Exploiting an Investment Opportunity Based on ESG Score

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Abstract:

The attitude of society towards the environment, good human and management practices is becoming more important and is therefore having a strong impact on the financial world. In this sense, there has been a broad discussion among investors about the topic when building their stock portfolios. Is it worth it to invest only in accordance with our values and principles? The empirical analysis consider returns of trading strategies built on company corporate social responsibility (CSR) as measured by Environmental, Social and Governance indicators (ESG) retrieved from the Thomson Reuters Datastream for the S&P 500 Index from 2002 to 2016. The results of the study point out that investors can increase their performance following a simple investment strategy based on ESG Score but in reverse. Using ESG Score as a starting point, an investor should buy the stocks with the lowest ESG Score and selling the stocks with the higher values. This trading strategy leads to high abnormal returns of up to 7,92% per year and an annualized Sharpe ratio of 1,06. Investors should adopt this trading strategy and invest in projects that encourage initiatives that meet their values and convictions.

Keywords: Socially Responsible Investing, ESG Score, Trading Strategy.

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Resumo:

A crescente importância dada pela sociedade em relação ao meio ambiente, às boas práticas humanas e de gestão teve influência e um forte impacto no mundo financeiro. Nesse sentido, tem existido uma ampla discussão entre investidores sobre o tema aquando da construção do seu portfólio de ações. Valerá a pena investir apenas de acordo com os nossos valores e princípios? Na análise empírica, são considerados os retornos das estratégias de investimento, construídas com base em *Corporate Social Responsability* (CSR), medida pelo indicador *Environment, Social, Governance* (ESG) extraído da *Thomson Reuters Datastream*, para o Índice *S&P 500*, desde 2002 a 2016. Os resultados do estudo indicam que os investidores podem aumentar o seu desempenho seguindo uma estratégia de investimento simples baseada no ESG Score, mas em sentido inverso. Usando o ESG Score como ponto de partida, um investidor deve comprar as ações com o menor ESG Score e vender as ações com os valores mais altos. Esta estratégia permite obter retornos elevados de 7,92% anuais e um Sharpe ratio anualizado de 1,06. Os investidores devem adotar esta estratégia de negociação e com os retornos obtidos, investir em projetos que vão de encontro aos seus valores e convicções.

Palavras-chave: Investimento Socialmente Responsável, ESG Score, Estratégia de Investimento.

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Glossary

CSR – Corporate Social Responsability

ESG – Environmental, Social, Governance

PRI - Principles for Responsible Investment

SRI – Socially Responsible Investing

1. Introduction

The natural expectation for a traditional investor while investing is, at the end, obtain financial return. However, in recent years it seems that not only profit matters but there are also another factors that should be taken into consideration namely those related with the positive or negative effects on society and environment of the companies when pursuing their activities. Recently, Financial Times wrote: "ESG is more than 'good karma' and analysis can help pick a winner".

With this perspective, we assist to a confrontation to the classic risk-return relationship in investment decision making where investors, by preference, want to minimize the risk in order to obtain a desired return or obtain the maximum return for a certain level of risk

This conscious approach of investment arises with the change we are assisting in our conception of the world regarding environmental issues and its human side. The threat of global warming and then several environmental disasters in recent years alerted society to world's sustainability. This mind-set evolution involves a lot of actions that are happening. The international political initiatives such as Kyoto protocol or Paris agreement are some examples. The incessant issue of poverty and the gap between rich and poor people made society act in order to believe in a better future. Seems like the actual generation are worried about the future.

The "millennials" are characterized as liberal, socially conscious and promoting their values to shape the world. They are really important to the change in investment perspective since it is expected that with their inherited considerable wealth and consequently will invest in companies that go along with their values and convictions.

The Socially Responsible Investing (SRI) is a possible solution to address the concerns mention above. It is related with screening of companies based on their corporate social responsibility. In order to do that one potential approach is using environmental, social, and governance (ESG) criteria as a measure to assess a company's behavior in this field.

To classify and compare the ESG performance of the companies, it was created a measure nominated as ESG Score. For the computation of ESG Score, according with Thomson Reuters, within the 3 pillar categories – Environmental, Social, Governance - are involved 10 different topics such as resource use, emissions, innovation, workforce, human rights, community, product responsibility, management, shareholders and CSR Strategy. To

obtain the score, different weights are attributed to each topic taking into consideration hundreds of company-level measures.

