerable way. Another study by Borges et al. (2013) shows that initial outperformance could be due to a market underreaction. They use ESG cut-off points to form long-short value and equal weighted portfolios.

They argue that, since ESG initial contribution is characterized by a significant degree of intangibility, the market fails to recognize such information at an initial stage. Halbitter and Dorfleitner (2015) obtained the same results by following the same analytical procedure. However, they also incorporated another methodology based on Fama-MacBeth cross-sectional regressions which led to evidence of higher future returns for high-rated companies. We can conclude that there is room left for further research in order to assess the impact of different approaches and how results vary accordingly, especially when regressors or factors have been changed. A more recent paper by Larsen (2016), found a positive correlation between ESG returns and ESG scores in 2012-2016. Furthermore, high-scored stocks were characterized by the lower standard deviation of returns, consistently with the theory about ESG investments and their relative "safeness".

There is a variety of studies which analyze the impact of single factors such as social screens and environmental screens, however, we will not dig into the details because in this paper I will analyze the ESG performance comprising all of them. Finally, we can conclude saying that a significant number of studies have been carried out on the relation between ESG investing and financial performances. The methodologies used are diverse, and this works as an obstacle to the formation of a unique view. Furthermore, it seems that several papers lack objectivity. Some works have been given a "biased" tone in favor of ESG investments and their potential benefits. Others are purely constructed to support a message against these new types of products. I have tried to maintain a high level of subjectivity in the analysis and interpretation of my results.

3.2 Data

The source of data for my empirical analysis is Bloomberg and I relied on its database for the identification of my sample population. Bloomberg started providing ESG data ten years ago through its Terminal platform. Its ESG data represent a subset of its Sustainable Finance Solutions service, focusing on the supply of a set of integrated analytics and news for ESG analysis. The Terminal platform can be used to gain access to information on over 350.000 funds worldwide and use the screening tool to integrate ESG and thematic investing criteria into the traditional analysis.

Through its screening device, I applied the following general filters: "open-end fund", "asset class focus: equity", "general attribute: ESG"; and then I applied separately the "Western Europe" and "United States" filters to the following characteristics: country of domicile, country of availability, and manager location. This way, I built two samples consisting of ESG equity-focused mutual funds belonging to Western Europe and US markets. The decision to focus on Western Europe, instead of the whole European region, belongs to the fact that I wanted my overall ESG sample to be as homogeneous as possible. Thus, since West European and US regions are more similar, while East Europe is relatively underdeveloped, the latter has been excluded from the analysis. Moreover, I screened for the presence of ESG mutual funds across the whole European region, and it turned out that all of them belonged to West-European countries, making it even more convenient to limit the European sample to the West region. To add further clarity, here is the list of countries classified as West-European by the Bloomberg screening tool: Andorra, Austria, Belgium, Denmark, Faeroe Island, Finland, France, Germany, Gibraltar, Greece, Guersney, Iceland, Ireland, Isle of Man, Italy, Jersey, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, Sweden, Switzerland, and the United Kingdom.

I considered the main share class of each fund as representative of the fund's performance in order to add simplicity to the analysis. In addition, I applied a

geographical investment focus during the screening phase, further splitting the data in funds engaging in a global investment strategy and domestic-focused funds.

In order to carry on my comparative analysis, I built two more samples consisting of conventional US and European funds with the same characteristics which I listed before. I used a procedure similar to the one of Munoz et al. (2013). I constructed a matched sample considering the following features: investment objective, age, and size. A similar procedure has been employed in other studies like Varma and Nofsinger (2013) and Climent and Soriano, proving to be efficient for mutual funds comparative analysis. For each ESG fund, I individuated conventional funds with the same share class focus, geographical focus, and approximately the same inception date and size. The age matching between the two categories helps to mitigate the survivorship bias that would be accentuated if I had to compare funds whose activity started at very different time periods. Furthermore, I have previously checked for terminated funds during the ESG sample screening process and I found just one instance of ceased/terminated/liquidated activity, concluding that, given the relatively young age of the ESG asset management sector, the ESG sample is not significantly affected by the survivorship bias.

First and foremost, I picked the conventional funds with the same investment objective and geographic focus according to Bloomberg. Then, I discarded the funds whose inception date differed for more than a year from their ESG matching funds. Thirdly, for each ESG fund, I selected the two conventional funds more similar in size (i.e. total assets). In some isolated cases, matching criteria have been relaxed in order to find comparable funds for every single ESG-portfolio's constituent.

At the end of this process, I obtained four matching conventional portfolios.

Table 3.1 summarizes the number of individuals in our sample population.

Table 3.1

ESG FUNDS				CONVENTIONAL FUNDS			
WE		US		WE		US	
Domestic	Global	Domestic	Global	Domestic	Global	Domestic	Global
23	22	18	4	46	38	36	8

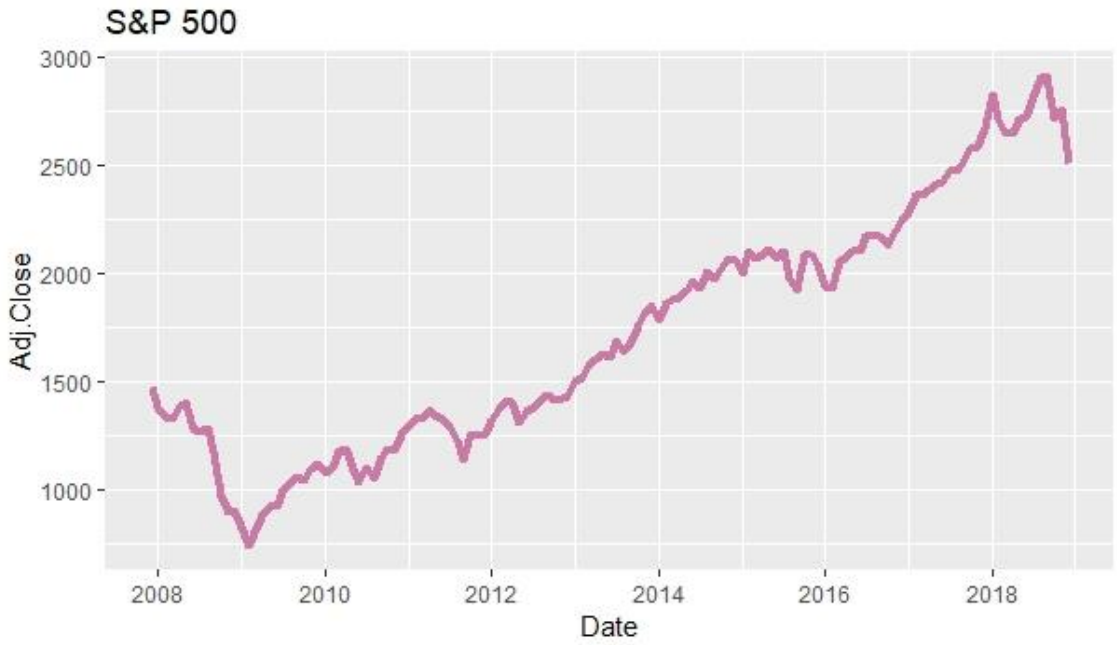
The complete list of ESG samples' constituents can be found in Appendix 1 and Appendix 2.

Funds data have been collected with respect to the Jan 2008-Dec 2018 period, which allows us to conduct a comprehensive analysis giving a clear picture of what kind of results ESG funds have been able to achieve in the last decade.

So far, I have specified some measures employed to control for funds' geographical and market focus, as well as funds' investment objective. I added an additional control procedure in order to prevent my analysis from being biased by exogenous variables. Specifically, I carried out model estimation of crisis and non-crisis alpha parameters in order to control for crisis periods. Those periods are expected to damage the performance of both funds, especially conventional funds. The reason is that ESG funds are supposed to bear less risk due to their attributes, and therefore they should represent better protection to the downside risks belonging to tail events such as recessions. Therefore, I ran separate regressions for my models and checked for differences in results between crisis and non-crisis periods. Varma and Nofsinger (2012) identified March 2000-October 2002 (technology bubble), and October 2007-March 2009 (global financial crisis) as the main crisis periods. Since my analysis goes from January 2008 to December 2018, I focused my attention on January 2008-March 2009 crisis period. Moreover, given that half of my portfolios consist of European funds, I need to take into consideration the sovereign debt crisis which heavily impacted the Eurozone. Munoz et al. (2013) checked the trend of European government bonds from ECB official data, observing how sovereign risk started to

affect them from October 2009. In the same way, I focused on October 2009-January 2013 as the second crisis period for European funds.

The following explanatory graphs illustrate the trend of the S&P 500 and the STOXX Europe 600 indexes in the last 10 years. What I specified above can be seen by paying attention at the plunges of adjusted prices during the period designated as “crisis-market”.



In this paragraph I am going to give a descriptive overview of the portfolios' population. Table 3.2 displays the number of funds which constitute the two portfolios of US funds. Additionally, it summarizes the mean and median age (years of activity after the inception date), the mean, minimum, maximum and standard deviation of portfolio returns, total assets' mean and median (proxy for the size), management fee data, and their Morningstar's ESG historical rating.

By looking at the first rows, we can see that funds which belong to the American domestic portfolios present median age of 20 years. On the other hand, the global US ESG and conventional portfolios present median ages of about 24 years. Hence, we can assess that, overall, domestic portfolios look younger than global portfolios. The median of the total assets represents a proxy for the size of our groups of funds. The data show us that the median size of domestic portfolios is way bigger than the median size of global ones, nearly as much as four times the size of their counterparts. Specifically, the ESG domestic portfolio' size equals $462.79M, while the domestic US ESG portfolio presents a median size of $180.45M total assets.

