

Louvain School of Management

Can ESG factors be considered as a systematic risk factor for equity mutual funds in the Eurozone?

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Abstract

During the last decade, there has been a growing interest in socially responsible investment practices, particularly with Environmental, Social and Governance (ESG) factors. This trend is due to a shift both in investment practices and in the motivation of investors. The latter want to have a larger scope of analysis by using non-financial information to complement traditional financial data. The link between ESG factors and financial performance is well documented in the literature. However, a clear conclusion is yet to be found. The objective of the present thesis was to investigate whether ESG factors can be considered as a systematic risk factor. To do so, a proxy of an ESG-related factor was combined with the five factors of the Fama and French (2015) model. These factors are: broad-market-related factor, capitalization-related factor, valuation-related factor, profitability-related factor and an investment-related factor. A time-series regression was performed on the returns of an equally weighted portfolio, formed by 556 equity mutual funds originating from the Eurozone, for the period from May 2010 to November 2019. Empirical findings include the fact that the risk exposure to the ESG-related factor is significantly different from zero and that equity mutual funds, originating from the Eurozone, tend to hedge this risk. It was also found that, when splitting the sample period in two, the ESG-related risk factor was only significant during the second half of the period which implies that hedging the ESG-related systematic risk has become prevalent over time. Finally, it was discovered that, funds of small size and funds that focus on picking small cap and value stocks are the ones that hedge the most for the ESG-related systematic risk factor.

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Chapter 1: Introduction

1.1 Context of the Research

In recent years, there has been a growing interest in socially responsible investments (SRI) and Environmental, Social and Governance (ESG) factors. This interest is present both in the literature of financial economics and amongst asset managers. Many studies have investigated the financial benefits of integrating ESG factors into investment decisions. Indeed, SRI is defined as practices aiming at the systematic integration of ESG factors into an investment decision (Eccles & Viviers, 2011). This type of investment strategy aims at having a larger scope of analysis by using non-financial information to complement traditional financial data (Plantinga, Scholtens, & Van Duuren, 2015). ESG factors are often used as indicators to evaluate companies on management performance, risk management and non-financial performance (Galbreath, 2013).

The results of studies on that topic are still inconsistent and controversial. Friede, Busch, and Bassen (2015) reviewed over 2,000 studies, completed by scholars and investors, on the relationship between ESG and organisations' financial performance since 1970 and conclude that there is a positive correlation between ESG strategies and strong financial performance. However, the interrogations around the nature and the consistency of these results remain important. Indeed, depending on the methodology used to test this relationship (vote-count, portfolio or event-case studies,...), results differ. Investors are also sceptical about SRI because they consider that screening for securities, that respect a certain number of ESG criteria, is taking a risk of giving up financial reward as it imposes limits on diversification (Jin, 2017). Despite this skepticism, ESG investing grew to more than 30 trillion dollars in 2018, and some estimate it could reach 50 trillion dollars over the next two decades GSIA (2018). These strategies are not new but momentum is growing as shareholders are requiring action and the consequences grow for companies that fail to adapt.

1.2 Research Question and motivation

Investors have diverse motivations to integrate ESG in their investment analysis. Some may have directives to meet regarding ESG goals, others for political reasons and reputation, whereas the rest believe that SRI will bring them higher returns (Maiti, 2020). Due to these facts, there is an increasing demand for a model that can integrate ESG factors with the financial valuation of firms and portfolio models. In this thesis, we chose to investigate the integration of ESG factors into financial valuation through factor-based investing. The latter is a strategy that chooses securities on attributes that are associated with higher return (Chen, 2020). Nowadays, size and value factors discovered by Fama and French (1993) along with the beta factor are the most employed ones. This method uses risk factors like a beta to capture the mispricing of assets. Indeed, ESG factors could be a source of variation in equity returns and could bring additional information that other traditional risk factors (size, valuation, ...) do not have.

Two recent studies investigate whether ESG factors can be considered as a systematic risk factors. Jin (2017) found that an ESG-related systematic risk is well priced by the market and that US open-ended equity funds tend to hedge the ESG risk. This means that those funds included stocks of companies that have high ESG scores to be protected against the ESG-related systematic risk. On the other hand, Maiti (2020) concluded that a market model with market, size and ESG factors performs better at explaining the returns of a portfolio than the Fama and French (1993) three-factor model. The author concludes that an investor must take into account ESG factors while considering investment decisions as there is evidence that these factors are a source of systematic risk in the current financial market.

From the above discussion, it is clear that the studies on the subject are still in the nascent stages and need further investigation. In this context, the goal of this master thesis is to find out whether ESG factors can be considered as a systematic risk factor (a beta) and more precisely:

Can ESG factors be considered as a systematic risk factor for equity mutual funds in the Eurozone?

Please note that, to investigate this matter, we chose to construct an equally weighted portfolio of equity mutual funds rather than stocks. Mutual funds are defined as *"companies that bring together money from many people and invests it in stocks, bonds or other assets. The combined holdings of stocks, bonds or other assets the fund owns are known as its portfolio. Each investor in the fund owns shares, which represent a part of these holdings"* (Securities and Exchange Commission, 2005). Thus, mutual funds are a mean for individual investors to allocate assets across market sectors while still benefiting from centralized record keeping. As the Modern portfolio theory (MPT) states, well diversified portfolios are compensated only for their systematic risk since firm-specific risk has been eliminated with diversification (Bodie et al., 2014). By choosing equity mutual funds, we assure that our portfolio is only compensated for systematic risk as they should be insulated against individual risk and thus are appropriate to be used for our purpose.

We then modified the conventional Fama and French (2015) five-factor model (composed of the broad-market-related factor, size-related factor, valuation-related factor, profitability-related factor and investment-related factor) by adding an ESG-related risk factor. Furthermore, we run a time-series regression on the returns of an equally weighted portfolio, formed by 556 equity mutual funds originating from the Eurozone, for a period going from May 2010 to November 2019 on the mentioned risk factors. Through this method the main hypothesis we are testing is that the risk exposure to the ESG-related factor is significantly different from zero. We then run a number of variations of our method to assure the robustness of our results.

This thesis contributes to the existing literature by taking a different approach to the link between ESG and financial performance. Very little research has been done regarding the consideration of ESG factors as a systematic risk apart from Jin (2017) and Maiti (2020). We thus further investigate the subject by analysing a different market (which is the mutual fund market within the Eurozone) and by using different ESG risk factor proxies than the ones used in previous papers. Finally, we investigate how this risk factor is linked with specific funds or specific stocks criteria.

1.3 Structure of the thesis

Our thesis unfolds as follows: Chapter 2 offers an overview of Socially Responsible Investments with a particular focus on ESG rating agencies. Chapter 3 reviews previous literature in order to have the theoretical background necessary to investigate the subject. Chapter 4 sheds light on the methodology used to answer our research question. In Chapter 5, the data collected is described. In Chapter 6, our results are presented and confronted with previous literature to infer conclusions from our investigation. Finally, Chapter 7 concludes the master's thesis, points out limitations of the investigation and offers suggestions for future research on the subject.

Chapter 2: Overview of Socially Responsible Investments

2.1 Motivation for SRI

The CFA Institute interrogated portfolio managers regarding ESG issues. Seventy-three percent of them said they integrated ESG issues in their investment analysis and decisions, mostly to mitigate investment risk, while 57% of them considered ESG issues into the whole investment analysis. These answers illustrates the growing interest of portfolio managers regarding these issues (Hayat & Orsagh, 2015). Furthermore, The Forum for Sustainable and Responsible Investment (2018) conducted a similar questionnaire. The main argument cited by asset managers, on why they incorporate ESG criteria in their investment decisions, is client demand followed by other motivations such as the fulfillment of mission or values, the pursuit of environment or social benefits, the gain of improved returns over time and the reduction of risks aligned with the fulfillment of fiduciary duty. There are also other reasons like the desire to access niche market catalysts (BlackRock, 2019) or to cope with the external pressure from NGO's and the media (Eurosif, 2018).

The last ones mentioned are also reasons that can motivate companies to improve their ESG performance. Companies can gain better overall performance when improving these factors. Deloitte (2017) in its report, *"2030 Purpose: Good business and a better future"*, mentions that companies committed to wider social good are the ones that are better prepared to retain high quality employees, which is a main challenge for companies nowadays. Furthermore, consumers are becoming sensitive to these matters and are willing to spend more on socially engaged brands. Finally,

Deloitte reports that sustainable companies can potentially achieve considerable savings in their supply chain.

In its annual report, PRI (2019) observes that ESG factors are long-term drivers of return and that the risks associated to ESG factors have an impact in the long run. However, these risks are emerging in the short-term horizon as well. They were considered to be far from being tangible enough to impact the revenue of a company. They are now very close to doing so in terms of cash flow and fundability. According to a survey interrogating 1,100 members of the CFA Institute, 23% of respondents believe that ESG issues have affected share prices in 2017, while 52% believe that ESG factors are going to impact share prices in 2022. This illustrates how the impact of ESG on a firm's risk/return is becoming both a short-term concern and a long one (Orsagh, 2019).

2.2 Current state around the world

Despite the growth of SRI around the globe, there are some major discrepancies between regions in terms of SRI assets and of growth. These facts are summarized by the GSIA (2018) in their latest review.

As shown in Table 2.1, Europe and the United States dominated the world in terms of assets under management with 12,306 billion euros and 11,995 billion dollars in 2018. The largest increase between 2016 and 2018 was in Japan with a growth of over 300%. The domination of Europe regarding SRI can be attributed to a cultural discrepancy between roman and anglo-saxon countries. Indeed, anglo-saxon countries tend to focus first on return on investment then on social impact.

The United States are growing faster in terms of SRI assets under management than Europe. They might soon surpass them. Aon (2019) surveyed institutional investors around the world to uncover how SRI is evolving and discovered that Europe, despite the growth of SRI assets in the United States, is considered to be the lead in Responsible Investments (RI) for the future, followed by the UK and the US. The UK overtook the US compared to the survey conducted by Aon in 2018. This is

likely due to policy gaps in the US and the regulatory advance in the UK.

Table 2.1: SRI assets by region in local currency (in billion) 2014-2018 (GSIA, 2018, p.8).

	2014	2016	2018	Growth Per Period		Compound Annual Growth Rate (CAGR) 2014–2018
				Growth 2014–2016	Growth 2016–2018	
Europe	€ 9,885	€ 11,045	€ 12,306	12%	11%	6%
United States	\$ 6,572	\$ 8,723	\$ 11,995	33%	38%	16%
Canada (in CAD)	\$ 1,011	\$ 1,505	\$ 2,132	49%	42%	21%
Australia/New Zealand (in AUD)	\$ 203	\$ 707	\$ 1,033	248%	46%	50%
Japan	¥ 840	¥57,056	¥231,952	6692%	307%	308%

2.3 ESG rating agencies

In its report, PRI (2015), defines ESG rating agencies that give ESG scores as companies that *“evaluate a security issuer (either of bonds or equities) according to their exposure and performance relative to ESG factors and compared to their peers. They are quantitative indicators; they are usually compiled by third-party service providers (typically paid for by investors) and are unregulated products”* (PRI, 2015, p.27).

These rating agencies have been created in response to a demand coming from socially responsible investors that need social and environmental information on firms to be able to invest in more sustainable companies (Escrig-Olmedo, Fernandez-Izquierdo, Ferrero-Ferrero, Rivera-Lirio, & Muñoz-Torres, 2019). They are trying to solve two issues. The first one is to help investors figure out whether valuable long-term assets and relationships are being created. The second one, aligned with the first is to help customers, regulators or potential employees to better understand the social performance of the company that is being evaluated (Chatterji & Levine, 2006).

In 2008, the financial crisis came with some positive effects. It brought a shift in the

mentality of investors regarding corporate sustainability. This is illustrated by the significant growth of the ESG rating industry in the last decade, which has already undergone a phase of consolidation. This growth can be explained by an important number of new ESG rating agencies but especially due to an important part of mergers and acquisitions among existing rating agencies. For example, Morgan Stanley Capital International (MSCI) absorbed a number of ESG research providers like RiskMetrics Group in 2010 which themselves had acquired ISS (Institutional Shareholder Services) in 2007, Innovest Strategic Value Advisors in February 2009, and Kinder Lydenberg Domini (KLD) Research & Analytics in November 2009 (Escrig-Olmedo et al., 2019).

Some could consider, though, that this phenomenon is going to cause a lack of competitiveness on the market. We can also argue that these agencies are becoming bigger and more professionalized. They also have extended their scope of action by providing market diverse products and services like sustainability indices, sector and thematic research reports, benchmarks, etc.

The rise of ESG rating agencies can also be explained by the fact that the information provided, by external sources, on the corporate sustainability of a company has a greater impact on consumers than if it was provided by the firm itself, which gives a major role to these agencies (Schuler & Cording, 2006). There are some other major players that require the services provided by ESG Rating agencies. Investment firms (even the biggest ones like Blackrock) and asset managers rely deeply on these agencies to conduct ESG Research because the commitment in terms of time and money can become too important for in-house research (ACCF, 2018).

2.4 ESG rating challenges

Although ESG data is improving through the years, there are still many challenges to overcome. Indeed, it is important not to blindly rely on ratings as rating agencies can make mistakes or be miss-informed (Mooij, 2017).

In its report on sustainable investing, Black Rock (2018) points out that ESG data is still inconsistent. Indeed, aggregating all these different factors into one single

number can prove to be a bit simplistic. The report identifies four main drawbacks for existing ESG-related data.

The first one is quality of the data. Since the data available depends on what companies are willing to provide, this can lead to inconsistency and unreliability. A step towards improvement would be to have a higher company disclosure and a standard reporting framework. This should come with industry-specific standards that are detailed enough to have a good comparison between companies. Deloitte (2016) reports that 80% of investors remain dissatisfied with the difficult comparability of firms within the same industry when it comes to sustainable reporting. Hawley (2017) reports three biases regarding transparency and disclosure for companies:

- The Geographical Bias: with ESG issues being more developed in Europe, the tendency is to rely on standards from there;
- Factor Bias: a lack of disclosure regarding the weighting scheme used for each category in ESG;
- Selection Bias: big companies tend to be awarded high ESG scores, as these have more means to report on ESG factors.

The author also identifies the fact that there is limited research done on what data sources are used and how they are used by ESG rating agencies. This might be because most agencies are trying to protect their intellectual property and data sources.

The second one is coverage, which is briefly mentioned above as the selection bias. Indeed, essentially big companies report broadly on their sustainability actions. Obtaining ESG data is a lot of work for rating companies and for the firms that are being rated. Chatterji and Levine (2006) explain that providing this data includes filling endless forms and explaining safety procedures. They must also host visits from compliance auditors, fill out multiple surveys each year on their ESG and ethics policies. It is especially difficult for stakeholders to identify which codes and standards are reliable measures of social responsibility when there are so many of them. Due to the multitude of surveys, firms end up not answering all of them or

not answering as detailed as they could due to a lack of time or motivation.

The third one is consistency. Each ESG metric is given a different weight. Since the methodology of the different ESG rating agencies vary from one to the other, there is little correlation between their respective scores (Wigglesworth, 2018). Numerous studies point out this lack of standardization across markets (Escrig-Olmedo, Fernandez-Izquierdo, Ferrero-Ferrero, Rivera-Lirio, & Muñoz-Torres, 2010), along with multiple approaches to come up with an ESG score that make these scores incomparable. Chatterji and Levine (2006) tend toward the idea of dividing points between each category as being the most convenient one. It is also said that standardized weighting might under, or over-weight a given company or industry, as company and sector-specific risks are not considered in the analysis, which makes it biased.

The last drawback the author mentions is frequency. Most of ESG metrics are only updated once a year, while investors need timely data to manage risk and make returns. This makes the data difficult to use (Hawley, 2017).