For the value-minded investors ESG Score is a criteria to measure the company's behavior in this field. Since this investment approach is relatively new, it is important to and understand if this kind of investments are profitable or if value-driven investors are willing to dismiss financial performance to go along with their beliefs.

Therefore, the main goal of this thesis is to analyze financial performance of trading strategies constructed based on ESG Score that gives as the quantification for companies' Corporate Social Responsibility (CSR). The point is to show if investing in stocks of companies with high corporate social responsibility results in considerable expected returns, i.e. could be profitable and comparable to a benchmark composed by a diversified portfolio.

The analyzed companies are from S&P 500 index, both listed and delisted for the period of 2002 to 2016. The database where were extracted the ESG Score and returns information was Thomson Reuters Datastream.

In pursuance of setting up the strategy, after retrieving the ESG Score monthly as well as returns, I ordered ESG Score into deciles. The decile one includes the companies with the 10% bottom rated ESG Score and the decile ten includes companies with 10% top-rated ESG Score. After order the companies by their ESG Score, I allocate them in portfolios, attributing the respective companies' stock returns to their corresponding decile. It is important to note that equal weights are assigned to the stocks of each portfolio and that ESG Score of month t correspond to the returns of month t+1. To recap, portfolio one is the average of all stock returns, from February 2002 to January 2017 (lagged one month), of companies included in decile one according to their ESG Score. However the ESG Score it is released yearly, the rebalancing of the portfolio will occur monthly since there is no mandatory date for companies to disclose their ESG Score information.

To decide which is the strategy that best address the main question of this thesis, meaning finding the most profitable one, the idea is to observe what is the trend line between the average ESG Score of each decile as well as the average returns for each portfolio.

Answer the implied question is fundamental once it identify if SRI are valuable only for value-driven investors or if it worth also for profit-seeking investors. Or, in case of

negative expected returns, how could conscious investors pursuing their values and beliefs with a strategy based on ESG Score.

Considering that the trend line had a negative slope, the strategy is against the expectations since go long on companies' stocks with high ESG Score and short on companies' stocks with low ESG Score results in expect returns lower than zero. The most profitable trading strategy consist on the opposite: buy stocks of companies with low ESG Score and sell stocks of companies with high ESG. The results suggests then that SRI would harm the wealth of value-driven investors and in contrary, purely profit seekers would beneficiate when investing on portfolios based on a company's CSR.

Although it is not possible to benefit directly from ESG Score screening, the recommendation for conscious investors is therefore, invest in this profitable strategy since it can even beat the benchmarks and going against its beliefs but with the profit, invest in projects that promote their values and convictions.

This thesis is structured as follows: section 2 describes the Literature Review regarding relevant key findings in this field. Section 3 describes Data and Methodology - the concept of Environment, Social and Governance (ESG) is explained, the sources of information are presented and it is clarified how the data it is applied and measured in order to get the results for the empirical study. Section 4 presents the empirical analysis and the results and their respective interpretation. It starts by the analysis of ESG Score over the years, then the strategy that best addresses ESG Score topic and finally a comparison to benchmarks and alternative ways to set up a trading strategy. Section 5 proceeds with the discussion of methods and results, giving some comments regarding weaknesses of the study and also some suggestions for further improvements on the field. Finally, section 6 concludes and highlights the key findings associated with this thesis.

2. Literature Review

Socially responsible investing (SRI) is a broad concept, it is an investment process that involves identifying companies with high CSR that can be evaluated on the basis of ESG criteria (Renneboog, Ter Horst, & Zhang, 2008). By doing so, investors try to be consistent with their personal and societal values especially because their investment decisions come not only from financial utility but also from non-financial utility regarding what they believe (Bollen, 2007). The general idea consists on social investing, ethical investments, impact investing, green investments, sustainable investments and both aware

and conscious investments. These concepts, their vague boundaries and their absence of clear definitions has been debated by researchers (Höchstader and Scheck, 2015). These topics are becoming more important and more researchers are attracted to them. What is also being discussed is about the economic viability of SRI. Reston & O'Bannon (1997) and Sauer (1997) wrote about three opposite views.

The first, '**Doing good while doing well**' implies that you can achieve better returns from choosing high-rated stocks, which means that there is a positive relationship between social and financial performance. There are two hypothesis behind this theory: available fund hypothesis (Eichholtz, Kok, & Yonder, 2012) - high corporate performance yields slack resources enabling firms to invest in socially responsible activities – and good management hypothesis (Cornell & Shapiro, 1987) – meeting requirements of the major stakeholders by ensuring product enhancement or job security, can lead to higher financial performance as a result of continued business firm loyalty.