Domestic funds are characterized by lower mean monthly returns, while the standard deviation varies across samples. Furthermore, the mean management fee is lower for both ESG and conventional domestic portfolios compared to global portfolios. With regards to sustainability, we can notice that domestic portfolios display lower mean and median Morningstar historical sustainability ratings.

Table 3.3 reports the same descriptive statistics for European funds portfolios' components.

Table 3.2: Descriptive statistics of US ESG and conventional portfolios

	DOMESTIC		**GLOBAL**	
	ESG US	**Conv. US**	**ESG US**	**Conv. US**
#	18	36	4	8
Mean age	22	21	24	24
Median age	20	20	24	23
Mean assets ($M)	2178.39	2179.19	168.23	157.15
Median assets ($M)	462.79	400.65	180.45	165.20
Mean fee	0.64	0.73	0.78	0.79
Median fee	0.68	0.75	0.80	0.78
Mean ESG	47.76	44.29	50.50	46.25
Median ESG	48	45	51.50	46.50
Mean return monthly (%)	0.67	0.67	0.37	0.44
Min. m. ret. (%)	-17.86	-20.34	-21.15	-22.31
Max. m. ret. (%)	12.75	13.37	13.28	13.30
SD ret.	4.48	4.93	4.93	4.73

Data reported belong to US portfolios and indicate how many funds each portfolio consists of. Other technical data: mean and median age, mean and median assets, mean and median management fee as well as the average and median size (proxied by total assets). Lastly, it includes performance data like average and median return, minimum, maximum and returns' standard deviation.

Table 3.3: Descriptive statistics of European ESG and conventional portfolios

	DOMESTIC		GLOBAL	
	ESG EU	**Conv. EU**	**ESG EU**	**Conv. EU**
#	23	46	22	38
Mean age	24	24	18	18
Median age	23	23	18	18
Mean assets (€M)	352.42	344	746.20	490.53
Median assets (€M)	169.75	187.26	195.70	174.42
Mean fee	1.27	1.31	1.07	1.30
Median fee	1.40	1.40	1.40	1.50
Mean ESG	55.31	52.11	50.58	48.24
Median ESG	56.15	53.02	49.24	48.57
Mean return monthly (%)	0.64	0.70	0.46	0.44
Min. m. ret. (%)	-21.15	-15.64	-14.66	-13.83
Max. m. ret. (%)	16.53	15.26	12.32	10.58
SD ret.	5.18	4.19	3.89	3.48

This table refers to European portfolios and reports the following technical data: mean and median age, mean and median total assets, average and median management fees, as well as mean and median total returns, their minimum, maximum, and standard deviation.

The median age is higher for both ESG and conventional domestic European portfolios, exactly the opposite with respect to the previous case. The current level of management fees is reported to be about 1.40% annually, with the exception of European global conventional portfolios whose average fee stands at 1.50%. Median total assets of the 4 portfolios are all similar, whereas average total assets present some considerable differences between domestic and global funds. This is due to the fact that total assets distribution is quite skewed, presenting a few outliers indicating a very high total assets level. With regards to sustainability historical ratings, ESG portfolios averages are obviously higher. In particular, the European domestic ESG

portfolio proved to be the most ESG compliant. With respect to returns, domestic portfolios report a higher mean and standard deviation than domestic portfolios.

By having a general look at the results, we can conclude that domestic US portfolios are younger, bigger, and less volatile than domestic European portfolios, instead, global US portfolios are older, more volatile, and of about the same size as European global ones. Moreover, US portfolios have on average lower fees and a lover average historical ESG rating than European funds. I relied on both Morningstar and Bloomberg databases for the funds' descriptive statistics. Morningstar offers a valid open source data center which lists the most important information about portfolio composition, fees, ratings, and management. However, I used Bloomberg's terminal whenever I could not find specific data on Morningstar because of country restrictions or lack of open-source disclosure. With regards to sustainability scores, Morningstar website offers several interesting information regarding the implementation of sustainability frameworks, environmental impact, the presence of a sustainability mandate, and their associated rankings. For the sake of my analysis, I reported each fund's historical sustainability score to give a partial but still representative picture of the average degree of ESG integration in each of the portfolios. In appendix 3 I am going to explain in depth how Morningstar's scoring system works, and which factors are weighted in this evaluation.

The central part of my dissertation is centered around the comparison between ESG and conventional funds. To fulfill this purpose, I applied multifactor models to assess the funds' financial performance and the managerial abilities of their executives. I considered the five-factor model introduced by Fama and French (2015), whose authors argued that it proved to over-perform their previous three-factor model. Data relative to style factors have been retrieved from the open-source library of Kenneth French's website, which represents the best solution providing monthly data for the Fama-French factors on my areas of interest: the US market, European

market, and global market. As I previously mentioned, I ran the 5-factor separately for crisis and non-crisis periods.

Multifactor models have been used extensively in the literature, especially in the measurement of SRI funds performances. For instance, Gregory et al. (2007) employs both the classical Fama and French three-factor model, as well as the Carhart four-factor model in their analysis of UK SRI funds. Climent and Soriano (2011) conduct a comparative analysis between SRI mutual funds and conventional funds, in which they implement models such as the Carhart four-factor model. Munoz, Vargas and Marco (2013) analyze the same kind of mutual funds, however, they run additional models such as the Treynor Mazuy model to evaluate the managers' market timing and investing-style abilities.

3.3 Models

3.3.1 Four-Factor Carhart Model

$$R_{it} - R_{Ft} = a_i + b_i RMRF_t + s_i SMB_t + h_i HML_t + p_i MOM_t + e_{it}$$

$t = 1, 2, \dots, T$

Where the left-hand side of the expression shows the returns on portfolio *i* in excess of the risk-free asset return at time *t*. This model represents an extension to the Fama and French (1993) 3-factor model. It embeds the following factors:

- SMB: it stands for "*Small Minus Big*". It accounts for the size premium, measuring the excess return which investors have historically received for investing in low capitalized stocks, in comparison with other high-cap peers. A positive value indicates that small-cap stocks outperformed large-cap, and vice versa for a negative value. This factor can also be considered as a measure

of size risk. Small companies are expected to be more sensitive to risk factors because of their relatively low diversification and their weakness in case of negative tail events.

- HML: *"High Minus Low*". It measures the value premium granted to investors who bet on companies characterized by high book-to-market value. A positive value means that value stocks overperformed growth stocks in that month. Moreover, this factor implies a higher risk exposure for value stocks, which can be explained by the fact that, if they belong to a high book-to-market sample, their market value has probably plunged and hence they are exposed to credit and/or bankruptcy risk.
- MOM: this is the additional factor which is not present in the Fama and French model. It represents the *monthly momentum*, which is the tendency of assets to follow a specific trend. It can be calculated by subtracting the equal-weighted average of highest performing firms from the lowest performing firms, lagged by one month. Carhart (1997) implemented this model in studying about mutual funds, arguing that the momentum factor improves portfolio performance evaluation. He added that managers' excellent performance could be due to the exploitation of momentum in stock returns, instead of attributing the whole merit to their professional abilities.

The coefficient on *b* represents the excess returns generated by the market premium over the risk-free proxy. A positive significant coefficient means that the portfolio holds more market risk than the average portfolio and vice versa.

If the SMB loading is positive and significant, our portfolio would have a tilt towards smaller stocks, while we would have a negative and significant *s* coefficient if our portfolio was more exposed towards bigger stocks.

Since HML is a value factor, we would estimate positive and significant values if our fund was tilted towards value stocks, and a negative and significant value if it was prone to growth stocks.

3.3.2 Fama and French 5-factor Model

Its authors have come up with an extended version of the previous Fama and French (1997) three-factor model. The purpose of this relatively new version is to better capture size, value, and investment patterns in stock performances. Novy-Marx (2013) and Titman et al. (2004) argued that the 3-factor model lacked explanatory power because it is not able to capture the returns' variation due to profitability and investment. Therefore, they added the following two factors in the regression:

- RMW: "*Robust Minus Weak*". It represents the difference between the returns on diversified portfolios of stocks with robust and weak profitability. Novy-Marx (2013) gave credit to this factor, saying that earning anomalies could be explained by controlling for gross profitability.
- CMA: "*Conservative Minus Aggressive*". This factor measures the difference between the returns on diversified portfolios of the stocks of low and high investment firms. This factor has been proposed by Fama and French (2014), when they specified that the 5-factor model is not accepted in the Gibbons-Ross-Shanken test, although it finds very practical applications in describing average returns.

The following expression represents the model:

$$R_{it} - R_{Ft} = a_i + b_i RMRF_t + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it}$$

$$t = 1, 2, \dots, T$$

Specifically, the left-hand side represents the portfolio's *i* excess return at time *t.* The interpretation of the *b* coefficient and the SMB and HML factors is the same as I have previously explained for the Carhart model.

3.3.3 Treynor and Mazuy model

This multifactor model is a quadratic extension of the CAPM model, having the aim of measuring the manager's performance. It gives a picture of the excess returns which are not explained by the amount of risk undertaken and have been created by actively managing a portfolio of assets. The underlying assumption is that the manager adjusts risk positions according to the expectations of the market portfolio returns. The expression below shows us the model's components:

$$R_{it} - R_{Ft} = \alpha_{iT} + b_{iT}RMRF_t + \gamma_{iT}RMRF_t^2 + e_{i,t}$$

$t = 1, 2, \dots, T$

The left-hand side of the equation represents the Traynor's statistic, while RMRF represents the excess returns of the market portfolio over the risk-free proxy, as in the previous models.