Chapter 3: Literature Review

3.1 Socially Responsible Investment

In the literature, many terms are used to qualify the intention of investing in stocks or companies that respect certain criteria. These can be related to ethics or personal beliefs that the investor believes companies should respect. Terms like Responsible Investments, Socially Responsible Investment, Ethical investing or ESG investing are often used in the literature. The main objective is to look into the literature to find what these terms really mean and what they have in common.

Ethical investing began back in the colonial era in the US, as some religious groups decided to not invest in certain funds which had financial links to the slave trade. The first mutual fund to screen out gambling, alcohol and tobacco investments was the Pioneer Group in 1921. In the 1970's, a new trend of screens was introduced. It was different from the "sin" screens used until then (like alcohol or gambling). They were based on screening out given countries having policies in place that did not correspond to certain ethics. This kind of investment practices kept growing throughout time but with new concerns. In the 21st century, they are focused on climate change, corporate scandals and humanitarian crisis (Caplan, Griswold, & Jarvis, 2013).

The first book that was written on ethical investing in the UK was from Ward (1986). The author did not attempt to give a precise definition to what "socially responsible" was because the beliefs regarding the subject varied depending on the people. It could be alcohol, tobacco or creating jobs among other things. Though some eventually attempted to define it. Cowton (1994) gave a more specific definition of what he called ethical investment which, according to him, can be defined as *"the exercise of ethical and social criteria in the selection and management of investment portfolios, generally consisting of company shares(stocks)"* (Cowton, 1994,

p.217). He argued that the terms SRI and ethical investment are equivalent. This was contradicted by Sparkes (2002), who distinguished between ethical investing and SRI. This author considers that ethical investing should be used for investments carried out on behalf of value-based organisations such as churches and charities while SRI should be used for the rest. He also gave a more precise definition of SRI. He stated that the *“key distinguishing feature of socially responsible investment lies in its combination of social and environmental goals with the financial objective of achieving a return on investing capital approaching that of the market”*(Sparkes, 2002, p.201). Although SRI had the same problem as ethical investing regarding a consensus on the appropriate definition for it (Berry & Junkus, 2013), the one proposed by Eccles and Viviers (2011) seems to be the most precise and defined as: *“Investment practices that integrate a consideration of ESG issues with the primary purpose of delivering higher-risk-adjusted financial returns”* (Eccles & Viviers, 2011, P.401)

3.2 From SRI to ESG

Accounting for ESG in the investment process has been labeled as SRI (Eccles & Viviers, 2011; Johnsen, 2003). Others label accounting for ESG as responsible investing (RI) which is distinct from SRI as it integrates ethical and financial gains for pure profit (PRI, 2015). Today the ones who practice these two types of investing describe it in a similar way. The common theme they talk about is to focus on ESG issues. Regardless of how ESG issues are labelled, the important aspect is to focus on what ESG investing really means (Hayat & Orsagh, 2015). ESG factors relate to environmental (i.e. carbon emissions, water and energy consumption or waste management), social (i.e. employee satisfaction, product safety or human rights), and governance (management, corruption and bribery, reporting and disclosure and compensation) (Plantinga et al., 2015). ESG factors have become key indicators of management performance, risk management, and non-financial performance (Boerner 2011; Kiernan 2007; Yegnasubramanian 2008, as cited in Galbreath, J. 2013).

ESG investing is a subpart of SRI but it takes it a step further. Caplan et al. (2013, p.1) define it as” *integrating ESG factors into fundamental investment analysis to the extent that they are material to investment performance*”. ESG analysis examines whether those factors have an impact on the performance of a company and, therefore, on the performance of a portfolio in the long term. This definition of ESG investing is also known as ESG integration as it is the most widely used strategy according to the PRI (2015). However, there are a couple of other ESG based strategies out there: negative screening (excluding specific companies or industries), positive screening (focusing on specific industries) and best-in-class investing (selecting the best companies regarding ESG) (Hayat & Orsagh, 2015).

The objectives of these strategies differ from the ones of ESG integration. Positive and best-in-class screening have common objectives which are to mitigate ESG risks, to achieve higher returns and to improve or maximize the ESG score of a portfolio. The objectives of negative screening differ in some ways. Although the goal behind the strategy is also to mitigate ESG risk, the main objective is to align portfolios with the moral and ethical values of investors and to influence a company to change its business model or stop an objectionable practice (Kumar, Dayaramani, & Rocha, 2018). Figure 3.1 summarizes the definition of each term.

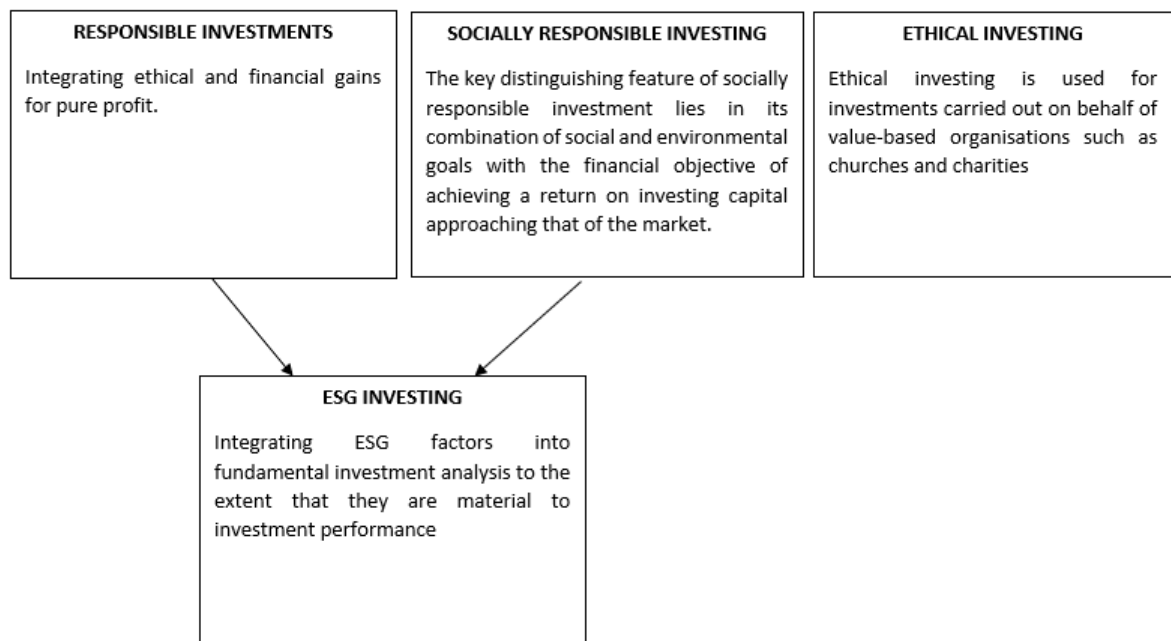


Figure 3.1: Term Definitions

3.3 ESG and financial performance

Although these different terms have their specific definitions in the literature, there is not a general consensus on these definitions. In this section, we review the literature on the link between responsible investments in general and financial performance. This relationship is well documented in the literature and is reviewed below, based on two meta-studies of the literature dedicated to the topic and some recent analyses. Attention was paid to consider studies that use different types of methodologies to evaluate the impact of ESG on financial performance.

Friede et al. (2015) made a review of about, 2000 studies regarding the relation between ESG and financial performance between 1970 and 2015. They concluded that there is a clear evidence that ESG investing has a positive financial impact. However, they had to distinguish between three categories of studies they had reviewed which were: meta-analyses, vote-count studies (which involves comparing the number of positive studies (studies showing benefit) with the number of negative studies (studies showing harm)) and portfolio studies. The first two gave similar positive results, which reinforced the claim that there is a business case for ESG investing. Finally, Wagner, Schaltegger, and Wehrmeyer (2001) distinguish a category of past empirical studies on RI which are event studies.

Viehs, Clark, and Feiner (2015) agreed with this conclusion. They completed a meta-study of 200 different sources published between 2007 and 2014. They drew the following conclusions: 90% of the studies that were focusing on the cost of capital show that ESG standards lower the cost of capital, 88% of the studies conclude that strong ESG practices results in better operational performance and finally that 80% of stock prices are positively influenced by ESG practices.

Revelli and Viviani (2015) performed a meta-analysis of 85 studies and 190 experiments. They tested the relationship between socially responsible investing and financial performance to determine whether it is more profitable than conventional investment policies. They found that SRI does not outperform or underperform conventional investing.

Friede et al. (2015) noted that portfolio studies often come up with the conclusion

that the relationship between ESG and financial performance are either negative or neutral. For example, to illustrate this result, Lee and Faff (2009) investigated this relationship by creating two mutually exclusive leading and lagging global corporate sustainability portfolios. The authors found that the leading portfolio underperforms its lagging counterpart. This can be explained by the fact that the higher returns for the firms in the lagging portfolio compensates for the higher idiosyncratic risk. To support this explanation, the authors prove that by using a pricing model that considers the difference in idiosyncratic risk, no significant difference remained between the lagging and leading portfolio.

The negative (or neutral) relationship between ESG and financial performance for portfolio studies can be explained by construction constraints and costs for portfolio implementation specifically for mutual funds. It can also be explained by the effects of systematic and idiosyncratic risks that can cover ESG alpha (Bassen & Senkl, 2011). "Alpha" is defined as *"The abnormal rate of return on a security in excess of what would be predicted by an equilibrium model like CAPM or multi-factor models."* (Bodie et al., 2014, p.1046). This means that the excess returns obtained by making portfolios with a focus on ESG stocks are already explained by risk factors. This explanation is confirmed by Plantinga, Galema, and Scholtens (2008) who conclude in their study *"The stocks at stake: Return and risk in socially responsible investment"* that most researchers control for risk using Fama and French (1993) regressions.

Indeed, the three-factor Fama and French (1993) model includes the HML factor which measures the sensitivity of a stock to the return difference of stocks with high and low book-to-market ratios. Since Socially Responsible Investments result in lower book-to-market ratios the HML factor already explains the returns of SRI stocks. This statement is confirmed when seeing that studies like *"The Wages of Social Responsibility"* by Statman and Glushkov (2008), in which the Fama and French (1993) three-factors model and the Carhart (1997) four-factor model are used, do not find that ESG focused portfolios can generate alpha. While other ones like the paper *"ESG for All? The Impact of ESG Screening on Return, Risk, and Diversification"* by Verheyden, Eccles, and Feiner (2016) that use the CAPM model

(which does not include the HML factor) find that ESG has a positive impact on financial performance (generates alpha).

Event studies found evidence of a link between ESG factors and financial performance (Klassen & McLaughlin, 1996; Rao, 1996). Most of them found that positive (negative) ESG-related events are linked with positive (negative) consequent abnormal returns. Yamashita, Sen, and Roberts (1999), for their part, did not find significant link between ESG-events and abnormal returns.

3.4 Corporate Social Performance and ESG related firm risk

We want to focus on the effect and consequences of Corporate Social Performance (CSP), to see how it impacts different aspects of a company. CSP is defined as: *principles, practices and outcomes of businesses' relationships with people, organizations, institutions, societies and the earth, in terms of the deliberate actions of businesses toward these stakeholders as well as the unintended externalities of business activity* (Wood, 2018, p.1).

The CSP of companies is frequently operationalized and evaluated by ESG factors. (Bassen and Senkl 2011; PRI 2015, as cited in Sassen, Hinze and Hardeck 2016). As Plumlee, Brown, Hayes, and Marshall (2010) proved, a high CSP has the potential to raise the value of a company by decreasing the cost of capital. Thus, since a firm's risk is an important determinant of the cost of capital, we can consider that CSP has an impact on a firm's risk.

There has been hardly any research done in the literature on the relationship between CSP and firm risk (Sassen, Hinze, & Hardeck, 2016). A meta-analytic review on the relationship between CSP and firm risk has been made by Orlitzky and Benjamin (2001) which covered 18 US-based studies. The authors found strong evidence supporting that greater CSP leads to lower financial risk.

Later on, there has been research investigating different approaches regarding CSP and firm risk, which makes it more complicated to compare them. Luo and Bhattacharya (2009) conducted a study showing evidence that the impact of CSP is greater in firms with higher (versus lower) advertising. Furthermore, Albuquerque, Durnev, and Koskinen (2013) discovered evidence that the impact of corporate social responsibility (CSR) on decreasing systematic risk is stronger for firms with high product differentiation. More recently, Y. Chen (2020) took an original approach, investigating the relationship between CSR risk and the investment behavior of institutional investors. The study demonstrated that there is a negative correlation between the institutional investor's shareholding and a CSR risk, which indicates that institutional investors consider CSR risk when they invest. The previously stated that the relationship is more significant in regions with higher levels of marketization, state-owned listed companies and firms with greater operating performance.

Most of the data that was used in the different studies come from Northern American companies. There are few exceptions, like Luo and Bhattacharya (2009) who used an international sample, Salama, Anderson, and Toms (2011) who conducted their investigation using data from the United Kingdom or Y. Chen (2020) who used data from the Chinese capital market. The majority of studies did not focus on specific industries, with the exception of the one of Jo and Na (2012) who focused on sinful industries and Bassen, Meyer, and Schlange (2006) who evaluated utilities.

Existing studies mostly employ aggregated CSP measures (all three ESG factors) to measure the CSP of a firm, rarely do they use measures such as governance scores or social scores. Regarding risk measures, they mostly used systematic risk. Only a few studies focused on total risk or idiosyncratic risk. At the aggregated level, the results are consistent regarding the negative relationship between CSP and firm risk. However, at the disaggregated level, results are mixed, depending on the samples, the risk measures and CSP measures that are used (Sassen et al., 2016).

Bouslah, Kryzanowski, and Mzali (2013) and Oikonomou, Brooks, and Pavelin (2010) established that the relationship between community or employee relations

and firm risk tends to be negative. However, investigating the product dimension tends to have no influence (Bouslah et al., 2013) or a negative impact (Oikonomou et al., 2010). Regarding the environmental performance, Salama et al. (2011) and Sharfman and Fernando (2008) found evidence of a negative relationship with the risk measure they used. In contrast, Bouslah et al. (2013) found a positive relationship for one sample and a negative one for another sample. Similarly, regarding diversity and corporate governance, Bouslah et al. (2013) and Oikonomou et al. (2010) found ambiguous results.

3.5 Factor models

In his paper “Portfolio Selection”, Markowitz (1952) developed what is now known as the modern portfolio theory (MPT). It is an important theory, which factor models are based on. This theory assumes that investors are risk averse. A risk-averse investor “*will consider risky portfolios only if they provide compensation for risk via a risk premium*” (Bodie et al., 2014, p.1056). It states that these investors can build portfolios to optimize their expected returns based on a given level of risk. It emphasizes that a higher risk should give a higher return.

According to Markowitz (1952), investors can construct an “efficient frontier” which is a set of efficient portfolios. These efficient portfolios are Minimum Variance Portfolios for a given level of expected return and correlation structure (Elton, Gruber, Brown, & Goetzmann, 2009). Based on the efficient frontier, an efficient risky portfolio P can be identified by drawing the capital allocation line (CAL) to the frontier as it can be seen in Figure 3.2. Every investor in the economy is facing the same efficient frontier, irrespective of their risk preference (since, according to the theory, all investors have homogeneous beliefs, same investment horizon and the same universe of stocks). Thus, only one portfolio has the highest expected return compared to its inherent risk. Therefore all investors have the same optimal risky portfolio.

Once the investor has identified the optimal risky portfolio, depending on his risk aversion, he will balance his investment between a risk-free asset and the optimal risky portfolio. Since the market portfolio is the aggregation of all individual portfolios, it will contain the exact same securities in the same proportions than the

optimal risky portfolio. We can thus consider the optimal risky portfolio as the market portfolio which is the value-weighted portfolio of all assets in the investable universe (Bodie et al., 2014).