Having a good performance on the CSR, can also mean lower costs if its related to exceptional management skills. Regarding externalities, having confidence on the firm CSR strategy and executing it well implies the reduction of future risks of scandals or lawsuits about the topic. Due to that, higher returns can be expected in this field.

The second theory, '**Doing good but not doing well'** implies a superiority of low-rated firms, which means a negative relationship related to other two hypothesis: managerial opportunism hypothesis (Posner & Schmidt, 1992) – managers tend to maximize private gains in prosperous times and placate weak financial performance by increasing the shareholder's welfare through social activities – and trade off theory (Aupperl, Carroll, & Hatfield, 1985) – social responsible activities may siphon off resources from a firm, putting it in relative disadvantage to firms that are less socially active.

In other words, higher CSR can speak for costs that could be avoided and therefore, reduce profits and also wealth of shareholders. In this perspective, managers, when attending to CSR, seeking for appreciation from promoters of social responsibility, fail to obtain compensation accordingly to shareholder's interests. Ferrell et al. (2016) studied that in this perspective, CSR is a waste of corporate resources. Thus, the fact of only investing in companies with good CSR can lead to under-diversification which affects the returns negatively.

The last theory argues that SRI neither adds nor destroys portfolio value because CSR is not priced. This perspective comes from the standard framework of finance (Hamilton, Jo, Statman, 1993) – factors that are not proxies for risk do not affect expected returns and socially responsible investors do no reduce the relative cost of capital to socially responsible companies by favoring their stocks.

Additionally, following this perspective there is an equilibrium between costs and the benefits, the pros and cons about CSR annul, meaning (Ullmann, 1985) that there is so many factors that influence the relationship between CSR and financial performance that no prevailing effect can be expected. The author also states that the result of the study could be biased by the lack of empirical data on the topic by that time.

Another section of the literature about SRI targets the comparison between the financial performance of mutual socially responsible funds and the performance of conventional mutual funds (Hamilton et al (1993), Sauer (1997), Bauer et al. (2005), Bello (2005), Geczy at al. (2005), Kreander et al (2005), and Barnett and Salomon (2006)). The problem is that many drawbacks came from this kind of analysis of SRI performance.

The most critic one is that performance can be influenced by the skills of fund manager and by doing so the results cannot be attributed only to the focus in SRI by the fund manager or by their talent itself (Baks, 2003).

Furthermore, over time the SRI fund change their social responsibility and the tendency is to converge to conventional funds, and due to that the label is not enough to ensure that the SRI fund follow the SRI principles.

Finally, it is difficult to know if the returns reflect the impact of social responsibility by the underlying securities or simply the differences in management fees, which vary widely across investment objectives and fund families.

A strand of literature investigated if the investors can benefit from making socially screening in their portfolios. Most part of the studies focus only on environment screening but there is also investors considering a multitude of criteria. There was no pattern found throughout the studies that have been done.

According to Diltz (1995) only screening for employing environmental and military have a positive impact on portfolio performance. Guerard (1997) found that there is no relevant difference between socially screened and unscreened portfolios. Derwall, Guenster,

Bauer, and Koedijk (2005) and Kempf and Osthoff (2007)confirm superior performance of certain socially responsible screens. Brammer, Brooks, and Pavelin (2006) and Hong and Kacperczyk (2009) studied the higher performance for portfolios of socially least desirable stocks. Frank and Schuhmacher (2015), reached the same conclusion but included the analysis across different geographic regions.

Derwall et al. (2011) stated two types of socially responsible investors. There are Value Driven Investors (VDI) that are concerned with the non-financial utility – their intention is to invest in companies that align with their values. In fact, they are willing to accept a loss in financial performance in return for investing in companies with high commitment to SRI. Second, Responsible Profit Seekers (RPS), not only value SRI principles but also combine it with financial profits. They will not invest in industries where SRI does not provide financial benefits. Despite the two types of SRI-related investors, there is also the type of investor named Irresponsible Profit Seeker (IPS) who is simply interested in investing in profitable investment opportunities including in controversial stocks if they show superior performance.