Alpha (α) measures the manager's stock-picking ability in choosing the assets outperforming its alternatives with the same level of non-diversifiable risk. If we obtain a positive and significant alpha coefficient, we have proof of the manager's abilities in selecting the right securities. On the other hand, if we end up having a negative and statistically significant coefficient, we would conclude that the manager showed poor skills.

The *b* parameter is a function of the slope of the portfolio return function. It measures the riskiness with respect to the market, in fact, a beta smaller than one indicates less risk while a beta higher than one represents more risk.

The gamma (γ) parameter represents a proxy for market-timing because the quadratic term represents the curvature of the market timer's characteristic line. If the estimated gamma coefficient is positive and significant, the manager showcased effective market-timing abilities, and the graphical representation looks like a convex upward-sloping regression line. If it is negative and significant, the manager's timing

of the market proved to be poor. In fact, gamma is a measure of portfolio convexity because the model is constructed on the assumption that there exists a convex relationship between fund returns and market returns. This means that the fund's market exposure should be increased when expected market return increases, and it should be reduced in the opposite case.

The model is constrained in the sense that it allows us to assess timing abilities just considering the market as a whole. The missing opportunity is the possibility to predict the movement of the style factors. In fact, if that represented a possible path, it would be possible to strategically augment the exposure to investment styles, which proved to generate good performances and thus improve the overall portfolio profitability.

For this reason, in the following paragraph, I am going to introduce a model which allows us to extend performance measurement in this direction.

3.3.4 Style-timing abilities model

Empirical literature offered samples of different approaches for the analysis of managerial abilities. Some researchers experimented with classical models, obtaining better results by combining different approaches while integrating different factors into the same regression. An important example is given by Lu et al. (2005), which used a combination of the Traynor-Mazuy and Carhart models to evaluate the style-timing abilities of growth-oriented equity mutual funds. They obtained the following expression:

$$R_{it} - R_{Ft} = a_{iT} + b_{iT}RMRF_t + s_{iT}SMB_t + h_{iT}HML_t + p_{iT}MOM_t + \gamma_{iT}RMRF_t^2 + \gamma_{SMB_{iT}}SMB_t^2 + \gamma_{HML_{iT}}HML_t^2 + \gamma_{MOM_{iT}}MOM_t^2 + e_{i,t}$$

$t = 1, 2, \dots, T$

The first part of the expression above reports the same factors and coefficients of the Carhart model for financial performance measurement. The second part of the expression is where we are going to focus because it represents the reason why I decided to integrate this model. In fact, the coefficients γ_{iT}, $\gamma_{SMB_{iT}}$, $\gamma_{HML_{iT}}$, and $\gamma_{MOM_{iT}}$ represent the magnitude of the fund manager's ability to time the following investment styles: market, size, book-to-market, and momentum.

If we obtain a positive and significant value for those coefficients, we will conclude that we observed effective timing skills. Whereas, if we obtain negative and significant coefficient estimates, then we will assert that timing abilities have been poorly employed, or, in other words, the manager timed market and style factors in the wrong direction. If neither of those two is the case, and we obtain estimates which are not statistically significant, we will conclude that there's a lack of timing ability with respect to the market and the considered styles.

3.4 Survivorship Bias

For the sake of being as clear and objective as possible, I decided to open a brief paragraph which addresses the issue of survivorship bias. My analysis is based on historical data, which means that I am trying to give a picture of performance evaluation basing my considerations on past events. Consequently, if past returns have been noticeably high, I would conclude that a portfolio outperformed its peers and vice versa for low returns. However, things get more complicated when we are analyzing funds' performances. As we all know, a fund may not always be successful, as some of them may incur in significant losses in case of isolated market events or wrongful trading strategies. Therefore, some funds are liquidated, others are merged, and their historical returns are consequently removed. For this reason, once we are trying to build a portfolio of historical returns belonging to a specific fund category, we end up having a look just at those funds who 'survived' and not those

who ceased to exist. Here the survivorship bias issue kicks in because by looking just at survived-funds performances we end up having an upward-biased picture of the group or industry performance. The exclusion of poor results ultimately leads to inflated performance measurement and accordingly to over-optimistic conclusions.

The academic literature on mutual fund performance measurement rarely addressed this problem. In most of the cases, the authors do not even mention it, or they simply discuss survivorship bias as a premise for the interpretation of the results, without giving any concrete solution. Just a few papers discussed the issue in depth.

With regards to my research, I found for just one ceased ESG fund for the criteria I used in my screens, therefore, I can conclude that my ESG-sample is rather free of survivorship bias. On the other hand, my conventional funds' sample is surely more affected by the issue. A possible solution could be represented by the construction of unbalanced panels of data, in which historical returns of ceased funds are included in the samples up until their final date, after which, portfolios are re-balanced accordingly. However, this procedure is quite trivial, and, for the purpose and nature of this analysis, I am going to keep things as simple as possible by addressing the survivorship bias just from a descriptive point of view.

To sum up, I want to highlight all the premises I have discussed so far regarding this issue and its implications in performance evaluation. I want to stress the fact that comparative results might be positively biased in favor of conventional funds; however, the bias should not be too accentuated given the fact that my ESG portfolio is minimally affected by such a problem.

Chapter 4

Empirical Analysis

In this chapter, I am going to comment on the results of the regression outputs which result from the application of the previous models. I applied performance and managerial abilities models to each of the four domestic samples and four global samples. Then, as I have already mentioned, I re-ran the regressions separately for crisis and non-crisis periods to check how the results would be affected by a turbulent or stable economic environment.

4.1 Full Sample Results

These results concern the full estimation period of ten years: from January 2008 until December 2018. This sample consists of total returns in both crisis and stable market periods. Table 4.1 reports the regression results of the Carhart four factors model which represent the first attempt of measuring the financial performance of each portfolio along with four factors: RMRF, SMB, HML, and MOM.

The first panel (A) comprises the outputs for the global portfolios. We can see that US ESG global funds have a negative alpha, and the conventional matching US funds have a positive but low alpha. EU global portfolios, instead, both report positive alphas. On the other hand, panel B concerns the results of domestic portfolios. Here, US portfolios display a negative alpha while EU portfolios display positive values. From a geographical point of view, we would conclude that both ESG and conventional European portfolios outperformed their American peers.

Table 4.1

	α alpha	RMRF	SMB	HML	MOM1YR	R^2
Panel A: global equity						
ESG US	-0.095	1.038	0.01	-0.216	-0.026	0.98
	(-1.38)	(66.40)***	(0.21)	(-5.18)***	(-1.21)	
Conventional	0.003	0.981	0.054	-0.131	-0.046	0.97
US	(0.04)	(55.10)***	(0.96)	(-2.78)**	(-1.85)'.'	
ESG EU	0.143	0.697	0.026	-0.146	-0.054	0.73
	(0.79)	(16.83)***	(0.196)	(-1.33)	(-0.935)	
Conventional	0.127	0.644	0.048	0.211	-0.029	0.76
EU	(0.82)	(18.421)***	(0.436)	(-2.27)*	(-0.59)	
Panel B: domestic equity						
ESG US	-0.025	0.971	0.1	-0.074	-0.048	0.99
	(-0.55)	(86.95)***	(5.066)***	(-4.03)***	(-4.64)***	
Conventional	-0.105	1.053	0.236	-0.125	-0.034	0.99
US	(-2.457)*	(97.26)***	(12.39)***	(-7.00)***	(-3.39)***	
ESG EU	0.397	0.826	0.449	-0.364	-0.081	0.76
	(1.74)'.'	(17.47)***	(3.57)***	(-3.14)**	(-1.19)	
Conventional	0.598	0.645	0.121	-0.102	-0.115	0.82
EU	(3.70)***	(19.30)***	(1.36)	(-1.25)	(-2.37)*	

If we compare ESG with conventional performances, the picture we get is controversial. On a global level, ESG funds are underperforming the conventional ones in the American portfolio and overperforming in the European portfolio. On a domestic level, it is the exact opposite: ESG US funds are overperforming while the ESG EU portfolio is underperforming.

However, most of these alphas are not statistically significant. Therefore, I would highlight just three results. The conventional US domestic portfolio reported a significant alpha equal to -0.105, meaning that it underperformed the market by 1.26% per year. The domestic ESG EU portfolio, instead, has a positive and (weakly) significant alpha of 0.397 which corresponds to an overperformance of 4.76% per

year. Finally, the conventional EU domestic portfolio reports a positive significant alpha of 0.598, meaning that it overperformed the market by 7.18% per year. To sum up, among domestic funds, it seems that ESG European funds overperformed conventional US funds, but they have been surpassed by an even better result of conventional European funds.

Having a look at the first factor (RMRF), representing the portfolio risk with respect to the market, we can notice that only two samples show slightly higher riskiness than the market portfolio: global ESG US and domestic conventional US, having a beta of 1.038 and 1.053 respectively. All ESG portfolios report a higher beta compared with their matching conventional peers, with the exception of the domestic ESG EU portfolio. However, overall, we can conclude that ESG funds have a significant and higher RMRF coefficient than conventional funds, therefore, they carry more risk and they are more sensitive to market swings. This result seems quite surprising given the fact that ESG investment strategies are thought to be 'safer' because they tend to exclude certain kinds of companies. However, ESG's RMRF factors are very close to 1, like most of equity funds, so they do not represent a sign of a high risk per se.