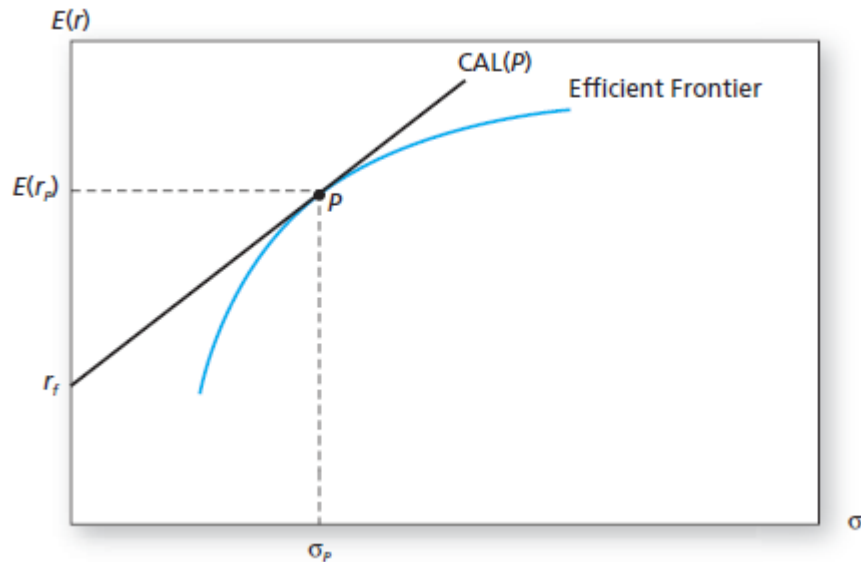


Figure 3.2: The efficient frontier (Bodie et al., 2014, p.292)

Note: The Y axis represents the expected return and the X axis the expected risk represented by the standard deviation

One of the limitations of the MPT is that it is completely silent on what should be, the expected returns on assets. The Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965), built on the MPT, helps fill the gap. The CAPM is a pricing relation for all assets including inefficient portfolios (Van Der Wijst, 2010). It is a single factor model that gives a prediction of the relationship that we should observe between the risk of an asset and its expected return. The model relies on the following assumptions as cited in Elton et al. (2009):

1. Many small investors with endowment (initial wealth) that is small compared to total wealth in the economy;
2. Identical holding period for all investors;
3. Can invest only in publicly traded financial assets, such as stocks and bonds and risk-free assets;

4. No Taxes and transaction costs;
5. Investors are “rational” — in the sense of mean-variance optimizers;
6. Investors have “homogenous expectations or beliefs”;
7. Divisible assets: investments are infinitely divisible.

As we noted before, the MPT states that the market portfolio is optimal in the mean-variance investment space and that all investors will therefore hold the market portfolio. Since all agents invest in the market portfolio, the only risk incurred is the market risk according to the CAPM. The expected return of an asset should then only depend on its contribution to the market risk, which is measured by its beta. What is called “Beta” in the model is actually the contribution of a security to the variance of the market portfolio as a fraction of the total variance of the market portfolio (Elton et al., 2009).

Sharpe (1964) derived the CAPM giving the following algebraic relationship:

$$E(R_i) = R_f + [E(R_m) - R_f]\beta_{iM} \quad (3.1)$$

Where:

$E(R_i)$ = expected return of an asset i

R_f = the risk-free rate

$[E(R_m) - R_f]$ = excess return of the market portfolio, market risk premium

β_{iM} = measure of systematic risk of the asset i

Thus, as stated in the equation, the model gives a measure of risk (β) and the price of risk ($E(R_m) - R_f$). It sums up the risk return relationship for all assets in the investment universe in a linear relation (Van Der Wijst, 2010). The expected return-beta relationship can be portrayed graphically as the security market line (SML) which only prices systematic risk (β) (Figure 3.3).

The SML illustrates graphically individual asset risk premiums as a function of asset risk. The relevant measure of risk for individual assets held as parts of well-diversified portfolios is the contribution of the asset to the portfolio variance (the

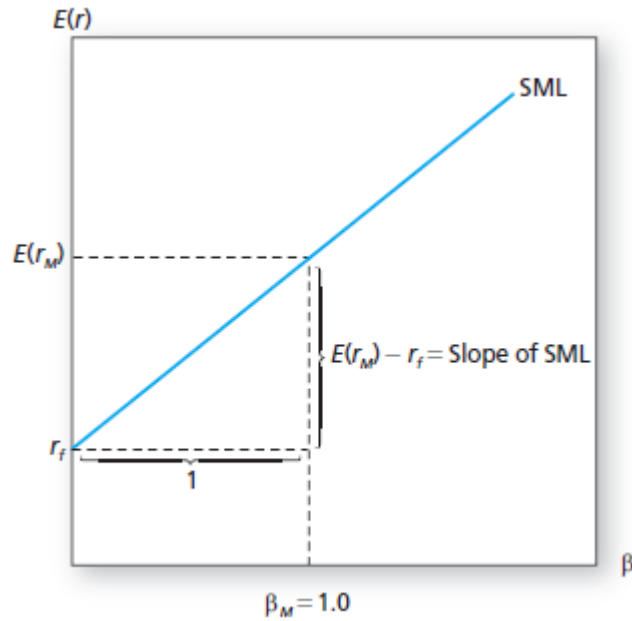


Figure 3.3: The Security Market Line (Bodie et al., 2014, p.298)

Note: SML plots beta on the x-axis and expected return on the y-axis

asset's Beta). Since the SML is the graphic representation of the expected return-beta relationship, “fairly priced” assets plot exactly on the SML. All assets lying under the SML are overpriced (given their betas, their expected returns are smaller than the model predicts) and all assets lying over the SML are underpriced according to the CAPM (given their betas, their expected returns are greater than the model predicts) (Bodie et al., 2014).

One of the big limitations of the CAPM is that some of the assumptions (like assuming there are no taxes and transaction costs, that you can buy fraction of stocks,...) do not conform to reality.

Another limitation of this model is that the CAPM controls the portfolio performance for only a single systematic risk factor (i.e. the covariance with excess market return). However, it has been shown by academics (Fama and French (1993) and Carhart (1997)) that a single-factor model cannot explain the cross-sectional variation in equity returns and that other factors should be included in the relation.

Fama and French (1993) developed a three-factor model, which is an extension of the

CAPM. They used all nonfinancial firms of the NYSE, AMEX and NASDAQ return files and the merged COMPUSTAT annual industrial files of income statement and balance-sheet data between 1962 and 1989. They concluded that the relationship described in the CAPM between the average return and market beta weakened during that period. Other factors demonstrated statistically significant effects. They incorporated a valuation-related factor called High Minus Low (HML), which is the return of a portfolio of stocks with a high book-to-market ratio (also called value stocks) in excess of return on a portfolio of stocks with a low book-to-market ratio (also called growth stocks). They also incorporated a capitalization-based factor Small Minus Big (SMB), which is the return of portfolio of small stocks in excess of the return on a portfolio of large stocks. The three-factor model is algebraically written as follows:

$$E(R_i) - R_f = \alpha_i + [E(R_m) - R_f]\beta_{iM} + \beta_{iSMB}[E(SMB)] + \beta_{iHML}[E(HML)] \quad (3.2)$$

where:

$E(R_i) - R_f$ = the expected excess return of the asset i

α = the intercept of the equation

$[E(R_m) - R_f]$ = the expected excess return of the market portfolio

$E[SMB]$ = Small market capitalization Minus Big, expected excess return of small caps over big ones

$E[HML]$ = High book-to-market ratio Minus Low, expected excess return of high book-to-market firms over low ones.

$\beta_{iM}, \beta_{iSMB}, \beta_{iHML}$ = the three betas measuring the risk premium associated with each factor

Although, this model is widely used and recognized in subsequent studies, it fails to consider the momentum strategy described in *“Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency”* by Titman and Jegadeesh (1993). Carhart (1997) developed a four-factor model, which is an extension of the three-factor model. The author introduced a fourth factor called the ”momentum factor”, denoted Winners Minus Losers (WML). Indeed, this momentum factor states that stocks that have been doing well (bad) on the market for the past 1

to 12 months will keep doing well (bad) in terms of returns in the next 1 to 12 months. The number of months taken into account depends on the strategy of the investor. They state that, by adding this factor, the model is still consistent with the market equilibrium with four risk factors. Algebraically the model is written as follows (Carhart, 1997):

$$E(R_i) - R_f = \alpha_i + [E(R_m) - R_f]\beta_{iM} + \beta_{iSMB}[E(SMB)] + \beta_{iHML}[E(HML)] \\ + \beta_{iWML}[E(WML)] \quad (3.3)$$

Recently, Fama and French (2015) introduced an extension of their original three-factor model. They added two factors, which are a profitability-related factor (High profitability stocks outperform Low profitability stocks) called the RMW (Robust Minus Weak) and the Investment-related factor (Low Investment stocks outperform High Investment stocks) called the CMA (Conservative Minus Aggressive). They demonstrated in their paper that the five-factor model outperforms the three-factor model of Fama and French (1993). The 5-factor model is algebraically written as follows:

$$E(R_i) - R_f = \alpha_i + [E(R_m) - R_f]\beta_{iM} + \beta_{iSMB}[E(SMB)] + \beta_{iHML}[E(HML)] \\ + \beta_{iRMW}[E(RMW)] + \beta_{iCMA}[E(CMA)] \quad (3.4)$$

3.6 ESG Factors as a systematic risk

When reviewing the literature there was hardly any papers investigating whether ESG factors could be considered as a systematic risk factor, which confirms the relevance of looking into this subject.

In his paper entitled *“Is ESG a systematic risk factor for mutual funds?”* Jin (2017) investigated whether the ESG-related systematic risk is priced by the mutual fund market. He used the five-factor model of Fama and French (2015), combined with an ESG-related factor on data coming from 1 425 US open-end equity funds between April 2009 and December 2016. Return difference between an ESG-score weighted

portfolio and an unweighted market portfolio were used as a proxy for the ESG-related risk factor. Jin (2017) found that the US open-end equity funds hedged the ESG-related systematic risk. Moreover, the author discovered that the exposure to ESG-related systematic risk is significantly priced by the market and finally that equity funds are finding more efficient ways to factor CSP into their investment decisions. Finally, it was demonstrated that responsible investments provides downside protection against the ESG-related systematic risk which is not reduced by extensive diversification.

Furthermore, Giese and Lee (2019) found that the ESG factor has a positive effect on risk, especially to mitigate tail risk (which is the risk that a stock will deviate by more than three standard deviations from its mean). The authors argue that there is a need for long-term series of ESG scores to possibly test and prove the existence of ESG risk premium.

Maiti (2020) takes a different approach to tackle this subject in his paper *"is ESG the succeeding risk factor?"*. The author chooses to form portfolios of ESG factors by constructing them using the same methodology as other common risk factors (like size, value, momentum,...), even though there is still a low number of companies with ESG scores. In the study, monthly data from 426 companies of the STOXX Europe 600 index, from September 2010 to June 2018 were used. The author tested an aggregated ESG risk factor which is constructed using Bloomberg ESG Scores. Maiti (2020) also decided to test each ESG factor as separate risk factor : the Environmental factor(E) with the Bloomberg Environment Scores, the Social factor(S) with the Bloomberg Social Scores and the Governance factor (G) with the Bloomberg G Scores. The study found that ESG risk factor is statistically significant at 5% level. It is interesting to note that the study demonstrated that each of the ESG factors (E,S and G) in relation to the stock performance was important. Finally, the author showed that there exists a more robust sustainable asset pricing model with ESG factors and finds that this model performs better at explaining portfolio returns than the Fama and French (1993) three-factor model. Indeed, by running a Gibbons Ross and Shanken(GRS) test (which is a test of the efficiency of a given portfolio), the study shows that the performance of the three-factor model

with each of these ESG risk factors along with market and size risk factors is better than the conventional three-factor model of Fama and French (1993). An investor must consider all of these factors (ESG, E, S and G) when considering investment decisions.

Chapter 4: Methodology

To find out whether ESG factors can be considered as a systematic risk factor, we will follow the methodology used by Jin (2017) on US equity mutual funds.

We can consider responsible investments as an investment strategy put in place to hedge the ESG-related systematic risk. This is an aspect that has not been the focus of the literature on responsible investments. Indeed, it was generally considered as a strategy to earn higher returns. Thus, previous studies have focused on demonstrating whether it was an effective strategy or not. We chose to test the performance of mutual funds with ESG systematic risk as Jin (2017) did because, as the MPT states, well diversified portfolios are compensated only for their systematic risk, since firm-specific risk has been eliminated with diversification (Bodie et al., 2014).

4.1 ESG-related risk factor

We modified the Fama and French (2015) five-factor model (see Equation 3.4) that is originally composed of a market factor, a size-related factor, a valuation-related factor, a profitability and an investment related factor by adding an ESG-related factor. The challenge to proxy this risk factor is the lack of consensus regarding ESG data. Indeed, there is a lack of standardization and transparency in ESG reporting and thus, ESG scoring presents a major challenge for investors as it depends on the willingness and transparency of companies (State Street Global Advisors, 2019).

The factors in the original five-factor model are five value-weighted, zero-investment factor-mimicking portfolios. Each risk factor is constructed as a factor portfolio, which is a well diversified portfolio constructed to have a beta of 1 on one of the factors and zero on the other ones. This is possible to do because there is a large number of securities and a small number of factors (Bodie et al., 2014). The method used for the Fama and French (1993) factors is, for example, for the size-related factor, to form a zero-net-investment portfolio going long the small portfolio (portfolio

constituted of small company stocks) and going short on the big portfolio (portfolio constituted of companies of a large size).¹ It is thus not achievable to form an ESG-related factor portfolio by screening subgroups of securities out of a large set of them, since that type of approach requires that all securities in the universe available to investors have long-term ESG scores. Indeed, since ESG ratings have a much shorter history than traditional factors, the statistical confidence level is low when compared to other common factors (since other factors have many more years of data) (Giese & Lee, 2019). Instead, we used the same methodology as Jin (2017), which is to take the return difference between an unweighted market portfolio and an ESG-score weighted portfolio. The main difference between this factor and the ones originally used in the Fama and French (2015) five-factor model is that for the ESG weighted portfolio, it includes securities that are the same as the unweighted portfolio. On the contrary, factor portfolios built using the Fama and French (2015) method are constructed by using the difference between mutually exclusive portfolios. To assure that our results are robust, we chose to have two different proxies for the ESG risk factor. Thus, an important hypothesis we make in our research is that the methodology used to proxy the ESG risk factor is relevant.

4.2 Six factor model

To identify whether the exposure to the ESG risk factor is significantly different from zero and thus, if it can be considered as a systematic risk factor, we formed two types of portfolios. We chose to use two weighting methods as this choice can potentially impact our results. Indeed, it has been demonstrated that inferences drawn from the results of asset-pricing models are substantially different, depending on whether the portfolios used are equally or value-weighted (Plyakha, Uppal, & Vilkov, 2014).