SRI is actually connected to ESG. In fact, ESG is one of the investment strategies falling under the SRI area. In this study with a new dataset of ESG score, I will answer if it is worth it to invest in socially responsible companies comparing to conventional investments.

The notion of SRI is closely linked to the concept of CSR. SRI addresses the conscious behavior of companies during and throughout their business activities. CSR arises when companies care about society and environment, when they assume responsibility for their effect on that context. Related to those two terms is also the environmental, social and governance (ESG) characteristics of a company, which is an approach to measure CSR.

Following SRI, an investor can explore the opportunity for empirical research on companies with better CSR, measured by ESG. Ethical aspects are not directly being taken into account by responsible investing, however it incorporates ESG factors in order to contemplate risks that might affect returns.

The Principles for Responsible Investment (PRI) is a partnership association of The United Nations and is currently the main supporter of SRI. Responsible Investing from their perspective is “an investment approach that aims to incorporate ESG factors into investment decisions, to better manage risk and generate sustainable, long-term returns".

The most part of academics follow PRI's terminology since it establishes the overall view of responsible investment.

Due to the growing importance of socially responsible investments, new market indexes have been created, among them S&P ESG Indices, DJ Sustainability World Composite or MSCI World ESG Index. The relevance of ESG is also prominent in new loans which have the interest rate also depending on ESG criteria as a measure of sustainability performance.

Despite the growing emphasis on this kind of investment, according to Colby (2017), in 2013, only 13 percent of SRI was made by singular investors and in 2016, 26 percent. Most of the SRI is attributable to institutional investors such as pension funds and other institutions. Their engagement regarding responsible investing is mostly associated to their willingness to have a healthy relation with stakeholders and a clear reputation.

Friedman (1970) was the author who stated the main arguments against SRI. The economist wrote that if SRI is not worth in financial returns, it is reasonable to invest according to their values trough the diversification of their portfolio in order to obtain good returns and therefore invest in projects that reflects their beliefs. It is possible to do so in a direct or indirect way, so what should be decided by the investor is to choose between these two options, in addition to the fact that the approaches constructed into the company's good CSR can positively, negatively or neutrally impact financial performance of portfolios.

3. Data & Methodology

3.1 Data

In this section, I'll first describe the ESG, the database used and then proceed with the time span analysis. Another part consists on the explanation of methodology for the study and finally the presentation of the performance measurement criteria. For this thesis, the empirical analysis is constructed mainly based on ESG Score and stock returns of S&P500 index from 2002 to 2016.

Environment, Social, Governance (ESG) Criteria is a set of extra-financial standards for a company's operations used by investors who are focused on socially responsible investments to screen potential investments. In order to classify and compare the ESG performance of the companies, it was created a measure nominated as ESG Score.

ESG data are collected by agencies from different sources such as CSR reports, NGO reports, annual reports, company websites and media. The information gathered are related with several categories of CSR and in the end, compiling all the data, comes out a concrete ESG Score for each specific company.

The longest database has history since 1991 by MSCI ESG metrics (formerly known as Kinder, Lynderberg and Domini Research and Analytics Inc. (KLD)). Through the platform is possible to have knowledge about strengths and weaknesses of companies in different fields, recorded as binary information. The final score for each company consists on a simple sum of strengths less the sum of weaknesses for that company. Nonetheless, according to Mattingly and Berman's (2006) it is not sufficient to aggregate strengths and weaknesses, it is also important to attempt if there is any influence of financial distress.

Thomson Reuters also as a very recognized database – ASSET4 ratings. This database has been recorded since 2002 and it counts now with more than 5000 companies with ESG Score released. In contrast to MSCI ESG metrics, ASSET4 ratings change binary information to percentage procedure.

Besides the two sources above, there are other databases compiled by Bloomberg L.P, Sustainalytics, RobeccoSAM and Ethical Investment Research Services (EIRIS).

In this thesis the database used for the ESG Score of the companies listed on S&P 500 index is from Thomson Reuters Datastream. In order to overcome any bias that would arise otherwise, it is important to note that for the study the companies being part of the sample include firms that are now listed on S&P 500 index but also the companies that were part of the index at any moment from 2002 until 2016.