The third factor (SMB), the so-called 'size factor', tells us the portfolio propensity towards either company with relatively smaller or bigger capitalization. The first thing to notice from the table is that there is no statistical evidence regarding the SMB factor contributing to the excess returns of global portfolios. Conversely, we find positive and significant evidence of the SMB factor for the domestic conventional US portfolio, and for both the domestic ESG EU and US portfolios. Hence, we can conclude that ESG domestic portfolios and the conventional American portfolio belong primarily to large-cap funds.

The HML factor, the so-called 'value factor', indicates the degree to which our portfolio is tilted towards stocks with high or low book-to-market ratios. From the table we can see that all the estimated coefficients are less than 0.3, therefore all of the portfolios seem to consist primarily of funds which invested more in growth

stocks. Moreover, ESG portfolios seem to be more prone to growth stocks than conventional ones, with the exception of the domestic ESG US (*h*= -0.074) and the domestic conventional US (*h*= -0.125). Again, just some of these estimations turn out to be statistically significant. For this reason, evidence regarding the HML factor can be confirmed just for three domestic portfolios (ESG US, conventional US, and conventional EU) and three global portfolios (ESG US, ESG EU, and conventional US). Therefore, I would argue that sensitivity to growth stocks is higher in ESG portfolios when we are looking at global equities, while it is higher for conventional portfolios when we are looking at domestic equities.

For the fourth and last factor, the situation is the same as for the SMB factor. All the estimated *p* coefficients are negative, meaning that excess returns are negatively affected by the MOM factor. Moreover, ESG portfolios seem to be generally less heavily affected by this factor with respect to conventional portfolios. Nonetheless, estimations for global portfolios are not statistically significant. Contrarily, I found negative significant coefficients for domestic ESG US funds, and for both domestic conventional US and EU funds. Specifically, the domestic conventional EU portfolio seems to be the one whose excess returns are the most negatively impacted by the MOM factor.

Finally, having a look at the R^2, we can see how well these variables explain each portfolio's excess returns. For American portfolios, the R^2 is very high and stays around 98%, while for European portfolios it is around 76%. Consequently, we can conclude that it is harder to model the financial performance of these funds for the European market with respect to the American one.

Table 4.2 shows the results of the implementation of the five-factor Fama and French performance model.

Table 4.2

	α alpha	RMRF	SMB	HML	RMW	CMA	R^2
Panel A: global equity							
ESG US	-0.088	1.039	0.008	-0.204	-0.03	-0.036	0.97
	(-1.19)	(63.11)***	(0.16)	(-4.32)***	(-0.37)	(-0.73)	
Conventional US	-0.114	1.012	0.126	0.008	0.32	-0.004	0.97
	(-1.42)	(56.56)***	(2.19)*	(0.16)	(3.66)***	(-0.08)	
ESG EU	0.124	0.704	0.046	-0.083	0.052	-0.097	0.73
	(0.63)	(16.17)***	(0.32)	(-0.66)	(0.24)	(-0.73)	
Conventional EU	0.086	0.65	0.084	-0.136	0.141	-0.099	0.76
	(0.52)	(17.78)***	(0.71)	(-1.30)	(0.79)	(-0.89)	
Panel B: domestic equity							
ESG US	-0.044	0.987	0.111	-0.019	0.067	-0.06	0.99
	(-0.90)	(79.258)***	(5.141)***	(-0.84)	(2.01)*	(-1.52)	
Conventional US	-0.064	1.042	0.229	-0.051	-0.054	-0.166	0.99
	(-1.53)	(97.42)***	(12.42)***	(-2.63)**	(-1.87) '.'	(-4.9)***	
ESG EU	0.344	0.755	0.395	0.125	0.366	-0.634	0.79
	(1.46)	(14.75)***	(3.07)**	(0.70)	(1.50)	(-3.25)**	
Conventional EU	0.583	0.619	0.082	0.111	0.024	-0.35	0.82
	(3.34)**	(16.35)***	(0.86)	(0.83)	(0.13)	(-2.42)*	

As I did before, I start by having a look at the estimation of the alphas for each sample. Comparing the estimation between ESG and conventional samples, the results seem a bit contradictory. In fact, ESG global portfolios seem to outperform with respect to conventional global ones, while ESG domestic portfolios underperform compared to their counterparts. However, statistical significance only supports the estimated intercept for domestic conventional EU funds (α= 0.583). Therefore, the only results which matter are, that the domestic conventional European portfolio has overperformed its benchmark by roughly 7% per year, over the ten years period considered.

Moving to the RMRF factor, the results resemble closely the ones previously depicted by the Carhart four-factor model. The estimates are slightly changed by the whole picture remains the same: ESG funds have generally higher betas than conventional ones, even though these betas remain very close to 1 and hence they do not indicate a high level of risk. With respect to the previous model, the results change a bit for the SMB size factor. The coefficients for three domestic portfolios remain positive and significant, plus we have some new statistical significance also for the global conventional US portfolio. Overall, domestic ESG portfolios remain significantly tilted towards large-cap stocks. The same becomes true for US conventional funds, both domestic and global. To be more specific, those estimates indicate a propensity for large-cap investments because, even though they are positive, their value is quite low (< 0.5). The situation for the HML factor changes considerably in comparison with the previous results. Estimates for global conventional US and EU portfolios are no longer statistically significant as well as for domestic ESG US and EU portfolios. The only significant results remain the global ESG US coefficient (-0.204) and the domestic conventional US coefficient (-0.051). These outputs confirm the consideration previously made about the value-linked nature of those funds' investments.

Finally, I am going to comment on the results of the fourth and fifth factors. These are the RMW factor, accounting for the return spread of the most profitable firms minus the least profitable, and the CMA factor which measures the return spread of firms which invest conservatively minus those who invest aggressively. We have positive significant RMW coefficients for global conventional US funds (0.32) and domestic ESG US funds (0.067). We also have a negative significant RMW coefficient for the domestic conventional US portfolio (-1.87). Hence, there seems to be no evidence of any involvement of investment strategies linked to the RMW factor in the European market. The three significant estimates tell us that the domestic US conventional portfolio, the global US ESG and the global US conventional portfolios are tilted towards companies which reported poor future earnings. This is not a

surprise because Novy-Marks (2013) found that a high exposure towards profitable companies is likely to enhance the performance of value strategies. However, our funds seem to do exactly the opposite because of a predominance of growth strategies. With regards to the CMA factor, there is no evidence for funds with a global focus, but I found negative and significant coefficients for three out of four domestic portfolios. Conventional EU, conventional US, and especially ESG EU funds seem to show a propensity towards companies investing heavily in growth projects. Table 4.3 shows the results for the first of our model whose aim is the evaluation of managerial abilities.

Table 4.3

	α alpha	**RMRF**	$RMRF^2$	R^2
Panel A: global equity				
ESG US	-0.073	1.031	-0.0003	0.97
	(-0.85)	(61.85)***	(-0.18)	
Conventional US	0.09	0.977	-0.004	0.97
	(0.99)	(55.90)***	(-1.95)	
ESG EU	0.332	0.68	-0.008	0.73
	(1.61)	(17.10)***	(-1.88)	
Conventional EU	0.315	0.619	-0.008	0.75
	(1.79) '.'	(18.20)***	(-2.00)*	
Panel B: domestic equity				
ESG US	-0.041	0.9997	0.0009	0.98
	(-0.68)	(84.58)***	(0.63)	
Conventional US	-0.058	1.092	0.002	0.98
	(0.077)	(72.57)***	(-0.757)	
ESG EU	0.795	0.743	-0.0096	0.73
	(2.91)**	(17.45)***	(-2.33)*	
Conventional EU	0.679	0.65	-0.004	0.81
	(3.66)***	(22.51)***	(-1.38)	

The Traynor-Mazuy model assesses the portion of excess returns which is not explained by the risk position taken by the fund manager. Looking at the alphas, we can see that most of them provide no statistical evidence of good or bad stock-picking skills. Nonetheless, the domestic conventional EU portfolio shows a positive and significant alpha (0.679). Moreover, conventional global conventional EU and global ESG EU portfolios provide weaker but still significant evidence of fine stock-picking capabilities. Overall, we can see that the strongest evidence has to be identified in domestic European funds where the ESG portfolio performs slightly better than the conventional one. The general overlook regarding the betas presents some small and non-relevant numerical variations compared to the previous model. The factor of interest for this model is the $RMRF^2$ factor which represents the curvilinear relationship between the fund returns and the market returns. The main findings concern the global conventional EU portfolio and the domestic ESG EU portfolio. Their estimated gammas are negative and significant, meaning that those two groups of funds have been affected by poor market timing managerial abilities. The last model to comment is the combination of the Treynor-Mazuy and Carhart models (Table 4.4). Its regression turns out to be particularly interesting for the study of managerial abilities linked to the implementation of style factors into the investment process. Having a look at the head of the table, we can notice that our model did not identify any statistical evidence regarding the portfolios' alphas. The RMRF estimated obviously stay significant and similar the previous models' results. Like before, there seems to be no evidence concerning the SMB factor in the global market. However, coefficients for the usual three domestic portfolios are still positive and significant, and all of them indicate the preference for large-cap investments, especially the ESG US sample.