On one hand, we form an equally weighted portfolio which gives more weight to small-size funds that may also pay attention to ESG criteria when investing in

¹for a more detailed explanation of the method used to construct Fama French factors portfolios, see p.427 of Bodie et al. (2014)

firms. Indeed, in this type of portfolio, each fund will have the same weight when computing the returns of the portfolio. On the other hand, we formed a value-weighted portfolio. The weights of this portfolio depend on the fund's Assets under Management (AuM). The weights are thus proportional to the fund's size. The portfolio is rebalanced monthly, and will therefore give more weight to large-size funds. We will consequently be able to determine whether there is a difference between large and small-size funds regarding the ESG risk factor. The excess returns of each type of portfolio are regressed against the risk factors as follows:

$$R_{it} = \alpha_i + MKT_t\beta_{iM} + SMB_t\beta_{iSMB} + HML_t\beta_{iHML} + RMW_t\beta_{iRMW} + CMA_t\beta_{iCMA} + ESG_t\beta_{iESG} + \epsilon_{it} \quad (4.1)$$

Where:

$t = 1, \dots, 115$

R_{it} = excess return of the portfolio i at time t

MKT_t = excess return of the market portfolio

SMB_t = expected excess return of small caps over big ones

HML_t = expected excess return of high book-to-market firms (i.e. value stocks) over low ones (i.e. growth stocks)

RMW_t = Return difference between a robust profitability portfolio and a weak profitability portfolio

CMA_t = Return difference between a low investment portfolio and a high investment portfolio

ESG_t = Return difference between an unweighted market portfolio and an ESG score weighted portfolio

β_i = the six betas measuring the exposure associated to each factor

ϵ_{it} = error term

4.3 Five Factor Model

To identify whether the exposure to the ESG risk factor is significantly different from zero and thus, if it can be considered as a systematic risk factor, we decided to use the same method as cited above but by modifying the Carhart (1997) four-factor model and only using the equally weighted portfolio. It is originally composed of

a market factor, a size-related factor, a valuation-related factor and a momentum-related factor. We modified it by adding a ESG-related factor. We can check the robustness of our results by figuring out if the ESG risk factor is significantly different from zero using two different models. We formed an equally weighted portfolio of the different funds that we selected for our sample and regressed the portfolio against the risk factors as follows:

$$R_{it} = \alpha_i + MKT_t\beta_{iM} + SMB_t\beta_{iSMB} + HML_t\beta_{iHML} + WML_t\beta_{iWML} + ESG_t\beta_{iESG} + \epsilon_{it} \quad (4.2)$$

Where:

$t = 1, \dots, 115$

R_{it} = excess return of portfolio i at time t

MKT_t = excess return of the market portfolio

SMB_t = expected excess return of small caps over big ones

HML_t = expected excess return of high book-to-market firms (i.e. value stocks) over low ones (i.e. growth stocks)

WML_t = Return difference between a portfolio long on stocks with high past returns ("Winners") and short on firms with low past returns ("Losers")

ESG_t = Return difference between an unweighted market portfolio and an ESG score weighted portfolio

β_i = the six betas measuring the exposure associated to each factor

ϵ_{it} = error term

Chapter 5: Data Description

5.1 Selection of mutual funds and data collection

For the selection of mutual-funds that are considered for the analysis, the database available on the Bloomberg Terminal in the ESPO-library at UCLouvain Bloomberg (2020) is used. The Fund Screening function (FSRC) is used to select funds corresponding to the following criteria:

- we wanted to single-out funds denominated in EUR and invested in the Eurozone. By focusing on funds that invest in the Eurozone, it allows us to isolate investment strategies that are exposed to similar risk factors and therefore have more precise research results.
- the asset allocation of the fund must be equity, as equity funds are the focus of this thesis;
- the fund type must be open-ended;
- the fund inception must be before 2010. Indeed, we choose May of 2010 as the starting data for our analysis because it is the month after which returns on S&P 350 ESG index are available;

Applying these criteria leaves us with 570 funds. We eliminated 14 funds because they had missing data and we thus remained with a total of 556 funds. For these funds, the monthly Net Asset Value (NAV) from April 2010 to December 2019 are collected. The full list of the 556 funds can be found in Appendix A.

We can see in Figure 5.1 the country of origin of the different funds in our selected sample. The distribution is well allocated across the Eurozone. There is a greater concentration of funds in Germany. They represent about 30% of our sample, followed by Austria, Ireland, Finland and Spain. According to the European Fund and Asset Management Association (2019) Germany is third, behind the UK and France, in Europe in terms of net assets managed by investment funds at the end of 2017. It is thus, not surprising that Germany is one of the most represented countries within our sample. It is surprising that France is not more represented. However, this also depends on the inception dates of the mutual funds since this was one of our selection criteria, a lot of mutual funds in France might have been created more recently.

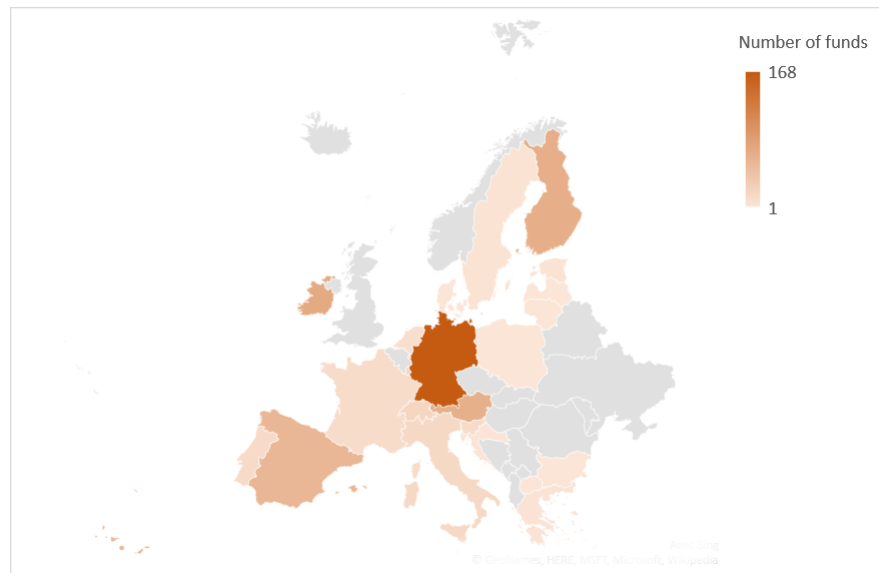


Figure 5.1: Origin of the different funds

Figure 5.2 represents the distribution of sample funds across 12 fund strategies. The two main components of the strategies is the size of the capitalization and the type (value/growth) of stocks in which the funds invest. A large capitalization (hereafter, large cap) strategy is to invest in stocks that have a market capitalization value of 10 billion dollars or more. A small capitalization (hereafter, small cap) strategy refers to investing in stocks that have less than 2 billion dollars of market capitalization (Farley, 2018). A strategy that consists in investing in value stocks, means investing in stocks that are trading for less than their intrinsic value. The latter is measured with ratios of the firm's stock price compared to the firm's earning, book value,

sales, cash flow and dividends.

On the contrary, a strategy that consists in investing in growth stocks means investing in stocks that have high ratios (trading for more than their intrinsic value which is measured the previously cited ratios). This means that investors believe that these firms will rapidly grow which justifies the prices at which the stock will be sold (Bodie et al., 2014). The Large-blend category contains the higher number of funds (153 out of 556), followed by Large value (78) and Small value funds (63) whereas Mid-cap value and Mid-cap growth contain less funds (3, 12).

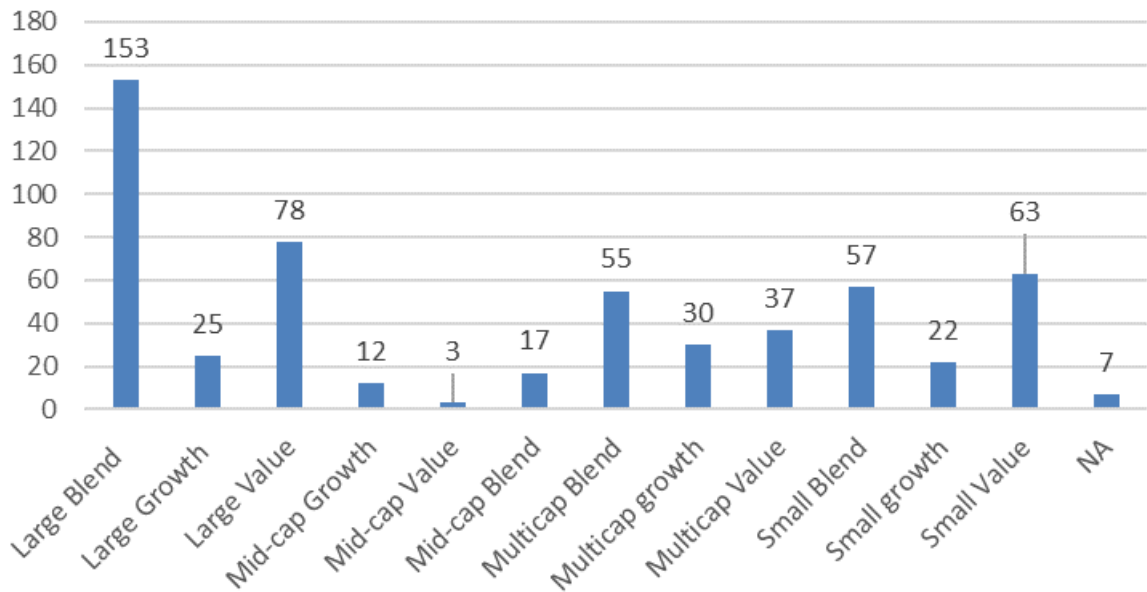


Figure 5.2: Number of funds by fund strategy

5.2 Market Benchmark

As Roll (1978) noted, when multi-factor models are used the choice of the market benchmark has an important impact on the inferences drawn from these models. For our analysis, the MSCI Europe Index is used as it is a relevant benchmark for the European market (Cortez, Silva, & Areal, 2009; Kaserer & Diller, 2004) which is what we target in this thesis. This index was created by Morgan Stanley Capital International and is a free float adjusted market capitalization weighted index. The purpose of the MSCI Europe index is to measure the equity market performance of the developed markets in Europe. It *“captures large and mid cap representation*

*across 15 Developed Markets (DM) countries in Europe*¹. With 438 constituents, the index covers approximately 85% of the free float-adjusted market capitalization across the European Developed Markets equity universe”(MSCI, 2020a). Monthly prices from April 2010 to December 2019 of the MSCI Europe NR (Net Return) Index are obtained from the MSCI website (MSCI, 2020b). The NR version of the Index is chosen because it is the index that includes reinvestment of net dividends.

5.3 Factors and Risk-free rate

The data for the risk-free rate and the four factors (SMB, HML, RMW and CMA) are retrieved from the Kenneth French Data Library for the European Market (French, 2020). Although the Fama-French factors are given in USD, they are assumed to be the same in EUR as they represent risk factors. The risk-free rate is the US 1-month T-bill return.

5.3.1 S&P 350 ESG factor weighted index

Regarding the ESG factor we take as a proxy the return difference between the S&P 350 Europe and the S&P 350 ESG factor weighted index. The S&P 350 Europe consists of 350 leading blue-chip companies (including only the largest most liquid stocks) drawn from 16 developed markets² (S&P 350 Dow Jones Indices, 2020). The S&P 350 ESG Factor weighted measures the performance of the constituents of the S&P 350 Europe with a weighting scheme that takes into consideration the ESG Factor (assessed by Robeco SAM) for each company. The index incorporates all companies within their respective benchmarks but with weights constituents based on their ESG Factor Scores and float-adjusted market cap per Global Industry Classification Sector (GICS) (SP 350 Dow Jones Indices, 2020).

¹Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK.

²Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

As we can see in Figure 5.3 the two indices follow the same trend. However as of 2014, the S&P 350 ESG factor weighted index outperforms the S&P 350 Europe while keeping the same trend.



Figure 5.3: S&P Europe 350 ESG Factor Weighted Index and S&P Europe 350 Historical Prices (SP 350 Dow Jones Indices, 2020, p.1)

Figure 5.4 takes a different way of looking at the indices. It illustrates the cumulative returns of the ESG factor proxy from May 2010 to October 2019. As we can see, there is a pretty smooth downward trend (apart from two upward spikes in 2014 and the end of 2019) during the sample period, meaning that the SP 350 Europe ESG factor weighted index outperforms the SP 350 index. This downward trend can be explained by the rising awareness of the ethics needed in business after the 2008 financial crisis which was caused by a lack of regulation and of business ethics (Lewis, Kay, Kelso, & Larson, 2010).

Also events like the Deepwater Horizon oil spill illustrate how companies involved in negative ESG-related events can face huge financial losses (Sullivan, 2016). This event even forced the British government to tighten their regulations requiring pension schemes to disclose what ESG problems are considered in their investment policy (Stewart, 2010). There are many other examples of these kind of negative ESG-related events like the Sanlu Poisonous Mil Powder, the Volkswagen's "emission" incident and the recent Changchun Changsheng vaccin scandal (Y. Chen, 2020). The downward trend can also be explained by the rising popularity of RI in Europe (and around the world), in 2019 alone there was 2816 European Responsible Investments Funds domiciled in Europe with a total of 496 billion AuM (Assets under management) which was a 27% increase in number of funds and 12.5% in AuM

compared with 2018 (KPMG, 2010).

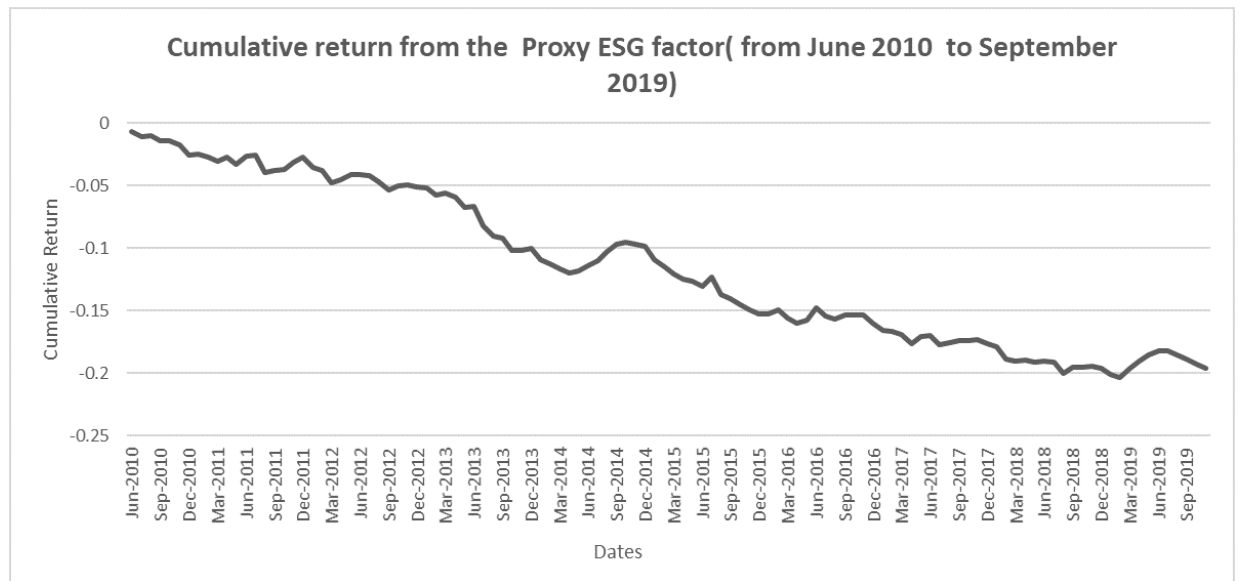


Figure 5.4: Cumulative return from the Proxy ESG risk factor (from June 2010 to September 2019)

Note: The proxy for the ESG risk factor is the return difference between the S&P 350 Europe and the S&P 350 ESG factor weighted index. Thus, the cumulative return of the ESG risk factor proxy is negative when the ESG weighted index outperforms the unweighted index.

5.3.2 iSTOXX ESG Weighted 50 index

As a second ESG risk factor proxy, we take the return difference between the EURO STOXX 50 index and the EURO iSTOXX ESG Weighted 50 index. It is important to note that this ESG-weighted index started in March of 2012 (compared to the S&P 350 Europe ESG factor weighted index which was started in April of 2010).

The EURO STOXX 50 is an index of Europe's leading blue-chip companies for the Eurozone. It provides a blue-chip representation of sector leaders in the region. It covers 50 stocks from eight countries³ (Stoxx, 2020). The EURO iSTOXX ESG Weighted 50 is an index that tracks the performance of the fifty largest securities from the EURO STOXX Index that are not involved in fossil fuels. They

³Belgium,Finland,France,Germany,Ireland,Italy,Luxembourg,the Netherlands and Spain

apply industry neutrality filters in their selection process to ensure diversification. STOXX will exclude firms that are considered by Sustainalytics (2020) (which is a global provider of ESG research and ratings) to be non-compliant with the UN Global Compact Principles or are involved in Controversial Weapons. They also exclude companies that *”generate revenues from Oil and Gas, Unconventional Oil Gas, Thermal Coal or with below 50 ESG scores”* (ISTOXX, 2020, p.2).