For the computation of ESG Score, according with Thomson Reuters, there are 10 different topics, within the 3 pillar categories. After a revision of 400 company-level measures, 178 are selected for a subset (indicated in brackets below) and afterwards those indicators in rating will be grouped for the 10 different topics that compose the 3 pillar categories as described hereunder with their respective weighting used on the calculations:

Environmental:

- Resource Use (20) - 11%
- Emissions (22) - 12%
- Innovation (19) - 11%

Social:

- Workforce (29) - 16%
- Human Rights (8) - 4.50%
- Community (14) - 8%
- Product Responsibility (12) - 7%

Governance:

- Management (34) - 19%
- Shareholders (12) - 7%
- CSR Strategy (8) - 4.5%

Furthermore, there is another measure to take into consideration, the high level measure - the ESG Combined Score –, which is, as the name says, the combination of ESG Score and ESG Controversies Score that includes the controversies across all the 10 topics. It is related with scandals and it guarantees that the company will be penalized during the year when it occurs or on the year immediately after. For this study, only ESG Score will be used.

ESG Score, in this format created by Eikon, it is released yearly. This information is disclosed normally in the balance sheet of a company or even in other relevant documents of a firm and therefore it can be published in December but it can be also it can be revealed in different months of the year, depending on the end of the fiscal year of each company. To mitigate this constraint, the rebalancing of the portfolio will occur monthly.

For the study, the time span will be driven by ESG Score, from January 2002, starting date of the Thomson Reuters concept, until December 2016, the recent year with the most complete information. The total number of observations for the time-span 2002-2016 is composed by the number that companies have the ESG Score monthly available. The study is constructed based on 99.389 observations.

The assignment of ESG Score for a company has never been mandatory. Until today there is no legal obligation to reporting information on ESG fundamentals. Due to this voluntary based initiative, not every company has ESG Score.

The ESG Score was released for the first time in 2002. For the S&P 500 index, at this time, the mean of the ESG Score, for the 303 companies with available data was 48.6. Since this year, the mean for the rising number of the companies with ESG Score available was also increasing steadily. The downs, although very slightly, occurred in 2003 and in 2012, the former coinciding with the minimum value registered for the entire period of 8.37.

In 2011, with 468 companies with data available, the mean was 57.73 and in 2012, for 469 companies, was 57.61. The number of companies with data available reached its maximum in 2015 and 2016 with 499 firms releasing the ESG Score.

In 2015 the mean was 62.38, corresponding to the year with the biggest growth (0.07) and in 2016, ESG Score reached its maximum mean of 65.66, coinciding also with the higher value for the minimum – 24.16. The maximum value for the ESG Score was reached in 2010, which was 98.06, while the mean was 56.92. The lower maximum value happened in the beginning, 2002 - 85.05.

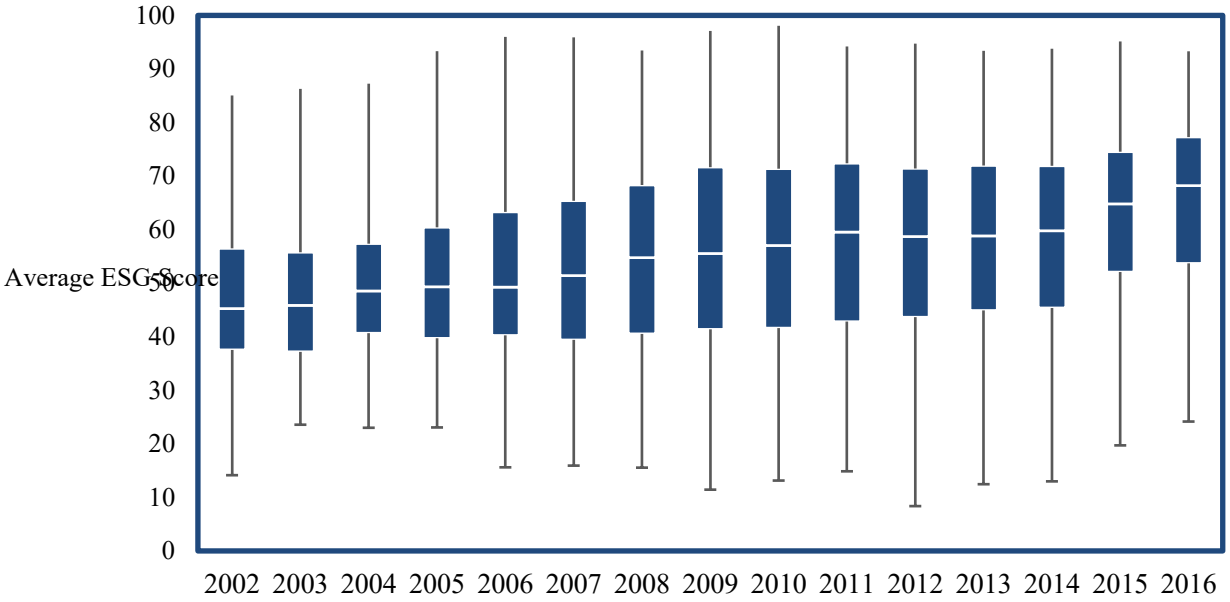
It is important to refer that after 2004, the maximum values were always superior to 90 and frequently between 90 and 95. Regarding the minimum values, there is no regular pattern, the values are between 8 and 24 but the median is around 15.