Table 4.4

	PORTFOLIO							
	GLOBAL				DOMESTIC			
	ESG EU	**Conv EU**	**ESG US**	**Conv US**	**ESG EU**	**Conv EU**	**ESG US**	**Conv US**
Alpha	-0.113	-0.094	-0.001	-0.11	0.152	0.343	-0.047	-0.046
	(-0.41)	(-0.40)	(-1.02)	(-1.02)	(0.49)	(1.56)	(-0.75)	(-0.78)
RMRF	0.657	0.615	1.039	1.039	0.813	0.642	0.973	1.048
	(15.25)***	(16.80)***	(60.63)***	(60.63)***	(16.93)***	(19.06)***	(81.56)***	(92.67)***
SMB	-0.104	-0.051	-0.001	-0.001	0.266	0.003	0.09	0.231
	(-0.80)	(-0.46)	(-0.02)	(-0.02)	(2.03)*	(0.04)	(4.45)***	(12.12)***
HML	-0.089	-0.169	-0.207	-0.207	-0.377	-0.142	-0.068	-0.121
	(-0.84)	(-1.87) '.'	(-4.88)***	(-4.88)***	(-3.23)**	(-1.73) '.'	(-3.65)***	(-6.87)***
MOM	0.035	0.041	-0.002	-0.002	0.018	-0.048	-0.028	-0.02
	(0.51)	(0.71)	(-0.06)	(-0.06)	(0.23)	(-0.89)	(-2.13)*	(-1.54)
$RMRF^2$	-1.49	-1.16	-0.06	-0.06	-1.52	-0.934	-0.157	-0.39
	(-3.13)**	(-2.86)**	(-0.32)	(-0.32)	(-3.22)**	(-2.81)**	(-1.15)	(-3.02)**
SMB^2	11.28	7.658	-1.649	-1.65	9.057	4.17	0.046	-0.51
	(1.58)	(1.26)	(-0.58)	(-0.58)	(1.71) '.'	(1.12)	(0.077)	(-0.90)
HML^2	6.91	6.70	0.541	0.54	3.817	4.87	0.27	0.295
	(1.84) '.'	(2.10)*	(0.36)	(0.36)	(1.41)	(2.56)*	(0.86)	(0.99)
MOM^2	1.202	0.916	0.278	0.278	1.178	0.678	0.135	0.139
	(2.73)**	(2.45)*	(1.59)	(1.59)	(2.49)*	(2.04)*	(2.30)*	(2.51)*
R^2	0.76	0.98	0.98	0.78	0.79	0.84	0.99	0.99

With regards to the HML factor, the regression's output is similar to the Carhart model's one, with the exception of the domestic conventional EU portfolio whose *h* estimate is now negative and significant at the 0.1 significance level. In general, we can notice that all the significant estimates are negative, meaning that these funds are tilted towards investing in growth firms with low book-to-market ratios. Examining the domestic sample, it emerges that domestic ESG funds are more tilted towards growth stocks compared to domestic conventional EU funds, and vice versa for domestic US funds. In fact, domestic US conventional funds estimate is higher in absolute value than the domestic US ESG portfolio, meanwhile, this difference seems to disappear in the global US sample.

The only significant coefficient for the MOM factor is the ESG US one, which indicates a negative relationship between those funds' excess returns and the momentum factor as an explanatory variable. The $RMRF^2$ estimates offer a more interesting picture than those of the Treynor-Mazuy model. In the global market, we have that both conventional EU and ESG EU funds showcased poor market timing skills, however, conventional funds' managers seem to own the 'less-worse' timing capabilities between the two. The same situation is reproduced in the domestic market, where both ESG EU and conventional EU portfolios report negative coefficients equal to -1.52 and -0.934 respectively. Statistical evidence drops considerably for the SMB^2 factor. The only useful results are the positive and significant (at the 0.1 significance level) coefficient for the global ESG EU portfolio of about 9.06. Such a high estimate indicates noticeably good managerial skills in timing the SMB size factor. The estimations of HML^2 coefficients are less rich from a significance point of view. Nonetheless, I would highlight three results. For the domestic market, conventional EU funds displayed positive and significant timing skills for the HML factor. Whereas, for the global market, ESG EU funds slightly outperformed their conventional counterparts. Lastly, the study of the MOM^2 factor allows us to assess managerial abilities in timing the momentum factor. As we can see from the table, the first important result is that global ESG EU funds showcased better skills than global conventional EU funds. Moreover, ESG funds (both European and American) had better capabilities than their matched sample for the domestic market as well.

After this in-depth analysis of the various regression outputs I am going to outline the most important results. From the first two regression tables, it emerges that both ESG and conventional European domestic funds reported positive alphas, plus where the conventional portfolio outperformed the ESG one. Keeping the focus on the relationship between these two, we can highlight that the ESG portfolio is slightly oriented towards large-cap and growth stocks, while conventional funds' excess

returns are negatively impacted by the momentum factor. Therefore, in the domestic European market, both ESG and conventional portfolios reported a positive financial performance, partially due to, respectively, a tilt towards large and growth stocks (for ESG funds) and an inverse tilt towards momentum (for conventional funds) which led to the outperformance of the latter portfolio. The results of the managerial abilities models are quite different. For the Traynor-Mazuy regression, we have that alphas for the ESG and conventional European portfolios are still positive and significant, however statistical evidence shows us that ESG funds had better stock-picking managers than conventional funds. Nonetheless, that ESG portfolio seems to be characterized by a poor market timing ability. In the last model, we have no evidence about stock-picking skills. However, we can notice that domestic ESG European funds have been characterized by bad market timing abilities, significantly good SMB timing skills and good momentum timing skills. On the other hand, their conventional counterparts displayed less-negative market timing abilities, good HML timing skills, and less-effective momentum abilities. Therefore, we can conclude that in the European domestic market, ESG funds proved to have better timing skills for the MOM factor and worse for the market factor.

4.2 Crisis Market Results

This part of the empirical analysis focuses on the market crisis periods: January 2008-March 2009 (for all samples), and October 2009-January 2013 (only for the EU portfolios). Like before, I start by looking at the first performance results given by the 4-factor Carhart model, depicted in table 4.5. The RMRF estimates are quite controversial because half of the portfolios have higher market risk with respect to the full sample result, whereas the other half reported lower risk. We can see that global conventional US and domestic ESG EU portfolios are quite oriented towards small-cap stocks, while the domestic conventional US portfolio is slightly tilted

towards investments in large-cap companies. Moreover, returns of domestic conventional US and ESG EU funds negatively affected by the HML factor, meaning that their portfolios are tilted towards growth stocks.

Table 4.5

	α alpha	**RMRF**	**SMB**	**HML**	**MOM1YR**	R^2
Panel A: global equity						
ESG US	0.18	1.067	0.138	-0.28	-0.026	0.98
	(0.57)	(22.39)***	(0.66)	(-1.79)	(-0.36)	
Conventional US	0.123	1.033	0.502	0.115	-0.092	0.99
	(0.45)	(25.09)***	(2.78)*	(0.85)	(-1.46)	
ESG EU	-0.372	0.684	0.129	-0.116	0.066	0.78
	(-1.24)	(12.78)***	(0.6)	(-0.66)	(0.68)	
Conventional EU	-0.109	0.625	0.228	-0.28	0.05	0.77
	(-0.40)	(12.62)***	(1.146)	(-1.72)'.'	(0.56)	
Panel B: domestic equity						
ESG US	-0.372	0.684	0.129	-0.116	0.066	0.78
	(-1.24)	(12.77)***	(0.60)	(-0.66)	(0.68)	
Conventional US	-0.107	1.088	0.437	-0.208	-0.027	0.99
	(-0.54)	(33.07)***	(4.64)***	(-4.72)***	(-0.86)	
ESG EU	0.095	0.962	0.586	-0.68	0.024	0.84
	(0.24)	(14.33)***	(3.16)**	(-3.25)**	(0.21)	
Conventional EU	0.471	0.641	0.189	-0.137	-0.073	0.85
	(1.67)	(13.39)***	(1.43)	(-0.92)	(-0.90)	

The second performance model partially confirms these first results. From table 4.6 one can notice that there is no useful evidence for the global portfolios. Looking at the domestic sample's results, we can see that American portfolios are tilted towards large-cap stocks, while ESG European funds are small-cap oriented.

Table 4.6

	α alpha	RMRF	SMB	HML	RMW	CMA	R^2
Portfolio							
Panel A: global equity							
ESG US	0.141	1.047	0.273	0.037	0.335	-0.177	0.98
	(0.44)	(20.55)***	(1.11)	(0.11)	(0.78)	(-1.14)	
Conventional US	0.292	1.053	0.378	-0.014	-0.371	0.01	0.98
	(0.95)	(21.72)***	(1.62)	(-0.05)	(-0.91)	(0.07)	
ESG EU	-0.529	0.722	0.193	-0.012	0.421	0.138	0.79
	(-1.64)	(11.69)***	(0.88)	(-0.05)	(1.29)	(0.74)	
Conventional EU	-0.191	0.645	0.267	-0.223	0.241	0.076	0.78
	(-0.63)	(11.16)***	(1.30)	(-1.09)	(0.79)	(0.43)	
Panel B: domestic equity							
ESG US	0.083	0.94	0.278	-0.088	-0.054	-0.207	0.99
	(0.34)	(23.31)***	(3.03)*	(-1.83)'.'	(-0.42)	(-1.38)	
Conventional US	-0.184	1.03	0.421	-0.137	-0.06	-0.32	0.99
	(-0.98)	(33.13)***	(5.94)***	(-3.68)**	(-0.59)	(-2.75)*	
ESG EU	-0.046	0.91	0.614	-0.035	0.86	-0.423	0.87
	(-0.12)	(12.71)***	(3.31)**	(-0.13)	(2.43)*	(-1.59)	
Conventional EU	0.459	0.606	0.144	0.104	0.119	-0.33	0.86
	(1.56)	(11.02)***	(1.02)	(0.49)	(0.44)	(-1.60)	

Additionally, American funds are also prone to invest in companies with a low book-to-market ratio. Examining the last two factors of this model, we can notice evidence of domestic ESG EU funds being exposed mainly to companies reporting robust future returns; while domestic conventional US funds are likely to invest in companies whose investment policy is quite aggressive.