If firms respect the criteria cited above, they are then ranked in descending order of their free float market capitalization. The fifty largest securities from that list are chosen and ranked in ascending order of their ESG scores and issued linearly increasing weights according to their ESG scores. This means that securities with a high ESG rating will be given a bigger weight in the index (ISTOXX, 2020). As we can see in Figure 5.5, the two indices follow the same trend. However as of 2013, the iSTOXX ESG Weighted 50 index starts outperforming the EURO STOXX 50 Index and the difference between the two indices grows larger over time. This can be explained by the same reasons mentioned above regarding the first ESG-related risk factor proxy.



Figure 5.5: EURO iSTOXX ESG Weighted 50 index and the EURO STOXX 50 Index historical prices (ISTOXX, 2020, p.2)

Chapter 6: Empirical Results and Discussion

The detailed results of our investigation are presented in this chapter. First, the descriptive statistics to better understand the data, followed by the main results and their interpretation. In addition, variations of the methodology are performed to assure the robustness of the results. Finally, the main results are discussed and confronted to the existing literature.

6.1 Descriptive Statistics

Table 6.1 shows descriptive statistics for the six risk factors from which we can extract some useful information. The CMA, SMB and HML factors are not significant, meaning that the market condition has been neutral to investment-related, size-related and valuation-related styles during our sample period. Furthermore, the market beta (hereafter, MKT) and RMW factors have significantly positive average returns which means that they will likely be priced in equity returns. We reach the same conclusion for the ESG-related risk factor which has significant negative average returns because in that case, the risk factor will likely be priced in equity returns.

Table 6.1: Descriptive statistics of the factors (May 2010 to November 2019)

Factors	Sample size	Mean	Sd. Deviation	Skewness	Kurtosis	T-test for mean=0(p-value)
ESG PROXY	115	-0.0017	0.0048	-0.3229	0.2610	0.0001***
MKT	115	0.0066	0.0342	-0.4656	0.3219	0.01967**
SMB	115	0.0013	0.0153	-0.0645	-0.1382	0.1830
HML	115	-0.0022	0.0223	0.3945	-0.0286	0.1429
RMW	115	0.0036	0.0155	-0.2427	-0.3894	0.0073***
CMA	115	-0.0003	0.0113	0.0930	-0.0536	0.3895

Note: for p-values significant codes (for all tables): **0.01** '***' **0.05** '**' **0.1** '*'

Table 6.2 presents a correlation matrix between the six factors during the sample period (from May 2010 to November 2019). The numbers in parenthesis represent p-values for the null hypothesis that cross-correlation coefficient are not statistically different from zero. The table reports that the ESG-Proxy has a negative correlation with the SMB factor which is statistically different from zero at a 10% significance level. This means that, since the ESG risk factor proxy is built by subtracting the returns of an ESG weighted index to a unweighted index, when stocks that have high ESG score are performing well on the market so are the small company stocks. However, the coefficient is relatively small (-0.1675). All other factors are not statistically correlated with the ESG factor. Correlation matrixes provide a first insight to spot-out multicollinearity and to know the relationship between the factors. It can be observed that the HML and RMW factors have a significant negative correlation of -0.8463. A correlation coefficient of more than plus or minus 0.7 can be a sign of possible multicollinearity (Svetlozar, Hoechstetter, Fabozzi, & Focardi, 2010). To verify that the model does not contain multicollinearity, we compute the variance inflation factor (ViF) for the different risk factors. It is a measure of the amount of multicollinearity in a set of multiple regression variables (Chappelow, 2018). The ViF for the six factors is below 5 which means multicollinearity will not affect the results of the model (a ViF that is higher than 10 is a sign of severe multicollinearity) (Jin, 2017).

Table 6.2: Correlation between the six factors (May 2010 to November 2019)

Correlation Matrix	ESG PROXY	MKT	SMB	HML	RMW	CMA
ESG PROXY	1(0)					
MKT	-0.0588(0.5335)	1(0)				
SMB	-0.1675(0.0777*)	0.2637(0.0059***)	1(0)			
HML	-0.0046(0.9609)	0.0208(0.8257)	-0.0295(0.7541)	1(0)		
RMW	-0.0630(0.5042)	-0.0935(0.3224)	-0.0870(0.3571)	-0.8463(0***)	1(0)	
CMA	-0.0160(0.8655)	-0.1255(0.1849)	-0.0998(0.2910)	0.5831(0***)	-0.4640(0***)	1(0)

Note: Numbers in parenthesis represent p-values against the null hypothesis that the cross-correlation coefficient is not statistically different from zero

Table 6.3: Variance inflation factors for the six factors

Variance Inflation Factor					
SMB	HML	RMW	CMA	MKT	ESG
1.1568	4.3680	3.8303	1.5688	1.1095	1.0605

6.2 Equally weighted portfolio exposures

Table 6.4 represents the exposure of the equally weighted portfolio, formed with the sample funds, to the six risk factors during the whole sample period (115 months) described by Equation 4.1. The adjusted R^2 reaches 0.9578, meaning that 95.58% of the variation of the excess returns of the equally weighted portfolio are explained by the significant risk factors. The SMB, HML, RMW and CMA factors are not significant since their p-values are above the 5% threshold level. This means that these factors fail to explain the returns of the equally weighted portfolio.

The MKT factor is significant, which implies that the returns of the portfolio are partially explained by the market returns. Since the MKT factor is close to 1, this means that the returns of the portfolio move with the market. The ESG factor is significant, meaning that, at a 95% significance level, the null hypothesis that the "true" (but unobservable value) is equal to zero can be rejected. The ESG risk factor is significant and negative, it is computed by subtracting returns from an ESG-weighted portfolio to an unweighted portfolio. Thus, the negative exposures implies that the equally weighted portfolio formed by the sample funds tend to hedge the ESG-related systematic risk. What is meant by "hedging" is that funds protect their portfolio against this systematic risk by incorporating stocks with high ESG scores.

Table 6.4: Equally weighted portfolio exposures (November 2019)

	Intercept	MKT	ESG	SMB	HML	CMA	RMW	Adjusted R2
Coefficient	-0.0022	0.9604	-0.5299	0.014	0.0014	0.0336	-0.0491	0.9567
P-value	0.0029***	0***	0***	0.7556	0.9816	0.6439	0.5545	

6.3 Average exposure to the six risk factor for the sample funds depending on their strategy

The objective of the results presented in Table 6.5 is to observe how funds are exposed to the six risk factors depending on their investment strategy. To do so, the returns of the different funds are regressed against the six risk factors for the whole sample period. The different funds are then grouped into their respective investing strategy and their exposure to the different factors are averaged.

Table 6.5: Average exposures of the sample funds in their respective categories (November 2019)

Fund Style	Number of funds	Intercept	SMB	HML	RMW	CMA	MKT	ESG	Adjusted R2
Total	556	-0.0022	0.0144	0.0014	-0.0492	0.0336	0.9604	-0.5230	0.7499
Large Value	78	-0.0038	-0.0062	0.0050	-0.0819	-0.0476	1.0611	-0.4795	0.7813
Large Growth	25	0.0009	-0.0395	0.4098	0.4804	0.0570	0.8242	0.0006	0.7160
Large Blend	153	-0.0025	-0.0087	0.0364	0.0104	-0.0142	1.0053	-0.1897	0.8392
Mid Value	3	-0.0041	0.074	0.1044	-0.2905	0.1380	0.9265	-1.3205	0.6024
Mid Growth	12	-0.0013	-0.0036	-0.1405	-0.1931	0.2045	1.0150	-0.4465	0.8406
Mid Blend	17	-0.0025	0.0016	0.05185	-0.0610	-0.1095	0.9664	-0.4050	0.7262
Multi Cap Value	37	-0.0028	0.0251	0.0063	-0.0626	0.0208	0.9692	-0.7367	0.7912
Multi Cap Growth	30	-0.0013	0.0041	-0.071	-0.0675	0.1299	0.9385	-0.5540	0.7736
Multi Cap Blend	55	-0.0014	0.0350	-0.043	-0.1025	0.0656	0.9239	-0.5560	0.7334
Small Value	63	-0.0034	0.0529	0.0576	-0.0630	-0.0653	0.9842	-0.7743	0.7142
Small Growth	22	-0.0002	0.0112	-0.1428	-0.1483	0.31062	0.9899	-1.2089	0.6831
Small Blend	57	-0.0013	0.0081	0.0018	-0.0080	0.1885	0.8469	-1.0223	0.7262
NA	7	-0.0022	0.01439	0.0014	-0.0492	0.0336	0.9604	-0.5299	0.7499

The observation of the sample funds classified into their respective categories shows that the average exposure to the MKT factor is close to one for all categories, which implies that each category has well-diversified funds. It can also be stated that differences in average exposure are compatible with the different categories. Indeed, for the size-related factor, large cap categories have negative average exposure to the SMB factor while small cap categories have positive average exposure to it. For the valuation-related factor, value fund categories have a negative average exposure to the HML factor while growth fund categories have a positive average exposure to the factor. Regarding the RMW and CMA factors, there are no consistent pattern across categories.

Finally, all categories (but one the Large Growth is neutral) are negatively exposed on average to the ESG factor, meaning that the funds across these different categories have hedged against the ESG-related risk.

6.4 Equally weighted portfolios constructed by grouping funds according to their strategies.

There are some limitations to the results presented in Table 6.5. They represent averages of coefficients across categories for each risk factor. However, we cannot average p-values and thus, we cannot know whether the exposure to the risk factors are significant. To observe how the ESG-related risk factor varies depending on the strategy, portfolios need to be created. By doing this, it is possible to observe if potential patterns are significant. We thus form four equally-weighted portfolios. They are constructed by grouping funds that have the following strategies: Value, Growth, Large and Small. Other categories are discarded, because the objective is to identify significant relationships between the ESG-related factor and fund strategies that can be interpreted. The results, when Equation 4.1 is run for the whole sample period, are presented in Table 6.6.

First, it can be observed that, for all four portfolios, the ESG-related risk factor is significant at a 95% confidence level. The "Small portfolio" and the "Large portfolio" have an exposure of -0.9499 and -0.2593, respectively to the ESG risk factor. This implies that, funds having a strategy that focuses on large cap stocks tend to be more neutral to the ESG-related risk factor than the ones that focus on small cap stocks. Furthermore, the "Value portfolio" and the "Growth portfolio" have an exposure of -0.6490 and -0.5618, respectively, to the ESG risk factor. This result demonstrates that, funds focusing on value stocks tend to hedge more the ESG-related systematic risk than the ones that focus on growth stocks.

Table 6.6: Equally weighted portfolios exposures to the six risk factors (November 2019)

Strategy		Intercept	MKT	ESG	SMB	HML	RMW	CMA	Adjusted R2
Large	Coefficient	-0.0025	1.0043	-0.2593	-0.0031	0.0206	-0.0219	-0.0173	0.9644
	P-value	0***	0***	0.0324**	0.9355	0.6937	0.7551	0.7778	
Small	Coefficient	-0.0021	0.9299	-0.9499	0.0285	0.0031	-0.0552	0.0970	0.8942
	P-value	0.0759*	0***	0***	0.6960	0.9745	0.6746	0.3999	
Value	Coefficient	-0.0034	1.0133	-0.6490	0.0276	0.0219	-0.0748	-0.0369	0.9378
	P-value	0***	0***	0***	0.6425	0.7834	0.4845	0.6930	
Growth	Coefficient	5.583e-05	0.9246	-0.5618	-0.0131	-0.0951	-0.1104	0.1869	0.9019
	P-value	0.95923	0***	0***	0.8482	0.3012	0.3708	0.0851*	

Note: The Large (Small) portfolio includes funds that have a strategy of incorporating Large (Small) cap stocks. The Value (Growth) portfolio includes funds that have a strategy of incorporating Value (Growth) stocks. For a more detailed explanation on the strategies, see Section 5.1.

6.5 Value-weighted portfolio exposure

Table 6.7 represents the exposure of the value-weighted portfolio formed with the sample funds to the six risk factors during the whole sample period (115 months) described by Equation 4.1. We can point out that the adjusted R^2 is 0.9644, which is better than the model with the equally weighted portfolio (95.567). As previously observed, only the intercept, the MKT factor and the ESG factor are significant. The MKT factor is closer to 1 (0.9914 compared with 0.9604). This could mean that large-size mutual funds are more exposed to the market although the difference is very small. Finally, the ESG risk factor is still negatively significant but with a smaller coefficient (-0.4329 compared to -0.5299). Since a value-weighting portfolio puts more weight on large-size funds than smaller ones, we can hypothesize that small-size funds tend to hedge more the ESG-related risk than large ones.

Table 6.7: Value-weighted portfolio exposures (November 2019)

	Intercept	MKT	ESG	SMB	HML	RMW	CMA	Adjusted R2
Coefficient	-0.0016	0.9914	-0.4329	-0.0079	-0.0187	-0.0726	0.024	0.9644
P-value	0.0224**	0***	0.0013***	0.8532	0.7528	0.3721	0.7211	

6.6 Robustness of our Results

6.6.1 Equally weighted portfolio exposure depending on the period

As mentioned previously, the interest in RI has been growing considerably in the last couple of years and it is a popular subject in Finance nowadays. It was therefore decided to split the sample period into two sub-periods to observe whether the ESG-risk factor had changed over time and whether this change was significant. The first sub-period ranges from May 2010 to January 2015 and the second from February 2015 to November 2019.

Table 6.8 represents the exposure of the equally weighted portfolio formed with the sample funds to the six risk factors during two sub-periods described by Equation 4.1. We can observe that the intercept and the MKT factor are significant in both periods and that the coefficients are similar between the two periods. The model better explains variations of the portfolio returns in the second period (0.9705) than in the first one (0.9454). Note that the ESG-risk factor in the first period is negative but not significant at 5% level while the ESG-risk factor in the second period is negative and significant. We can also point out, that when we compare the coefficient of the second period for the ESG-risk factor (-0.8747) to the one of the full period (-0.5299), it has a higher value when computing the exposure for a more recent time-frame. This result reflects that hedging against the ESG-related systematic risk has become more prevalent over time.

Table 6.8: Exposure of the equally weighted portfolio to the six risk factors for different sample periods

Period		Intercept	MKT	ESG	SMB	HML	RMW	CMA	Adjusted R2
First Period	Coefficient	-0.0029	0.9849	-0.3044	0.0155	0.0166	-0.0414	0.0039	0.9454
	P-value	0.0259**	0***	0.1821	0.8643	0.8643	0.7565	0.9724	
Second Period	Coefficient	-0.0017	0.9522	-0.8747	0.0433454	-0.0395137	-0.0707083	0.1564279	0.9705
	P-value	0.0454**	0***	0***	0.4436	0.6133	0.6133	0.1104	

6.6.2 Five Factor Model

To verify whether the same results regarding the ESG risk factor were obtained, the model was switched to the modified version of the Carhart (1997) model as represented by Equation 4.2. Table 6.9 represents the exposure of the equally weighted portfolio formed with the sample funds to the five risk factors to the whole sample period (115 months). It can be observed that similar results as the previous model are obtained. Only the intercept, the MKT factor and the ESG factor are significant. Removing the CMA and RMW factors and adding the WML factor does not change which variables are significant at the 5% level. This illustrates the fact that by changing models, the ESG factor is still negatively significant and confirms our previous results.

Table 6.9: Exposure of the equally weighted portfolio to the five risk factors (November 2019)

	Intercept	MKT	ESG	SMB	HML	WML	Adjusted R2
Coefficient	-0.002286	0.9548	-0.5153	0.0319	0.0474	0.0004	0.9578
P-value	0.0016***	0***	0***	0.4918	0.1116	0.1259	

6.6.3 Alternate ESG proxy

As explained previously, a different proxy for the ESG risk factor was taken to verify if similar results were obtained. The second proxy (called here ESG.2) is constructed in the same way as the first one but with different indices. In the present case, the returns difference between the EURO STOXX 50 index and the EURO iSTOXX ESG Weighted 50 index were taken. There is also a difference in sample periods compared to the previous results in Table 6.4. Since the EURO iSTOXX ESG Weighted 50 index was created in March 2012 there was a sample period of 92 months (from March 2012 to November 2019) for this regression compared with the 115 months of the previous one.