In the graph 1 is clear that most part of the values vary between 10 and 98. There is not a big dispersion in the results, the maximum and minimum values are considerably distant but between the quartile 2 and quartile 3, values are relatively close. The behavior of all statistics is similar. The minimum value are the ones that vary the most. The lower quartile as a stable although low growth, the mean is increasing through the time, the upper quartile percentile has oscillations but with an increase trend.

This statistics proves the growing trend on the importance of ESG Score. In the beginning there were a few companies having an ESG Score. Through the years, since the investors seems to give increasingly relevance to the non-financial aspects of the businesses, more and more companies started to assign the ESG Score and it is today a very important matter to consider once having a good rating gives good reputation.

Graph 1
ESG Score Distribution

This graph shows the ESG Score percentiles distribution through the sample period from 2002 to 2016. In order to reach the value for each percentile was computed the average of all the ESG Score available for the specific year. On the plot are presented the minimum and maximum values, the lower quartile meaning that below that boundary we find 25% of the sample, the median which corresponds to the value that divides the data into two parts, and the upper quartile meaning that 75% of the sample fall below that boundary.



Regarding the stock returns, the data was also retrieved from Thomson Reuters Datastream. Taking into account the methodology that is used explained further on, and the fact that ESG Score can influence the stock returns, this last variable was lagged on month. Being so, stock returns were retrieved from February 2002 to January 2017.

Additionally, to develop the Carhart model (4FF) and the five factor model, the data needed were retrieved from the Kenneth French data library. For the first model, $R_{Mt} - R_{Ft}$ is the excess return of the market portfolio (CRSP value-weighted index) over the risk-free rate. SMB is the return difference between the small stocks and big stocks. HML is the difference between a high book-to-market and a low book-to-market portfolio. A stock with a low book-to-market ratio is normally considered as growth stock, while a high book-to-market ratio is referred to a value stock. MOM is the difference between portfolios of stocks with high prior returns and low prior returns, over the past twelve months. The five factor model includes also RMW which is the return spread of the most profitable firms minus the least profitable and CMA is the return spread of firms that invest conservatively minus aggressively instead of MOM.

3.2 Methodology

To proceed with the main goal of this thesis of proving if ESG investing worth, the strategy made follows the subsequent process: first, after retrieving the ESG Score monthly from January 2002 to December 2016, I ordered ESG Score into deciles from decile 1 to decile 10. This means that the 10% lower ratings of ESG Score, are included in the decile 1 and 10% higher ratings of ESG Score are included in the decile 10. Secondly, it is necessary to make the returns of each stock correspond to its respective decile, lagged one month, what is called allocation into portfolios. Portfolio 1 is the average of all stock returns, from February 2002 to January 2017 (lagged one month) if their ESG Score is allocated to the first decile, the second portfolio is the average of all stock returns if their ESG Score is allocated to the second decile and the same logic is applied to the 10 portfolios. Moreover, equal weights are assigned to the stocks belonging to each targeted portfolios.

To demonstrate the results it is crucial to observe which strategy obtain higher results from 2002 to 2016. In order to achieve the best performance two approaches were implemented, both considering the persona an American investor and that portfolios are rebalancing monthly.

The first consists on buy winners and sell the losers, which means that the subtraction of portfolio 10 by the portfolio 1 has positive returns for the specific month. In this case the expected behavior for the investor is buy stocks of the companies with the 10% higher ESG Score and sell the ones with the 10% lower ESG Score. Acting following this behavior and reaching this results is what I expect in order to validate the theory and other previous studies which have found that socially responsible investing actually pays off.