The Traynor-Mazuy model (Table 4.7) reports positive and significant stock picking skills for two domestic portfolios: the ESG US and the conventional EU. Moreover, it individuates some statistical evidence of bad market timing skills for global conventional EU funds whose coefficient estimate is -0.01. The domestic sample offer

us a more interesting insight: both ESG and conventional European portfolios display poor market timing skills.

Table 4.7

	α alpha	**RMRF**	$RMRF^2$	R^2
Panel A: global equity				
ESG US	0.282	1.06	-0.001	0.99
	(0.77)	(15.24)***	(-0.26)	
Conventional US	0.3	1.037	-0.004	0.98
	(0.90)	(16.26)***	(-1.01)	
ESG EU	-0.028	0.623	-0.009	0.78
		(11.05)***	(-1.57)	
Conventional EU	0.305	0.549	-0.011	0.77
	(0.95)	(10.31)***	(-2.02)*	
Panel B: domestic equity				
ESG US	0.517	0.976	-0.005	0.98
	(2.05)'.'	(22.13)***	(-1.17)	
Conventional US	0.501	1.078	-0.007	0.98
	(1.58)	(19.52)***	(-1.48)	
ESG EU	0.859	0.742	-0.012	0.77
	(1.61)	(10.61)***	(-1.87)'.'	
Conventional EU	0.795	0.585	-0.008	0.85
	(2.51)*	(14.08)***	(-2.12)*	

These results lose significance after running the combination of the Treynor-Mazuy and Carhart models (Table 4.8). However, I obtained some interesting results for the domestic portfolios. The ESG EU sample seems to have been highly proficient in the timing of the SMB factor during crisis periods. Conversely, both ESG and conventional funds displayed very bad managerial skills with regards to the same factor.

Table 4.8

	PORTFOLIO							
	GLOBAL				DOMESTIC			
	ESG EU	**Conv EU**	**ESG US**	**Conv US**	**ESG EU**	**Conv EU**	**ESG US**	**Conv US**
Alpha	-0.268	0.016	0.425	-0.002	-0.326	0.545	0.514	0.399
	(-0.51)	(0.03)	(0.59)	(-0.38)	(-0.55)	(1.25)	(1.75)	(1.51)
RMRF	0.628	0.571	1.307	1.082	0.935	0.603	0.934	1.069
	(0.72)***	(9.67)***	(6.91)***	(6.54)***	(12.39)***	(10.96)***	(20.71)***	(26.42)***
SMB	-0.046	0.053	0.116	0.483	0.428	0.083	0.355	0.507
	(-0.18)	(0.23)	(0.42)	(2.01)'.'	(2.12)*	(0.57)	(3.77)**	(5.99)***
HML	-0.103	-0.251	-0.01	0.325	-0.617	-0.091	-0.187	-0.232
	(--0.57)	(-1.51)	(-0.03)	(1.09)	(-2.87)**	(-0.59)	(-3.53)**	(-4.88)**
MOM	0.072	0.067	0.141	-0.035	0.055	-0.045	-0.071	-0.036
	(0.72)	(0.73)	(0.89)	(-1.26)	(0.47)	(-0.53)	(-1.81)	(-1.01)
$RMRF^2$	-1.102	-1.078	1.323	0.08	-1.110	-0.803	-0.084	-0.005
	(-1.57)	(-1.67)	(1.19)	(0.08)	(-1.63)	(-1.62)	(-0.26)	(-0.02)
SMB^2	11.460	0.519	-25.798	9.553	14.581	4.715	-6.358	-7.525
	(0.91)	(0.83)	(-1.10)	(0.47)	(2.02)*	(0.89)	(0.99)'.'	(-3.10)*
HML^2	0.026	3.394	12.973	8.976	2.529	1.965	-0.448	-0.14
	(0.003)	(0.44)	(0.95)	(0.75)	(0.44)	(0.47)	(-0.59)	(-0.20)
MOM^2	0.283	-0.622	-0.538	-0.198	1.121	-0.162	-0.218	-0.441
	(0.15)	(-0.37)	(-0.38)	(-0.16)	(0.76)	(-0.15)	(-0.63)	(-1.41)
R^2	0.79	0.79	0.98	0.99	0.86	0.86	0.99	0.99

In conclusion, the main results about the performances during the crisis periods are to be identified with the domestic American portfolios. As it often happens when analyzing periods interested by an economic crisis, we did not obtain significant estimates of the alphas, probably due to considerably high volatility. However, we should notice that conventional American funds showed a greater tendency towards investing in large-cap companies, growth stocks, and companies with an aggressive investment style. This is in line with what we could expect from conventional funds since they are regarded as riskier than their ESG counterparts.

The main results of managerial skills differ from one model to the other. For the Traynor-Mazuy model, I obtained that both domestic ESG and conventional European

portfolios showed poor market timing skills. The two estimations do not differ a lot, however, ESG funds seem to have experienced the worst managerial performance with regards to market timing. In the last model the focus shifts on the domestic American sample. Both ESG and conventional funds have been characterized by very bad SMB timing capabilities, with conventional funds having the lowest coefficient estimate.

4.4 Stable Market Results

The third and most revealing part of this analysis is dedicated to the results belonging to the non-crisis market periods: January 2008-March 2009 (for all portfolios), and October 2009-January 2013 (only for European portfolios). Running the Carhart model (Table 4.9), I individuated four significant alphas. For the global market, ESG EU funds report a positive coefficient of about 0.46, meaning that they outperformed the market benchmark of 5.52% per year during the stable period. With regards to the domestic market, conventional US funds are the only ones displaying a negative alpha, meaning that they underperformed with respect to the market and all the other portfolios. Both ESG and conventional domestic EU funds reported positive and significant alphas as a sign of their good financial performance. The betas of the model slightly decrease with respect to the full sample's estimates but ESG portfolios keep bearing a higher market risk than conventional ones with the only exception for domestic ESG European funds. The SMB factor turned out significant for the global ESG US and the domestic conventional US portfolios, indicating their propensity for large-cap stocks. The HML coefficients estimates are statistically significant for both the global and domestic American portfolios. All of them reported negative estimates, meaning that they are all tilted towards growth stocks. The last column of estimates shows statistical significance for global US portfolios and for all the

domestic portfolios. Specifically, all the estimates are negative or close to zero which stand for a low or negative exposure to the momentum factor.

Table 4.9

	α alpha	**RMRF**	**SMB**	**HML**	**MOM1YR**	R^2
Panel A: global equity						
ESG US	-0.101	0.996	-0.013	-0.208	0.057	0.97
	(-1.28)	(41.06)***	(-0.24)	(-4.31)***	(-2.22)*	
Conventional	0.023	0.94	-0.008	-0.163	-0.08	0.94
US	(0.22)	(29.72)***	(-0.12)	(-2.59)*	(-2.37)*	
ESG EU	0.459	0.694	-0.093	-0.21	-0.126	0.66
	(1.96)'.'	(9.64)***	(-0.56)	(-1.47)	(-1.65)	
Conventional	0.208	0.69	-0.117	-0.173	-0.055	0.74
EU	(1.15)	(12.40)***	(-0.92)	(-1.57)	(-0.93)	
Panel B: domestic equity						
ESG US	-0.036	0.937	0.062	-0.079	-0.072	0.98
	(-0.70)	(57.83)***	(3.05)**	(-3.43)**	(-6.10)***	
Conventional	-0.098	1.018	0.21	-0.127	-0.044	0.98
US	(-1.79)'.'	(59.19)***	(9.70)***	(-5.18)***	(-3.53)***	
ESG EU	0.775	0.625	0.137	-0.199	-0.212	0.67
	(2.94)**	(9.04)***	(0.85)	(-1.62)	(-1.62)**	
Conventional	0.651	0.669	0.011	-0.076	-0.135	0.78
EU	(3.13)**	(12.30)***	(0.08)	(-0.79)	(-2.19)*	

The five-factor model (Table 4.10) individuates the same significant alphas as for the previous one, with the addition of global ESG US funds, whose alpha of about -0.14 represents the only 'bad' performances together with domestic conventional US funds. Estimates of SMB coefficients are quite different with respect to the first ones. In fact, ESG US coefficient is no longer significant, while global conventional US and domestic ESG US coefficients are both positive and significant. The HML factor maintains its significance only with respect to the global ESG US portfolio.