Table 6.10 represents the exposure of the equally weighted portfolio, formed with the sample funds, to the six risk factors during a sample period of 92 months described by Equation 4.1. It can be noted that the adjusted R^2 is 0.9656, which is better than the model with the first ESG risk factor proxy (0.9567). This means that the significant risk factors (meaning ESG.2 as it is the only that has changed) in this model better explain the variation of the returns of the equally weighted portfolio than the previous one. The intercept, the MKT Factor and the ESG.2 factor are significant at the 5% level, which is the same result as in Table 6.4. The alternate ESG risk factor proxy still has a negative coefficient. However the coefficient is much smaller (-0.1966 for ESG.2 compared to -0.5153). With a different proxy for the ESG risk factor, the same conclusion can be drawn, which is that the equally weighted portfolio formed by the sample funds tend to hedge the ESG-related systematic risk.

Table 6.10: Equally weighted portfolio exposures with an alternate ESG risk factor proxy (November 2019)

	Intercept	MKT	ESG.2	SMB	HML	CMA	RMW	Adjusted R2
Coefficient	-0.0016	0.9320	-0.1966	0.048	0.0011	0.0122	-0.022	0.9656
P-value	0.020**	0***	0***	0.2432	0.9848	0.8686	0.7742	

6.7 Discussion

The main results of the present study are, hereby, discussed and confronted to the results of published studies.

The results detailed above show that when Equation 4.1 is run, at the end of the sample period, on the returns of an equally weighted portfolio formed by our sample funds, a significant negative coefficient for the ESG risk factor is obtained. Based on this observation, the hypothesis that the risk exposure to the ESG-related factor is significantly different from zero can be validated. Furthermore, since the ESG risk factor is constructed by subtracting returns from an ESG-weighted portfolio to an unweighted portfolio, the negative exposure implies that the sample funds tend to hedge the ESG-related systematic risk. This means that these funds, incorporate

stocks that have high ESG scores to their portfolio to protect it from this systematic risk. When a different ESG-factor proxy was used, the same conclusions were drawn. These results confirm those of Jin (2017) with data of US mutual funds. This author revealed that the sample funds used in his investigation hedged the ESG-related systematic risk.

In the present study, a value-weighted portfolio was formed and Equation 4.1 was run at the end of the sample period. The significant variables were the same as those of the equally weighted portfolio. Regarding the coefficient for the ESG-related risk factor, it was smaller than the one for the equally weighted portfolio (-0.4329 compared to -0.5299). This result implies that small-size funds tend to hedge more for the ESG-related systematic risk than large-size ones. Indeed, an equally weighted portfolio puts more weight on small funds than a value-weighted one. This result seems counter-intuitive if the following rationale is used. Smaller funds tend to hold smaller market cap stocks (Busse, Chordia, Jiang, & Tan, 2014). Moreover, it has been demonstrated that large firms tend to have higher ESG scores due to the resources and the availability that they have to provide ESG data compared with smaller ones (Drempetic, Klein, & Zwergel, 2019). Thus, the intuition would be that the large size funds, who supposedly invest in large cap firms, hedge more the ESG-related systematic risk than smaller funds. To further investigate the issue, equally weighted portfolios grouping funds that have a strategy of focusing on large/small cap stocks were formed. It was found that funds that focus on small cap stocks hedge much more the ESG-related systematic risk factor than the ones that focus on large cap stocks. This implies that fund managers, when picking small cap stocks, choose the ones that have high ESG scores (even though there are fewer small cap stocks with high ESG scores).

Furthermore, equally weighted portfolios grouping funds that have a strategy focusing on value/growth stocks were formed. It was discovered that funds which focus on value stocks tend to hedge more the ESG-related systematic risk than the ones that focus on growth stocks. This implies that value stocks have higher ESG scores than growth stocks, as portfolios that include value stocks are more protected

against the ESG-related systematic risk. This result is coherent because the main ESG based strategy is ESG integration. It is defined as *"integrating ESG factors into fundamental investment analysis to the extent that they are material to investment performance"* (Caplan et al., 2013, p.1). Thus, since fundamental investment analysis is the methodology used to pick value stocks (stocks that are considered to be trading for less than their intrinsic value), it is coherent that they have high ESG scores, as ESG factors can be part of the valuation analysis.

When running Equation 4.1 for the six risk factors on our sample funds, only the intercept, the Mkt factor and the ESG-risk factor were statistically significant at the 5% level. These results lean towards the same conclusions reached by Maiti (2020). Indeed, the study showed that a model composed of the market factor, the ESG risk factor and the size-related risk factor, performed better in explaining portfolio returns than the Fama and French (1993) three-factor model. Although the size-factor is not significant in our results, we obtain similar conclusions. As a matter of fact, when testing our modified version of the five-factor model of Fama and French (2015) and four-factor model of Carhart (1997) only the market and ESG factors were significant. Thus, there is a real case to consider ESG factors as a Beta in asset pricing models. Future studies should investigate which risk factors should be combined with the ESG-related factor to optimally explain asset returns.

Finally, to investigate the growing interest in RI, our sample period was divided in two, to seek for a possible difference regarding the ESG risk factor across time. It was observed that the coefficient was only statistically significant in the second period. These results indicate that hedging against the ESG-related systematic risk has become more prevalent over time and confirm the growing impact of ESG factors on modern investing.

Chapter 7: Conclusion

This thesis aimed at conducting a thorough analysis of the impact of ESG factors on a portfolio formed by equity mutual funds originating from the Eurozone. More precisely, the goal of this thesis was to investigate whether ESG factors can be considered as a systematic risk factor for our sample funds. Our main hypothesis was that the risk exposure to the ESG-related factor would be significantly different from zero.

7.1 Main results

To verify this hypothesis, the ESG-related related factor was combined with the Fama and French (2015) five factors: broad-market-related factor, capitalization-related factor, valuation-related factor, profitability-related factor, and investment-related factor which results in a six-factor model. The ESG-related factor is thus a sixth factor incorporated in the model of Fama and French (2015). A time-series regression was performed on the returns of an equally weighted portfolio, formed by 556 equity mutual funds, for the sample period from May 2010 to November 2019. Variations of our methodology were implemented to assure the robustness of our results.

Our main results unfold as follows. First, the risk exposure to the ESG-related factor is significantly different from zero, which validates our main hypothesis. In addition, it was found that equity mutual funds originating from the Eurozone tend to hedge this risk. The risk factor stayed significant when changing both the proxy for the ESG-related risk factor and the asset pricing model. Then, we shed light on the fact that this factor had become significant over time. Indeed, between May 2010 and January 2015, the ESG risk factor was not significant and became significant during the second half of our sample period, illustrating the growing importance of ESG factors on the financial market. It was also found that, funds of small size tend

to hedge more the ESG-related systematic risk factor than large size ones. Finally, funds that focus on value and small cap stocks tend to be the ones that are the most negatively exposed to the ESG risk factor.

These results confirm the conclusions drawn by Jin (2017) and Maiti (2020). Indeed, there is a real case for an ESG-related systematic risk factor. SRI keeps growing and is becoming a major subject in modern investing. It has grown from 22 to 30 trillion dollars between 2016 and 2018 and is expected to reach 50 trillion in the next two decades (GSIA, 2018). As this trend continues, there is a strong case to incorporate ESG criteria in asset pricing models. Indeed, combining an ESG-related systematic risk factor with Fama and French (1993) traditional risk factors would give a better prediction of the returns of a given portfolio than the factor-based models that are currently used. The key to incorporate this risk factor into asset pricing models is to be able to rely on the ESG data that is available. ESG rating agencies are growing and consolidating, they are getting bigger and more professionalized (Escrig-Olmedo et al., 2019). As this trend continues, the number of companies that will be rated will rise and the reliability of the data will be greater, leading to reliable factor-based models that incorporate the ESG-related systematic risk factor.

Another implication of the significance of an ESG systematic risk factor is the impact on the social responsibility of companies and investment firms. On top of traditional reasons for wanting to have significant ESG practices (marketing, respecting regulations, attracting employees, ...), both are realising that these factors have an important financial impact. On one hand, companies need to monitor their ESG policies to mitigate their risk (i.e.; cost of capital, supply chain, ...). It is also in their interest to have high ESG scores, as this can impact their stock price. On the other hand, investment firms need to hedge the ESG-related risk and thus, have companies with high ESG scores in their portfolio. In addition, they will have to satisfy the growing demand of their clients that want investment policies that are aligned with their values. The 2008 financial crisis has risen concerns on the ethics and regulations needed in business, and this trend is beneficial both to environmental causes and to proper business practices.

7.2 Limitations and future research

Finally, in this section, some limitations of this investigation were pointed out, together with suggestions for future research on the subject.

First, the methodology used to proxy the ESG-related systematic risk factor still remains to be verified. Indeed, it differs from how traditional risk factors are constructed. To build this risk factor in the same way, we would have to go long on a portfolio with securities that have high ESG scores and short on a portfolio with securities that have low ESG scores. In the future, once ESG ratings will be available for a significant part of listed companies, a more reliable methodology to construct the ESG risk factor will be available. Moreover, additional risk factors could be investigated by desegregating each part of the ESG factors. Thus, the environmental, social and governance factors could be tested separately to find out whether they can be considered as risk factors. In addition, the sample period of this study is relatively short, if we compare those of previous studies like the one made by Fama and French (1993) with the three-factor model. In that case, a time period of thirty years was used. Thus, the sample period for future research should be extended longer. Finally, studies on portfolios made with both securities and funds need to be expanded to other regions (Asia-pacific region, for example) since SRI practices vary depending on regions.

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Appendix A: Appendix

Table A.1: Sample list of funds

Ticker	Name
CBHSEEA AV Equity	WIENER PRIVATBANK EUR EQY-A
CBHSEET AV Equity	WIENER PRIVATBANK EUR EQY-T
IWTJ GR Equity	ERSTE RESPONSIBLE STOCK EURP
IWTC GR Equity	ERSTE STOCK EUROPE-EME-T
FP84 GR Equity	IQAM SRI EQ EUROPE-RT
IWT5 GR Equity	ERSTE STOCK EUROPE EME-A
FP85 GR Equity	IQAM QUALITY EQUITY EURP-RT
RKC4 GR Equity	RAIFFEISEN-EUR-SMALLCAPFN-VT
RK1P GR Equity	RAIFFEISEN-EUROPA-AKTIEN-A
RK1C GR Equity	RAIFFEISEN-EUROPA-AKTIEN-VT
RK14 GR Equity	RAIFFEISEN-EUROPA-AKTIEN-T
RKC3 GR Equity	RAIFFEISEN TOPDIVIDEND AK-A
ZBEURAC CZ Equity	ZB EUROAKTIV
ALFEPEA FH Equity	ELITE ALF BERG AKT FOKUS-A
ALFEPBA FH Equity	ELITE ALF BERG AKT FOKUS-B
FIMTEKA FH Equity	FIM USA
FIMUNIA FH Equity	FIM EUROPE FUND
OPSEUIB FH Equity	OP-EUROOPPA INDEKSI-II B
NOREUIG FH Equity	NORDEA EUROPE PASSV-I K
OPEURIN FH Equity	OP-EUROOPPA INDEKSI-II A
GYLEINA FH Equity	SEB EUROPEAN INDEX-A
GYLEINB FH Equity	SEB EUROPEAN INDEX-B
AKTEURA FH Equity	AKTIA EURO-A
AKTEURB FH Equity	AKTIA EUROOPPA-B
ICEEUSI FH Equity	EQ EUROOPPA INDEKSI-1 K
POPEURO FH Equity	POP EUROPE
EQEUR1K FH Equity	EQ EUROOPPA OSINKO-1K
EQEUR1T FH Equity	EQ EUROOPPA OSINKO-1T
NOREEUA FH Equity	NORDEA EASTERN EUROPE-GROWTH
NOREEUI FH Equity	NORDEA EASTERN EUROPE-INCOME

ALAEVAB FH Equity	ALANDSBANKEN EUROPE VALUE-B
PROKAE0 FP Equity	PROMEPAR GEST-KARAMA ETHIQ-O
PROKAEI FP Equity	PROMEPAR GEST-KARAMA ETHIQ-I
ALSEACT FP Equity	ALCIS SELECTION ACTIONS
QAGAFAC FP Equity	EUROPE ENTREPRENEURS
MONEULD GR Equity	MONEGA EUROLAND
OD5H GR Equity	SEB EUROCOMPANIES
HLMAXFT GR Equity	HANNOVERSCHEMAXINVEST
U1IC GR Equity	UNIEUROAKTIEN
CXWP GR Equity	NUERNBERGER EUROLAND A
EUSTAUI GR Equity	FIRST PRIVATE EUR DVDSTAUF-B
UNIEURA GR Equity	UNIEUROAKTIEN
EUSTAUF GR Equity	FIRST PRIVATE EUR DVDSTAUF-A
EUROAKT GR Equity	SIEMENS EUROINVEST AKTIEN
UNIFDSN GR Equity	UNIFONDS -NET-
FVBAKTF GR Equity	FVB-DEUTSCHER AKTIENFONDS
UIGT GR Equity	TRENDCONCEPT-UNIV-FD-AKT-EUR
HJUM GR Equity	DWS EUROVESTA
HJU8 GR Equity	DWS TOP EUROPE
DJF5 GR Equity	ALLIANZ AKTIEN EUROPA-AE
FGUC GR Equity	VE-RI EQUITIES EUROPE R
FPJA GR Equity	FIRST PRIVATE EUROPE AKT U-A
OG70 GR Equity	DEKA-GLOBALCHAMPIONS CF
FHU1 GR Equity	LBBW NACHHALTIGKEIT AKTIEN-I
DWWB GR Equity	DWS QI LOWVOL EUROPE-NC
ADIGEPV GR Equity	ALLIANZ EUROPAVISION
FTEURDY GR Equity	ODDO BHF ALGO EUROPE-CRW-EUR
DHAKTUN GR Equity	DEGUSSA AKTIEN UNIVERSAL-FDS
GENEUUN GR Equity	UNIINST EUR MINRISK EQ
U1IE GR Equity	UNIEUROPA -NET-
OXM0 GR Equity	DWS QI EUROZONE EQUITY-RC
DI7T GR Equity	INDUSTRIA-A
FMUF GR Equity	MEAG EUROKAPITAL
LBBWAED GR Equity	LBBW DIVIDENDEN STRAT EU
OG7X GR Equity	DEKA-MEGATRENDS CF
BHWEURF GR Equity	POSTBANK EUROPA
BWKEURO GR Equity	LBBW AKTIEN EUROPA
BNYPNDN GR Equity	ODDO BHF ALGO SUS LDR-CRWEUR
LBBWAMV GR Equity	LBBW AKTIEN MINIMUM VARIANZ

FK8M GR Equity	DEKA TELEMEDIEN TF
FHUM GR Equity	LBBW DIVIDEND STRG EURLND-I
BFGEURC GR Equity	SEB EUROCOMPANIES
FHUA GR Equity	LBBW DIVIDEND STRG EURLND-R
EZTJ GR Equity	HANNOVERSCHEMAXINVEST
FK8W GR Equity	KOELN-AKTIENFONDS DEKA
M3AH GR Equity	MONEGA EUROLAND
FK8V GR Equity	KOELN AKTIENFONDS DEKA O A
S4WD GR Equity	SIEMENS EUROINVEST AKTIEN
UO1D GR Equity	POSTBANK EUROPAFONDS AKTIEN
UI4M GR Equity	UNIFONDS -NET-
FHUJ GR Equity	FVB-DEUTSCHR AKTIENFONDS
HJ3F GR Equity	HANSAEUROPA-CLASS A
LH4E GR Equity	AL TRUST AKTIEN EUROPA
EZTI GR Equity	ODDO BHF ALGO EUROPE-CRW-EUR
UIGX GR Equity	DEGUSSA AKTIEN UNIVERSAL-FDS
FZ14 GR Equity	POSTBANK EUROPA
OG77 GR Equity	W&W QUALITY SELCT AKT EUR
HG4N GR Equity	VPV-SPEZIAL AMUNDI
FHUK GR Equity	LBBW AKTIEN EUROPA
OG7S GR Equity	EUROPA-INVEST
OG7I GR Equity	LINGOHR-EUROPA-SYSTEMATIC
D6R7 GR Equity	DEKASPEZIAL-CF
FH9A GR Equity	INVESCO EUROPA CORE AKTIENFD
FK8T GR Equity	DEKA EUROPASELECT
OD5B GR Equity	SEB EUROPAFONDS
OD6E GR Equity	WARBURG-CLASSIC-FONDS
HAHEIUN GR Equity	HANSEN & HEINRICH UNIVERSAL
MONBIEU GR Equity	MONEGA BESTINVEST EUROPA-A
OD6J GR Equity	WARBURG-MULTI-ASSET-SELECT-F
MMWICLA GR Equity	WARBURG-CLASSIC-FONDS
MMWISEL GR Equity	WARBURG-MULTI-ASSET-SELECT-F
DZ7L GR Equity	LEA-FONDS DWS
CSMEDVP GR Equity	CS MACS EUROPEAN DVD VALUE-P
OG7U GR Equity	ARIDEKA-CF
MIAPRE GR Equity	METZLER AKTIEN EUROPA-AR
HIDIVPS GR Equity	HI-DIVIDENDENPLUS-FONDS
DI7S GR Equity	ALLIANZ VERMOEGENSBILD EUR-A
HSBCPEI GA Equity	TRITON PAN-EUROPEAN INTL EQ

INTEMFE GA Equity	INT/CAN NEW EUROPE FR EQF-E
ATEEZEF GA Equity	PIRAEUS EUROZONE EQTY FUND-R
MEZEM2E ID Equity	MGI-EUROZONE EQUITY-M2E
MEZEM7E ID Equity	MGI-EUROZONE EQUITY-M7E
VANESII ID Equity	VANGUARD EUROZONE STK-INS-EU
MEZEM1E ID Equity	MGI-EUROZONE EQUITY-M1E
MEZEI1E ID Equity	MGI-EUROZONE EQUITY-I1E
BGIEMFA ID Equity	ISHR EMU INDEX-FLX ACC EUR
GLGEEFS ID Equity	MAN GLG RI EUR EQ LDR- S
TTIFEUD ID Equity	TT INT'L-EUROPEAN EQ-D
LM52 GR Equity	LM-QS MV EUR EQ G&I-AINCA
NTEUEQ2 ID Equity	NT INV FND EX UK EQTY INDX-2
VANEIEI ID Equity	VANGUARD EURO STK-B INV EUR
VANEINI ID Equity	VANGUARD EURO STK-B INS EUR
TTIFEUQ ID Equity	TT INT'L-EUROPEAN EQ-A
GLGEEFN ID Equity	MAN GLG RI EUR EQ LDR- N
TTIEUQB ID Equity	TT INT'L-EUROPEAN EQ-B
GAF1 GR Equity	GAM STAR-EURO EQ-ORD EUR ACC
GIQA GR Equity	MORI EASTERN EU FU-A EUR
METEAEB ID Equity	METZLER EASTERN EUROPE-B
ME61 GR Equity	METZLER EASTERN EUROPE-A
GIQB GR Equity	MORI EASTERN EU FU-BE
METEA EI ID Equity	METZLER EASTERN EUROPE-A
GAF9 GR Equity	GAM STAR-EURO EQ-ORD EUR INC
GRIOTTO ID Equity	MORI OTTOMAN FD-A
SGRMEAA ID Equity	MSMM PLC-EUROZONE EQ F A EUR
SGREAEF ID Equity	MSMM PLC-EUROZONE EQ F B EUR
LEGCTEA ID Equity	LM-QS MV EUR EQ G&I-AINCA
GRIEEUB ID Equity	MORI EASTERN EU FU-BE
GRIEEUI ID Equity	MORI EASTERN EU FU-A EUR
ME62 GR Equity	METZLER EURO GROWTH
STXEURO ID Equity	SEILERN EUROPA-EURURFOUNDERS
METEUGB ID Equity	METZLER EUROPEAN GROWTH-B
METEUGR ID Equity	METZLER EURO GROWTH
COMGGRE ID Equity	COMGEST GROWTH EUR-RA-EUR D
WYZ5 GR Equity	COMGEST GROWTH EUROPE-EUR AC
COMGRE A ID Equity	COMGEST GROWTH EUROPE-EUR AC
BYQA GR Equity	BARINGS EASTRN EUROPE-AEURIN
BRGESEE ID Equity	BARINGS EASTRN EUROPE-AEURIN

AXAREBE ID Equity	AXA ROSENBERG EUROBLOC EQY-E
AXAREBB ID Equity	AXA ROSENBERG EUROBLOC EQY-B
AXAREBA ID Equity	AXA ROSENBERG EUROBLOC EQY-A
AXAPEEB ID Equity	AXA ROSENBERG PAN EUR INDX-B
AXARPEA ID Equity	AXA ROSENBERG PAN EUR EQT-AE
AXARPEB ID Equity	AXA ROSENBERG PAN EUR EQT-B
AXAPEEA ID Equity	AXA ROSENBERG PAN EUR INDX-A
AXARPEE ID Equity	AXA ROSENBERG PAN EUR EQT-EE
AXK4 GR Equity	AXA ROSENBERG EUROBLOC EQY-B
AXK2 GR Equity	AXA ROSENBERG PAN EUR EQT-B
DIEURVB ID Equity	DF EUROPEAN VALUE-EUR ACC
AXKJ GR Equity	AXA ROSENBERG PAN EUR EQT-AE
BRANEUI ID Equity	BRANDES EURPN VALUE-I-EUR
BRAEEEA ID Equity	BRANDES EURPN VALUE-A-EUR
BAZEURO IM Equity	BANCOPOSTA AZIONARIO EURO
EIGEIGE IM Equity	8A+ EIGER
SPAHEUR IM Equity	EURIZON AZIONI EUROPA
GEEURPA IM Equity	INV AZIONARI EUROPA-A
ARCAZEU IM Equity	ARCA AZIONI EUROPA
FDIALAZ IM Equity	ALTO TRENDS PROTETTO-A
EPSQGRO IM Equity	EPSILON QEQUITY
CONAZIO IM Equity	CONSULTINVEST AZIONE-C ACC
INVERPA IM Equity	INVESTITORI EUROPA
ARTEUDA IM Equity	BNL AZIONI EUROPA DIVIDENDO
EPSPORT IM Equity	EPSILON QVALUE
PREEURO LE Equity	PRINCIPAL EQUITY FUND-EUROPE
LLBAKEU LE Equity	LLB AKTIEN EUROPA EUR
LGTEQCE LE Equity	LGT SUSTAIN EQTY ERP EUR-B
4N27 GR Equity	LGT SLCT EQ EUR0 EUR-B
OAMOBFF1 LH Equity	OMX BALTIC BENCHMARK FUND
CSEUEQA LX Equity	CS LUX EUROPEAN DVD+ EQ-AEUR
CSEUEQB LX Equity	CS LUX EUROPEAN DVD+ EQ-BEUR
CSEUEQD LX Equity	CS LUX EUROPEAN DVD+ EQ-DB
CSEUEQF LX Equity	CS LUX EUROPEAN DVD+ EQ-EBEU
CSEUEQI LX Equity	CS LUX EUROPEAN DVD+ EQ-IBEU
SWLTDVE LX Equity	SWC EF TOP DVD EUROPE AA
SWLTDEB LX Equity	SWC EF TOP DVD EUROPE AT
SWLTDEJ LX Equity	SWC EF TOP DVD EUROPE JT
SNSREUE NA Equity	ACTIAM RSPNSBL INDEX EQ EURO

PEEOEIE PW Equity	PEKAO EUROPEAN EQUITY-EUR
AFEUCRT PL Equity	IMGA EUROPEAN EQUITIES ABERT
BNCACCS PL Equity	POPULAR ACCOES
MGACCEU PL Equity	MONTEPIO ACCOES EUROPA
CAIXINT PL Equity	CAIXAGEST ACCOES EUROPA
MGEUTEL PL Equity	MONTEPIO EURO TELCOS
MTPHEAL PL Equity	MONTEPIO EURO HEALTHCARE
MGEURUT PL Equity	MONTEPIO EURO UTILITIES
MGACCOE PL Equity	MONTEPIO ACCOES
MTPENER PL Equity	MONTEPIO EURO ENERGY
MTPFINS PL Equity	MONTEPIO EURO FINANCIAL SERV
AFEUROF PL Equity	IMGA EUROFINANCEIRAS
SANACEU PL Equity	SANTANDER ACCOES EUROPA
INFNEUR SV Equity	INFOND EUROPE
PSMOLIN SV Equity	PSP MODRA LINIJA
TRISTEB SV Equity	TRIGLAV STEBER GLOBAL
KDRASTK SV Equity	GENERALI RASTKO EUROPE EQU
MPEU SV Equity	ALTA-EUROPE
NLBVRO SV Equity	NLB SKLADI-RAZVITA EVROPA DE
NLBJUZN SV Equity	NLB SKLADI-JUZNA SRED VZH EU
KDESEUE SV Equity	GENERALI EASTERN EUROPE EQUI
ADZUEVR SV Equity	TRIGLAV EVROPA
IBELBOL SM Equity	UNIFOND RENTA VARIABLE EURO
FONDEUR SM Equity	FONDONORTE EUROBOLSA
SABACEU SM Equity	SABADELL EUROPA BOLSA-BASE
BANSBSE SM Equity	SABADELL EUROACCION-BASE
FONBEUR SM Equity	GCO EUROBOLSA FI
PHARMFD SM Equity	NB PHARMAFUND FI
INTVAIN SM Equity	INTERVALOR ACCIONES INTERNAC
CAJINME SM Equity	CAJA INGENIEROS GLOBAL-A
FNDMUSU SM Equity	FONDMAFIRE BOLSA EUROPA FI
BBKBEUR SM Equity	KUTXABANK BOLSA EUROZONA FI
BBKDIVI SM Equity	KUTXABANK DIVIDENDO FI-ESTAN
IDEUR50 SM Equity	ING DIRECT FN EUROSTOXX 50
FNBEURO SM Equity	BANKIA INDICE EUROSTOX-UNIVR
ARGFBIB SM Equity	BBVA BOLSA INDICE EURO
IBEBOEU SM Equity	PBP BOLSA EUROPA FI-A
SANACCI SM Equity	SANTANDER ACCIONES EURO FI-A
FININTN SM Equity	GESTIFONSA R VAR EURO FI-MIN

CAJINGI SM Equity	CAJA ING BOLSA EURO PLUS-A
BKRVEUR SM Equity	BANKINTER RENTA VAR EURO FI
EUVDIVI SM Equity	EUROVALOR DIVIDENDO EUROPA
INVFONB SM Equity	BANKIA DIVIDENDO EUROPA-UNIV
IBERBOE SM Equity	IBERCAJA BOLSA EUROPA-A
FONFIVA SM Equity	FON FINECO VALOR
BBVSEFI SM Equity	BBVA BOLSA EUROPA FINANZAS
MADBOEU SM Equity	BANKIA EURO TOP IDEAS
EUVALEU SM Equity	EUROVALOR BOLSA EUROPEA
FONCAB5 SM Equity	CAIBA BOLS INDIC EURO-ESTAND
IBEUTI SM Equity	IBERCAJA UTILITIES
RUREURV SM Equity	RURAL EURO RENTA VARIABLE-ES
MAIIBEX SM Equity	BANKIA INDICE IBEX-UNIVERSAL
ALFAPRI SM Equity	SANTANDER DIVIDENDO EUROPA A
FONBEUOP SM Equity	CAIXABAN BOLSA GESTION EUROP
PBPALTU SM Equity	PBP GRAN SELECCION FI
SCHPEIN SM Equity	SANTANDER INDICE EURO-OPENBA
SCHGRVA SM Equity	SANTANDER INDIC ESP-OPENBANK
HAOSA1E SS Equity	HANDELSBANKEN EME TEM-A1 EUR
CSIFEZI SW Equity	CSIF CH EUROZONE EMU-DB
CSIFEZZ SW Equity	CSIF CH EUROZONE EMU-ZB
HISAKTD SW Equity	FBG EUROPE EQUITY
AMCEUEQ SW Equity	BCV ENHANCED EUROPE EQ-A
AMCEUEB SW Equity	BCV ENHANCED EUROPE EQ-B
AMCEUEC SW Equity	BCV ENHANCED EUROPE EQ-C
BHFSTEF SW Equity	SCREENER TACTICAL EQUITY FD
UBSERTI SW Equity	UBS CH EQY - ERP OPPRT EUR-P
SWCEURO SW Equity	SWC EF EUROPE AA EUR
XMTA GR Equity	AB SW FD EURO OPPORT EQ FD
CRSEPRM SW Equity	AB SW FD EURO OPPORT EQ FD
SWCEEGI SW Equity	SWC PEF EU EX CH DA EUR
JIEUEQI DC Equity	JYSKE INVEST EUROPEAN EQU CL
CEASREP FH Equity	UB ASIA REIT PLUS-ACC
CEASRET FH Equity	UB ASIA REIT PLUS-T
NOREPLI FH Equity	NORDEA EUROPE FUND-INCOME
TAPINST FH Equity	LOCALTAPIOLA ESG EU MID CAP
MNPREUI FH Equity	NORDEA PRO EUROPEAN-A T INC
GYLEEVA FH Equity	SEB EUROPEAN EQUITY-A
GYLEEVV FH Equity	SEB EUROPEAN EQUITY-B

MAEEVAG FH Equity	DANSKE INV EAS EUR CON FND G
MAEEVAD FH Equity	DANSKE INV EAS EUR CON FND D
KAKDEKA GR Equity	KOELN-AKTIENFONDS DEKA
KLNAKTD GR Equity	KOELN AKTIENFONDS DEKA O A
PVFSALL GR Equity	VPV-SPEZIAL AMUNDI
DBIMERF GR Equity	DWS-MERKUR FONDS 1
OPPES50 GR Equity	DWS QI EUROZONE EQUITY-RC
DWSEURO GR Equity	DWS EUROVESTA
DWSTP50 GR Equity	DWS TOP EUROPE
ALLAKEU GR Equity	ALLIANZ AKTIEN EUROPA-AE
OPEXASR GR Equity	DWS QI EUROPEAN EQUITY-SC
STERNEU GR Equity	DWS EUROPE DYNAMIC
LIGOESB GR Equity	LINGOHR-EUROPA-SYSTEMATIC
FK8X GR Equity	DEKA-EUROPAPOTENTIAL TF
FK8S GR Equity	DEKA-EUROPAPOTENTIAL CF
DITWEUR GR Equity	ALLIANZ WACHSTUM EUROPA-A
DEKEURS GR Equity	DEKA EUROPASELECT
ARIDETF GR Equity	ARIDEKA-TF
ARIDEKA GR Equity	ARIDEKA-CF
LEAFDWS GR Equity	LEA-FONDS DWS
HASAKSE LX Equity	HASPA SUBSTANZ
ILISEEU MS Equity	ILIRIKA SOUTHEAST EUROPE
HHEVF NA Equity	HOF HOORNEMAN EUROPEAN VALUE
ABEURSL SM Equity	CAIXABAN BOLSA SMALL CAPS EU
RKC0 GR Equity	RAIFFEISEN-EUR-SMALLCAP-A
RTOSAKT AV Equity	RT OSTEUROPA AKTIENFONDS-T
RTOSAKA AV Equity	RT OSTEUROPA AKTIENFONDS-A
HAEEEEQE ET Equity	SWEDBANK EASTERN EUROPE EQ-E
AVAEESC ET Equity	AVARON EMER EUR FUND C
AVAEESB ET Equity	AVARON EMER EUR FUND B
AVAEESA ET Equity	AVARON EMER EUR FUND A
SAAEURA FH Equity	SAASTOPANKKI EUROOPPA-A
SAAEURB FH Equity	SAASTOPANKKI EUROOPPA-B
SELEU50 FH Equity	SELIGSON & CO EUROP IND FN-A
SELE50B FH Equity	SELIGSON & CO EUROP IND FN-B
NOREUIP FH Equity	NORDEA EUROPE PASSV-PROFIT
NOREPLA FH Equity	NORDEA EUROPE FUND-GROWTH
SAMEUOK FH Equity	DANSKE INV-EUROP-EQT-GROWTH
SAMEUOT FH Equity	DANSKE INV-EUROP-EQT-INCOME