Table 4.10

	α alpha	RMRF	SMB	HML	RMW	CMA	R^2
Panel A: global equity							
ESG US	-0.144	1.017	0.017	-0.136	0.068	-0.07	0.97
	(-1.70)'.'	(44.43)***	(0.27)	(-2.65)**	(0.69)	(-0.99)	
Conventional	-0.146	0.985	0.144	0.071	0.532	0.005	0.95
US	(-1.48)	(37.24)***	(2.00)*	(1.19)	(4.66)***	(0.06)	
ESG EU	0.471	0.721	-0.14	-0.192	-0.296	-0.319	0.66
	(1.92)'.'	(10.96)***	(-0.78)	(-1.30)	(-1.04)	(-1.57)	
Conventional	0.18	0.694	-0.116	-0.148	-0.039	-0.293	0.75
EU	(0.96)	(13.81)***	(-0.85)	(-1.31)	(-0.18)	(-1.89)'.'	
Panel B: domestic equity							
ESG US	-0.054	0.967	0.096	0.009	0.113	-0.044	0.97
	(-0.89)	(52.60)***	(3.68)***	(0.29)	(2.63)*	(-0.83)	
Conventional	-0.11	1.027	0.205	-0.008	-0.028	-0.175	0.98
US	(-2.04)*	(63.02)***	(8.84)***	(-0.27)	(-0.74)	(-3.71)***	
ESG EU	0.733	0.595	0.094	0.174	-0.034	-0.763	0.68
	(2.62)*	(8.03)***	(0.56)	(0.75)	(-0.11)	(-2.78)**	
Conventional	0.645	0.673	-0.009	0.041	-0.145	-0.341	0.77
EU	(2.88)**	(11.34)***	(-0.07)	(0.22)	(-0.57)	(-1.55)	

Continuing with the last two rows, we can see that the global conventional US is tilted towards 'robust' companies while the domestic ESG US portfolio is more exposed to companies with low future earnings estimates. Additionally, we can infer that domestic conventional US and ESG EU funds have a relevant exposure to aggressive-investing companies.

After all these considerations, I would like to point out the managerial abilities results coming from the estimation of the last two models. From the Treynor-Mazuy regression (Table 4.11), I found evidence of good stock picking skills for the global ESG EU portfolio, and for domestic European portfolios. Conversely, managerial stock-picking did not work well for domestic American portfolios.

Table 4.11

	α alpha	**RMRF**	$RMRF^2$	R^2
Panel A: global equity				
ESG US	-0.136	1.001	0.003	0.96
	(-1.42)	(39.30)***	(0.78)	
Conventional US	-0.115	0.94	0.011	0.94
	(-1.02)	(31.15)***	(2.47)*	
ESG EU	0.562	0.771	-0.013	0.649
	(2.19)*	(11.25)***	(-1.28)	
Conventional EU	0.323	0.729	-0.012	0.74
	(1.64)	(13.84)***	(-1.48)	
Panel B: domestic equity				
ESG US	-0.170	0.98	0.009	0.97
	(-2.38)*	(55.89)***	(2.95)**	
Conventional US	-0.199	1.082	0.004	0.96
	(-2.01)*	(44.48)***	(0.91)	
ESG EU	0.575	0.70	0.008	0.632
	(1.91)'.'	(8.84)***	(0.89)	
Conventional EU	0.626	0.729	-0.003	0.76
	(2.70)**	(13.09)***	(-0.43)	

We can also see that global conventional US and domestic ESG US funds have been characterized by a slightly positive market timing implementation. Whereas from the last model (Table 4.12) I obtained different results for the $RMRF^2$ factor. There is evidence of bad market timing skills for global European portfolios and for the domestic conventional European portfolio. Furthermore, we have zero and low statistical evidence for the SMB^2 and HML^2 factors. The most important result regards the MOM^2 coefficients estimates. All the reported values are positive and significant, meaning that all the portfolios displayed effective momentum timing skills, especially those consisting of European funds.

Table 4.12

	PORTFOLIO							
	GLOBAL				DOMESTIC			
	ESG EU	**Conv EU**	**ESG US**	**Conv US**	**ESG EU**	**Conv EU**	**ESG US**	**Conv US**
Alpha	0.321	0.11	-0.079	-0.002	0.766	0.475	-0.019	-0.08
	(0.91)	(0.40)	(-0.63)	(-0.96)	(2.01)*	(1.75)'.'	(-0.27)	(-1.10)
RMRF	0.72	0.706	0.989	0.931	0.656	0.749	0.937	1.013
	(10.58)***	(13.28)***	(40.62)***	(30.11)***	(8.88)***	(14.20)***	(59.23)***	(64.56)***
SMB	-0.139	-0.161	-0.032	-0.018	0.136	-0.097	0.061	0.206
	(-0.88)	(-1.30)	(-0.56)	(-0.25)	(0.80)	(-0.79)	(3.02)**	(10.27)***
HML	-0.122	-0.086	-0.181	-0.111	-0.21	-0.165	-0.041	-0.098
	(-0.83)	(-0.75)	(-3.43)**	(-1.65)	(-1.60)	(-1.77)'.'	(-1.50)	(-3.54)***
MOM	-0.07	0.021	-0.004	0.033	-0.058	-0.031	-0.032	0.009
	(-0.64)	(0.25)	(-0.11)	(0.67)	(-0.52)	(-0.39)	(-1.86)'.'	(0.53)
$RMRF^2$	-3.60	-2.523	0.218	0.837	-0.985	-2.458	0.197	0.140
	(-2.85)**	(-2.56)*	(0.48)	(1.46)	(-0.85)	(-2.96)**	(0.69)	(0.49)
SMB^2	10.487	6.405	-4.723	-1.417	-8.199	4.907	-0.674	-1.79
	(1.11)	(0.87)	(-1.40)	(-0.33)	(-0.96)	(0.81)	(-0.96)	(-2.57)*
HML^2	7.256	4.769	0.041	0.978	3.124	5.599	-0.449	0.593
	(1.71)'.'	(1.44)	(0.03)	(0.51)	(1.13)	(2.78)**	(-0.84)	(1.12)
MOM^2	1.09	1.01	0.332	0.53	1.024	0.991	0.174	0.264
	(2.00)*	(2.38)*	(1.70)'.'	(2.14)*	(1.86)'.'	(2.52)*	(2.68)**	(4.11)***
R^2	0.72	0.78	0.97	0.97	0.70	0.84	0.98	0.98

The outcomes of the non-crisis market period are richer than the previous two in terms of the number of statistically significant estimates. The Carhart model reports a positive and significant outperformance of ESG funds for the domestic European market. Considering the same two portfolios, we can add that ESG portfolios have a larger short position on the momentum factor with respect to their conventional counterparts. Therefore, portfolio allocation, with respect to the momentum factor, did not change in comparison to the full sample estimates. However, the performance relationship changed. Looking at both Carhart and Fama and French models, we can compare portfolio exposures of American domestic portfolios. In their case, ESG funds seem to be more tilted towards large-cap stocks, growth stocks,

and less adverse to the momentum factor than their peers. Looking at managerial skills under stable market conditions, we lose a lot of statistical significance relative to alpha estimates between the two models. The Treynor-Mazuy model tells us that, for domestic markets, European ESG managers had better stock picking skills, whereas the opposite is true for American managers. On the other hand, the second managerial abilities model offers us some interesting insights with regards to factors timing. There is some evidence that global European ESG and conventional fund managers displayed poor market timing capabilities, with ESG funds showing the most negative result. Finally, we have considerable evidence regarding the timing of the momentum factor. The regression table reports that, in Europe, ESG funds did a better job timing the momentum factor, while we can observe the opposite situation in US.

Chapter 5

Conclusions

Sustainable investing has been constantly expanding until it became a priority issue in the financial world. The 2018 Global Sustainability Investment Review reports: “It represents more than 50 percent of total professionally managed assets in Canada, Australia and New Zeland, nearly half in Europe, 26 percent in the United States and 18 percent in Japan. This growth has been fueled by increasing awareness of the importance of sustainability across different fields. Regional surveys on asset managers revealed that their will to engage in sustainable investing practices is moved by the objectives of risk minimization and performance improvement. These purposes led to the adoption of strategies such as ESG integration which have been widely adopted by money managers, changing the traditional way of selecting investments and allocating funds. If we dig into the motivations behind the widespread adoption of such strategies, we find the mission of making a positive impact on our society. In other words, investors see the chance of integrating personal ethical choices into their investing activity. These ethical choices can be identified with the pursuit of environmental, social and governance (ESG) principles. In turn, these principles are interconnected with a series of general goals whose advancement is thought to be good for the whole society, such as climate change, pollution, and social inclusion. Given the fact that sustainable investing is an up-to-date hot topic, and it is becoming more and more accessible, they have created a series of different options in terms of investment products which are suited for each type of investor’s need, both retail and institutional.

With all these premises, it is clear why it is so important to monitor the performance of funds which have been implementing these kinds of strategies and funds that stick with traditional asset management frameworks. Financial literature results are in conflict with each other. Some studies focus on environmental investments, others focus on ethical funds, while most of the researches analyze the performance of SRI (socially responsible investments). With the affirmation of ESG integrating strategies, there is the need to explore the performance of funds which have been classified as "ESG" by financial information providers such as Bloomberg and Morningstar. This niche of research has been clearly neglected as we can find just a few empirical works aimed at assessing the financial implications of this category of asset managers.

This dissertation aims at filling the gap concerning the effect of ESG integration in the mutual funds industry, with a focus on financial performance and managerial skills.

I considered four big samples consisting of equity-focused mutual funds belonging to both European (West Europe) and American (USA) markets. Then I divided them into funds with a domestic equity focus and global equity focus. After the empirical assessment of the whole sample, I ran the same models separately for crisis and non-crisis market periods to control for market effects.

The full-sample results report that ESG mutual funds do not perform significantly worse than conventional mutual funds. The only exception is represented by European funds with a domestic equity focus. In that case, both ESG and conventional portfolios managed to outperform the market benchmark by 4.76% and 7.18% per year, for the last ten years. Specifically, conventional funds' performance was superior compared to their ESG peers by 2.42% per year, even though they revealed to bear more volatility by showing a higher beta estimate. Moreover, looking at the Fama and French model, we could think the difference in performances could be linked to the fact that conventional excess returns are less negatively affected by the momentum factor. These results lose statistical significance after controlling for crisis-market periods. In fact, I did not find evidence of significant performances in

any of the samples. With regards to stable market periods, instead, I observed a different output concerning the same two domestic European portfolios. There is evidence of financial ESG outperformance of about 1.49% per year. This result is particularly interesting because, usually, ESG funds are expected to perform better than their peers in periods of high volatility and adverse market conditions, given the fact that their investments are thought to be less risky. The difference in riskiness is backed by the fact that, for the non-crisis periods, the ESG portfolio displayed a lower beta than the conventional one. Moreover, since ESG funds keep displaying higher adversity to the momentum factor, we can exclude the relation between financial outperformance and momentum.

Concerning managerial abilities, we can generally say that domestic ESG European funds have been characterized by better stock-picking skills than their conventional peers. Both ESG and conventional funds have not been able to effectively implement market timing strategies, however, conventional European funds reported a less negative implementation. In the global European market, both conventional and ESG funds showed good timing of the value factor, with ESG funds making the best use of it. Furthermore, both ESG and conventional funds reported a positive realization of momentum timing where ESG managers owned better skills in most of the cases. When I control for market crisis, I obtain the same results for market timing, however, I lose significance for stock-picking estimates. The last model, instead, reports significantly bad size timing skills for both ESG and conventional American funds. Again, I obtained different results for the stable market period. Outputs concerning stock-picking skills are quite contradictory because the Traynor Mazuy model's estimates considerably differ from the combination with the Carhart model. In the former, domestic conventional European funds showed better stock picking skills, while in the latter the opposite is true. I decided to weight my consideration on the second model because it offers us more statistically significant estimates about managerial abilities. Hence, apart from a general outperformance in stocks selection,

we have that ESG European funds showed better momentum timing skills for both global and domestic equities. Conversely, conventional funds reported better momentum timing skills for both domestic and global American equities. Finally, we found evidence that neither ESG nor conventional global European funds managed to efficiently implement market-timing abilities during stable market periods. Putting together these considerations, I would highlight that domestic European ESG funds had a worse and more volatile performance than their peers for the last ten years, even though they reported better stock picking and momentum timing managerial skills. Conversely, they performed better than conventional domestic European conventional funds in stable market periods, showing less-volatile returns, better stock-picking, and momentum timing managerial abilities.

My work concentrates on the analysis of financial performance, managerial abilities and their interconnectedness. However, the lack of a historical available database for ESG ratings prevented the integration of an ESG factor in multi-factor models regressions. For this reason, I would encourage future research in this direction to better assess the implications of the ESG element in the mutual fund industry. I believe that the results of an analysis of that kind could be particularly useful for the growing stake of investors demanding sustainable solutions for their financial needs.

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APPENDIX 1

Components of the sample of US ESG mutual funds with a domestic focus:

Appleseed Fund (APPLX), UBS US Sustainable Equity Fund (BPEQX), Calvert Mid-Cap Fund (CCAFX), Calvert Small Cap Fund (CCVAX), Calvert US Large Cap Core Responsible Index Fund (CISIX), Calvert Equity Fund (CSIEX), Green Century Equity Fund (GCEQX), JPMorgan Intrepid Sustainable Equity Fund (JIISX), Neuremberg Berman Sustainable Equity Fund (NBSRX), Parnassus Mid Cap Fund (PARMX), Parnassus Fund (PARNX), Parnassus Endeavor Fund (PARWX), Putnam Sustainable Future Fund (PMVAX), Putnam Sustainable Leaders Fund (PNOPX), Parnassus Core Equity Fund (PRBLX), Alger Responsible Investing Fund (SPEGX), Gabelli ESG Fund (SRIAX), and Walden Equity Fund (WSEFX).

Components of the sample of US ESG Funds with a global focus:

Azzad Ethical Fund (ADJEX), UBS International Sustainable Equity Fund (BNUEX), Calvert International Equity Fund (CWVGX) ,and Pax ESG Beta Quality Fund (PXWGX).

APPENDIX 2

Components of the sample of European ESG mutual funds with a domestic focus:
DnB Norge Selektiv II VPFO (AFGNNOA), DNB Norge Selektiv III (AFNOAK2), DNB Norden IV (AFNORDE), Alfred Berg Humanfond (ALFBHUM), Liontrust UK Ethical Fund (ASUKE2A), Swedbank Robur Ethica Sverige (BANSVER), Ohman Smabolagsfond A (CARSMAB), Ohman Sweden Micro Cap (CARSWMC), Delphi Norge (DFNORGE), DNB Norge Selektiv (DI20FND), DNB Norge III VPFO (DINORGE), DNB SMB VPFO (DISMB), Danske Invest – Norge II (FFNORG2), Danske Invest – Norge I (FFNORGE), KLP AksjeNorge (KLPAKNO), KLP AksjeNorge Indeks (KLPANOI), SEB Sverige Stiftelsefond (SEBSVST), Storebrand Aksje Innland VPFO (SPAKSIN), Sparinvest Danske Aktier (SPIKFX), Storebrand Norge (SPNORGE), SPP Aktiefond Sverige (SPPAKTS), Storebrand Vekst (SPSMBFD), Storebrand Verdi VPFO (SPVERDI), and Nordea Swedish Stars (TRETII).

Components of the sample of European ESG Funds with a global focus:
DNB Finans (AFFINAS), Verdipapirfondet Delphi Global (DFVERDN), DNB Health Care (DIGLHEA), DNB Miljioeinvest VPFO (DIMILJO), DNB Teknologi VPFO (DINORTE), DWS Global Water (DWSKLIM), Etica Azionario (ETVARAZ), DNB Navigator VPFO (GFNAVIG), KCD-Union-AKTIEN Nachhaltig DJSG-Index (KCDAKTI), KLP AksjeGLobal Indeks II (KLPAGII), KLP AksjeGLobal Indeks III Verdipapirfondet (KLPAIII), KLP AksjeGLobal Indeks I (KLPAKII), MEAG Nachhaltigkeit (MEAGNAE), Amundi OEKO Sozial Stock (PSKOSSA), Raiffsein – Raiffsein-Nachhaltigkeitsfonds-Aktien (RAIETAA), SEB Hallbarhetsfond Global (SEBETGL), SEB Utland Stiftelsefond (SEBUTST), Storebrand Global Value (SPGLOBA), Sparinvest INDEX Dow Jones Sustainability World, Sparinvest INDEX Globale Aktier Min. Risiko (SPIWIXH), SPP Aktiefond Global (SPPAKGS), Swisscanto CH Equity Fund Green Invest (SWCGREE).

APPENDIX 3

Morningstar Sustainability Ranking

Morningstar's Sustainability Rating system is a very useful tool which addresses investors' needs in implementing ESG criteria into their research, portfolio management, and comparative analysis. It measures the performance of a portfolio's components with respect to environmental, social, and governance criteria. The rating is not a stand-alone measure, it is rather part of a scoring system which ranks each portfolio in comparison with its peers. It is constructed through a specific set of calculations which consider historical holdings and firm-specific ESG information from Sustainalytics. In fact, Morningstar combines its portfolio holding database with Sustainalytics ESG data to evaluate stocks, indexes, and funds.

The process can be summarized in three steps:

- Morningstar Portfolio Sustainability Score assessment for each portfolio within the trailing twelve months.
- Use the previously estimated scores to calculate Morningstar's Historical Portfolio Sustainability Score
- Thirdly, they assign a Morningstar Sustainability Rating relative to its Morningstar Global Category.

The portfolio sustainability score is computed as the difference between the asset-weighted average of normalized company-specific ESG scores, and the deductions due to portfolio controversy issues (i.e. environmental disasters, wrongful corporate policies, corruption, etc.). The analytical formula is:

$$Portfolio\ Sustainabilty\ Score = Portfolio\ \ ESG\ Score - Portfolio\ \ Controversy\ Deduction$$

In order to receive such a score, the portfolio needs to have both a Portfolio Sustainability Score and a Portfolio Controversy Score.

The second step involves calculating the Historical Portfolio Sustainability Score. It can be done by computing the weighted average of the trailing twelve months of Morningstar Portfolio Sustainability Scores. One important feature is that a heavier weight is assigned to more recent portfolios in the estimation of historical portfolio scores. The expression is:

$$Historical\ Portfolio\ Sustainability\ Score = \frac{\sum_{i=0}^{11}(12-i) \times Portfolio\ Sustainability_i}{\sum_{i=0}^{11} i+1}$$

$$i = number\ of\ months\ from\ present$$

This measure represents an improvement with respect to the scores we obtained in the previous step. Considering the trailing twelve months scores and time-weighted portfolios adds consistency and validity.

The third step is dedicated to the computation of the Sustainability Rating. After considering the funds' historical scores, Morningstar assigns them to absolute category ranks and percent ranks within the Global Categories framework. To be more specific, the Sustainability Rating represents the fund's normally distributed ordinal score and descriptive rank corresponding to its category. The following image can illustrate better how it is visualized and expressed:

Distribution	Score	Descriptive Rank	Rating Icon
Highest 10%	5	High	
Next 22.5%	4	Above Average	
Next 35%	3	Average	
Next 22.5%	2	Below Average	
Lowest 10%	1	Low	

Source: Morningstar, Inc.

This score is recalculated whenever Morningstar updates a fund's portfolio. Therefore, Sustainability Ratings and ranks are issued on a monthly basis and calculations include the most recent data provided by Sustainalytics. One month and six business days after the last disclosure, portfolios receive their ratings and each fund is ranked in comparison with its peers. Whenever a portfolio update is not received, the rating will be based on the most recent available portfolio which must be less than 276 days old.