TAPREST FH Equity	LOCALTAPIOLA ESG ENVIR-A
MNPREUR FH Equity	NORDEA PRO EUROPEAN-A K ACC
FOURHAN FH Equity	FOURTON HANNIBAL UCITS
EVLEGRA FH Equity	EVLI EUROPE-A
EVLEGRB FH Equity	EVLI EUROPE-B
SAMEUVK FH Equity	DANSKE INVEST- EUR HI DIV -G
SAMEUVT FH Equity	DANSKE INVEST- EUR HI DIV -I
OTEAPEA FP Equity	OTEA PEA FUND
LBPEURA FP Equity	LBPAM MULTI ACTIONS EUR-A
LBPEURR FP Equity	LBPAM MULTI ACTIONS EUR-R
MONETOC FP Equity	MONTBLEU ETOILES-C
MANREFI FP Equity	MANDARINE REFLEX-I
BFTEDIV FP Equity	BFT EURO FUTUR ESG I-C
PLSF GR Equity	PLUSFONDS
CXWD GR Equity	PLUSFONDS
NURNADA GR Equity	NUERNBERGER EUROLAND A
FPJB GR Equity	FIRST PRIVATE EUR DVDSTAUF-A
GAPPTFL GR Equity	GAP PORTFOLIO UI
FGQF GR Equity	DWS-MERKUR FONDS 1
FGUD GR Equity	RWS-AKTIENFONDS
DEKGCTF GR Equity	DEKA-GLOBALCHAMPIONS TF
DEKGCCF GR Equity	DEKA-GLOBALCHAMPIONS CF
HJUQ GR Equity	DWS EUROPEAN OPPORTUNITIES
EURAKTI GR Equity	FIRST PRIVATE EUROPE AKT U-B
ALTLAKE GR Equity	AL TRUST AKTIEN EUROPA
DEKXTCF GR Equity	DEKA-MEGATRENDS CF
EURAKTS GR Equity	FIRST PRIVATE EUROPE AKT U-A
DEKUICF GR Equity	DEKA-UMWELTINVEST-CF
DEKUITF GR Equity	DEKA-UMWELTINVEST-TF
OG7W GR Equity	DEKA-UMWELTINVEST-TF
INDUSTR GR Equity	INDUSTRIA-A
BBEURIN GR Equity	EUROPA-INVEST
VICEKAP GR Equity	MEAG EUROKAPITAL
DEKTELM GR Equity	DEKA TELEMEDIEN TF
HJUB GR Equity	DWS TELEMEDIA TYP O
DPEUAKT GR Equity	POSTBANK EUROPAFONDS AKTIEN
HJUX GR Equity	DWS EUROPE DYNAMIC
LBBWNAC GR Equity	LBBW NACHHALTIGKEIT AKTIEN-I
LBBWNRE GR Equity	LBBW NACHHALTIGKEIT AKTIEN-R

VERVALR GR Equity	VE-RI EQUITIES EUROPE R
DWSEATO GR Equity	DWS QI LOWVOL EUROPE-NC
DPROVST GR Equity	DWS EUROPEAN OPPORTUNITIES
WWQSAEB GR Equity	W&W QUALTY SELCT AKT EUR
UNIEURP GR Equity	UNIEUROPA -NET-
LBDSERT GR Equity	LBBW DIVIDEND STRG EURLND-RT
LBDSELI GR Equity	LBBW DIVIDEND STRG EURLND-I
LBDSEIT GR Equity	LBBW DIVIDEND STRG EURLND-IT
BWKDSEU GR Equity	LBBW DIVIDEND STRG EURLND-R
CXWB GR Equity	ALLIANZ EUROPAVISION
FMUD GR Equity	MEAG EUROINVEST-A
SGRWSAV GR Equity	RWS-AKTIENTFONDS
MEAGEIN GR Equity	MEAG EUROINVEST-A
D6RF GR Equity	DEKA-UMWELTINVEST-CF
MEAGEII GR Equity	MEAG EUROINVEST-I
ARGSDYN GR Equity	ARGENTOS SAUREN DYNAMIK-PORT
HELAMIP GR Equity	HELA AMI-P
OD6Q GR Equity	G&W-TREND ALLCTN PLS-FONDS
WARTAPF GR Equity	G&W-TREND ALLCTN PLS-FONDS
DEKSPEZ GR Equity	DEKASPEZIAL-CF
DEKSPTF GR Equity	DEKASPEZIAL-TF
GTEAKTF GR Equity	INVESCO EUROPA CORE AKTIENFD
ALZEUWP GR Equity	ALL WACHSTUM EUROLAND-A
DI7X GR Equity	ALLIANZ WACHSTUM EUROPA-A
FK8L GR Equity	DEKA-TECHNOLOGIE TF
DEKEPCF GR Equity	DEKA-EUROPAPOTENTIAL CF
DEKEPTF GR Equity	DEKA-EUROPAPOTENTIAL TF
BINEURF GR Equity	SEB EUROPAFONDS
U2IS GR Equity	TBF-EUROPEAN OPPORT-EUR R
LQ3F GR Equity	METZLER AKTIEN EUROPA-AR
DITVERE GR Equity	ALLIANZ VERMOEGENSBILD EUR-A
HIDIVPE GR Equity	HI-DIVIDENDENPLUS EUROPA
FH7F GR Equity	BNY MELLON GL-S/C EUROLND-AE
GAMSEDI ID Equity	GAM STAR-EURO EQ-ORD EUR INC
GAMSEDA ID Equity	GAM STAR-EURO EQ-ORD EUR ACC
RICOMEI ID Equity	ACADIAN EURO EQTY UCITS
ME63 GR Equity	METZLER EUROP SM COMPANIES-A
GAMSIEA ID Equity	GAM STAR-EURO EQ-INS EUR ACC
GSEECEA ID Equity	GAM STAR-EURO EQ-C EUR ACC

ATGASIA ID Equity	ALBEMARLE LONGEVITY -A
CAMMEUE IM Equity	AMUNDI DIVIDENDO ITALIA
ADREURF IM Equity	ALLIANZ AZIONI EUROPA-L
SAIPTOP IM Equity	ACOMEA EUROPA-A1
CITBSEF LR Equity	CBL-EURO LEADERS EQUITY FUND
LGMMEEB LE Equity	LGT SLCT EQ EUR0 EUR-B
SCHSCEU LE Equity	SCHERRER SMALL CAPS EUROPE
4N2F GR Equity	LGT SUSTAIN EQTY ERP EUR-B
LGTEEIM LE Equity	LGT SLCT EQ EUR0 EUR-IM
DJDITES LE Equity	PALATIUM EURO EQUITIES PLUS
IFOSSIM LE Equity	CIIM EUR STOCK PORTFOLIO
RNLE GR Equity	NORDEA I SIC-NORDIC-BP-EUR
QUECLEB LX Equity	QUEST CLEANTECH FUND-B
QUECLEA LX Equity	QUEST CLEANTECH FUND-A
DA13030 LX Equity	DEKA-EUROPA AKTIEN SPEZIAL
ORAPT NA Equity	KEMPEN ORANJE PARTICIPATIES
FINCAPT PL Equity	MONTEPIO CAPITAL
BKSECEN SM Equity	BANK-EFICIEN ENERG Y MEDIOAM
ASTITBO SM Equity	LIBERBANK RENTA VARIA EURO
ARGEURO SM Equity	BBVA BOLSA EURO
BBVEUBO SM Equity	BBVA BOLSA EUROPA-A
MAEUBOL SM Equity	MARCH EUROPA BOLSA
FIBEU50 SM Equity	MEDIOLANUM EUROPA RV-S
GESRIOJ SM Equity	GESRIOJA
BESTFON SM Equity	BESTINFOND
BESTINT SM Equity	BESTINVER INTERNATIONAL
HEURAEU SS Equity	HANDESBK-EUROPA IDX CRITR-A1E
HEURAEA SS Equity	HANDELSBANK EUR TEMA-A1 EUR
UFUD GR Equity	UBS CH EQ SM CP ERP EUR-P
SGAIMPC FP Equity	SG PRUDENCE PEA-C
VALXADV GR Equity	ADVANTAGE KONSERVATIV-INC
HIMIXFD GR Equity	HANSAINVEST-PTAM ABS RETRN-A
IFOAKTR LE Equity	AIPM SMALL/MID CAPS EURO-R
REEF NA Equity	INSINGERGILISSEN REAL ESTATE
RIGAAHI SM Equity	ALCALA GESTION ACTIVA FI
BBVAAGC SM Equity	BBVA BONOS CORE FI
QIK100A AV Equity	KATHREIN MANDATUM 100-A
QIK100T AV Equity	KATHREIN MANDATUM 100-T
EUPROST AV Equity	ERSTE STOCK EUROPE-PROP-T

EUPROSA AV Equity	ERSTE STOCK EUROPE-PROP-A
EUPRVTE AV Equity	ERSTE STOCK EUROPE-PRO-VTEUR
ALLINVT AV Equity	ALLIANZ INVEST AKTIENFONDS-T
ALLINVA AV Equity	ALLIANZ INVEST AKTIENFONDS-A
KATEUEQ AV Equity	KATHREIN EUROPEAN EQUITY-I
EURPL50 AV Equity	EUROPLUS 50-A
EUPL50W AV Equity	EUROPLUS 50-T
KLASAEA AV Equity	KLASSIK AKTIEN EUROPA-A
KLASAET AV Equity	KLASSIK AKTIEN EUROPA-T
RQEUEQA AV Equity	KATHREIN EUROPEAN EQUITY-A
RQEUEQT AV Equity	KATHREIN EUROPEAN EQUITY-T
ESXTEUR AV Equity	XT EUROPA
VPKEURS AV Equity	ERSTE RESPONSIBLE STOCK EURP
APOLOST AV Equity	APOLLO EUROPEAN EQUITY-A
SAPEURT AV Equity	APOLLO EUROPEAN EQUITY-T
GUTEUPO AV Equity	GUTMANN EUROPA PORTFOLIO
SEITEMU AV Equity	IQAM SRI EQ EUROPE-RT
DANBINT AV Equity	ERSTE STOCK EUROPE-EME-T
DANBINV AV Equity	ERSTE STOCK EUROPE EME-A
DANBIVT AV Equity	ERSTE STOCK EUROPE-EME-VT
WSSAREU AV Equity	WSS-EUROPA
QIMBEVA AV Equity	APOLLO BALKAN EQUITY-VA
QIMBEQT AV Equity	APOLLO BALKAN EQUITY-T
WPRVEPA AV Equity	WIENER PRIVATBANK EURO PR-A
WPRVEPT AV Equity	WIENER PRIVATBANK EURO PR-T
CPBADSTV AV Equity	EUROPEAN DIVIDEND PLUS VA
RESMCPA AV Equity	RAIFFEISEN-EUR-SMALLCAP-A
RESMCPT AV Equity	RAIFFEISEN-EUR-SMALLCAPFND-T
RESMCVT AV Equity	RAIFFEISEN-EUR-SMALLCAPFN-VT
ESPAESA AV Equity	ERSTE STOCK EUROPE-A
ESPASET AV Equity	ERSTE STOCK EUROPE-T
EUROTSA AV Equity	IQAM QUALITY EQUITY EURP-RA
ESPASEV AV Equity	ERSTE STOCK EUROPE-VA
NOVEUII AV Equity	ASPOMA EUROPE OPPRTUNIT FUND
EUROTST AV Equity	IQAM QUALITY EQUITY EURP-RT
ALLIOST AV Equity	ALLIANZ INVEST OSTEUROPA-A
ALINOST AV Equity	ALLIANZ INVEST OSTEUROPAFD-T
COREEUR AV Equity	C-QUADRAT EUROPE ESG SER M-A
COREEUT AV Equity	C-QUADRAT EUROPE ESG SER M-T

EUPROPA AV Equity	LLB AKTIEN IMMO EUROPA EUR-A
EUPROPT AV Equity	LLB AKTIEN IMMO EUROPA EUR-T
RAFEAPS AV Equity	RAIFFEISEN-EUROPA-AKTIEN-A
EUAKTIT AV Equity	RAIFFEISEN-EUROPA-AKTIEN-T
EURAKVT AV Equity	RAIFFEISEN-EUROPA-AKTIEN-VT
RTDIVAA AV Equity	RAIFFEISEN TOPDIVIDEND AK-A
RTDIVAT AV Equity	RAIFFEISEN TOPDIVIDEND AK-T
RTDIVVT AV Equity	RAIFFEISEN TOPDIVIDEND AK-VT
ADVEAEU BU Equity	ADVANCE EASTERN EUROPE
PBZEQTH CZ Equity	PBZ EQUITY FOND
FONNMAC FH Equity	FONDITA NORDIC MICRO CAP-A
FONNMCB FH Equity	FONDITA NORDIC MICRO CAP-B
MNNORSI FH Equity	NORDEA NORDIC SMALL CAP-AKAC
MNNORSC FH Equity	NORDEA NORDIC SMALL CAP-ATIN
FONESCA FH Equity	FONDITA EUROPEAN SMALL CAP-A
FONESCB FH Equity	FONDITA EUROPEAN SMALL CAP-B
MERAVAI FH Equity	NORDEA NORDIC-INCOME
ICEPROB FH Equity	EQ EUROOPPA KIINTEISTO-1 K
ICEPROA FH Equity	EQ EUROOPPA KIINTEISTO-1 T
CELKIIN FH Equity	UB EUR REIT FUND-ACC
OPKINTB FH Equity	OP-KIINTEISTO-B
OPKINTA FH Equity	OP-KIINTEISTO-A
CELKIIT FH Equity	UB EUR REIT FUND-T
AKNORDA FH Equity	AKTIA NORDIC-A
AKNORDB FH Equity	AKTIA NORDIC-B
FONNSCB FH Equity	FONDITA NORDIC SMALL CAP-B
FONNSCA FH Equity	FONDITA NORDIC SMALL CAP-A
MANDEUT FH Equity	DANSKE INV EURO SMA CA-INC
MANDEUK FH Equity	DANSKE INV EUR SMA CAP-GRO
AUREURR FH Equity	SIJOITUSRAH EQ EUR PIENY-1K
EVDIAAA FH Equity	EVLI NORDIC A
EVDIBBB FH Equity	EVLI NORDIC B
NOENFFA FH Equity	NORDEA NEW EMER MRKT-A
NOENFFI FH Equity	NORDEA NEW EMER MRKT-I
MANREFR FP Equity	MANDARINE REFLEX-R
LAZEMIC GR Equity	LAZARD EUROPEAN MICROCAP-ACE
UNSHCOR GR Equity	UNIVERSAL-SHARECONCEPT-BC R
GENIEAT GR Equity	GENEON INV EURO-AKTIEN-P(T)
UI2X GR Equity	UNIVERSAL-SHARECONCEPT-BC I

UNTRAKT GR Equity TRENDCONCEPT-UNIV-FD-AKT-EUR