The second formula, the investor should hold a long position on the bottom-rated ESG Score stocks and a short position on the top-rated ESG Score stocks, meaning that investing in a responsible perspective is not worth it. Following this view it is important to understand that although investors are acting against socially responsible investing, take ESG Score into account to invest and obtain profit.

To find which one of strategies is more valuable, the calculation of the cumulative returns is crucial. Furthermore, when plotting the returns of the portfolios and the ESG Score will be understandable what should be the position the investor should adopt, considering the time span of the study as being a good predictor.

To explore and compare the main strategy to other kind of analysis, there were developed another strategies: related with changes in ESG Score, positive, negative and general and using just returns but only accounting the returns that had correspondent ESG available for that specific period. For the changes in scores the procedure was the same as in the main strategy but instead of using the absolute values of monthly ESG Score to put deciles by order, it followed the change between the current month and last month. For the rest of the strategy the methodology is equal. The same happens in positive (negative) changes. We apply the strategy but just for positive (negative) changes.

Regarding the strategy of returns, instead of using the absolute values of ESG Score to put deciles by order, deciles are ordered by companies' stock returns. The following process is also allocate each stock to a decile and then make the average returns of the attributed portfolio. The difference between the two approaches within returns is that in one specific case, it uses the last month return to predict and in the other situation it uses the past twelve months excluding one.

3.2.1 Performance Measurement

In order to measure the performance and to do the comparison of strategies and respective benchmark with the index, in this specific case, S&P 500 index, were tested several measures.

The basic indicators used were mean, Sharpe ratio and skewness. The mean it is computed as the average of portfolio results for the time span in analysis. Skewness is the degree of distortion of a normal distribution from the symmetric bell curve and investors note it because it is important for them to look at the extremes – therefore they have preference for positive skewness since it better to have a small chance of large wins than have small chance of large losses. The Sharpe ratio used is the one provided by Jobson and Korkie (1981) which divide the mean by the standard deviation. Harvey and Liu (2005) find that a higher Sharpe ratio is associated with a higher t-statistic and therefore a higher significance level for the strategy. To annualize Sharpe ratio, because is what investors expect to see when looking for this measure, the formula is:

$$Sharpe\ Ratio\ annualized = Sharpe\ Ratio \times SQRT(12)$$

Equation 1 – Sharpe Ratio annualized

Additionally, the Carhart (1997) four factor model helps to evaluate the performance by controlling for the impact of the market risk, the size factor, the book-to-market factor, and the momentum factor on returns. Through this model, it is possible to capture what

is due to ESG Score by isolating the differences in returns coming from different factors of the portfolio. The following regression has as dependent variable the excess return of portfolio i in month t. As independent variable there are the subsequent factors: Mkt-Rf, SMB, HML, MOM. Alpha is also included and denotes the abnormal return of the portfolio i.

$$R_{it} - R_{Ft} = \alpha_i + \beta_{1i} (R_{Mt} - R_{Ft}) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}MOM_t + \varepsilon_{it}$$

Equation 2 – Carhart Four Factor Model

Where:

R_{it} is the return in month t of the portfolios

R_F is the risk-free rate

α is the abnormal return of the portfolio i

$R_M - R_F$ is the return spread between the capitalization weighted stock market and cash

SMB is the return spread of small minus large stocks (i.e size factor)

HML is the return spread of cheap minus expensive stocks (i.e. the value factor)

MOM is the return spread between portfolios of stocks with high and low returns over the past twelve months

Moreover, I tested the five factor model, adding two factors to the original 3-factor model controlling for market risk, size factor, book-to-market factor and also including factors of profitability and investment patterns**.** Through this regression, is it possible to see if the five factors have predictive power regarding the dependent variable and to see which variable are positively or negatively correlated to each other.

$$R_{it} - R_{Ft} = \alpha_i + \beta_{1i} (R_{Mt} - R_{Ft}) + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}RMW_t + \beta_{5i}CMA_t + \varepsilon_{it}$$

Equation 3 – Fama-French Five Factor Asset Pricing Model

Where:

Rit is the return in month t of the portfolios

RFt is the risk-.free rate

α is the abnormal return of the portfolio i

RM − RF is the return spread between the capitalization weighted stock market and cash

SMB is the return spread of small minus large stocks (i.e size factor)

HML is the return spread of cheap minus expensive stocks (i.e. the value factor)

RMW is the return spread of the most profitable firms minus the least profitable (i.e. profitability factor)

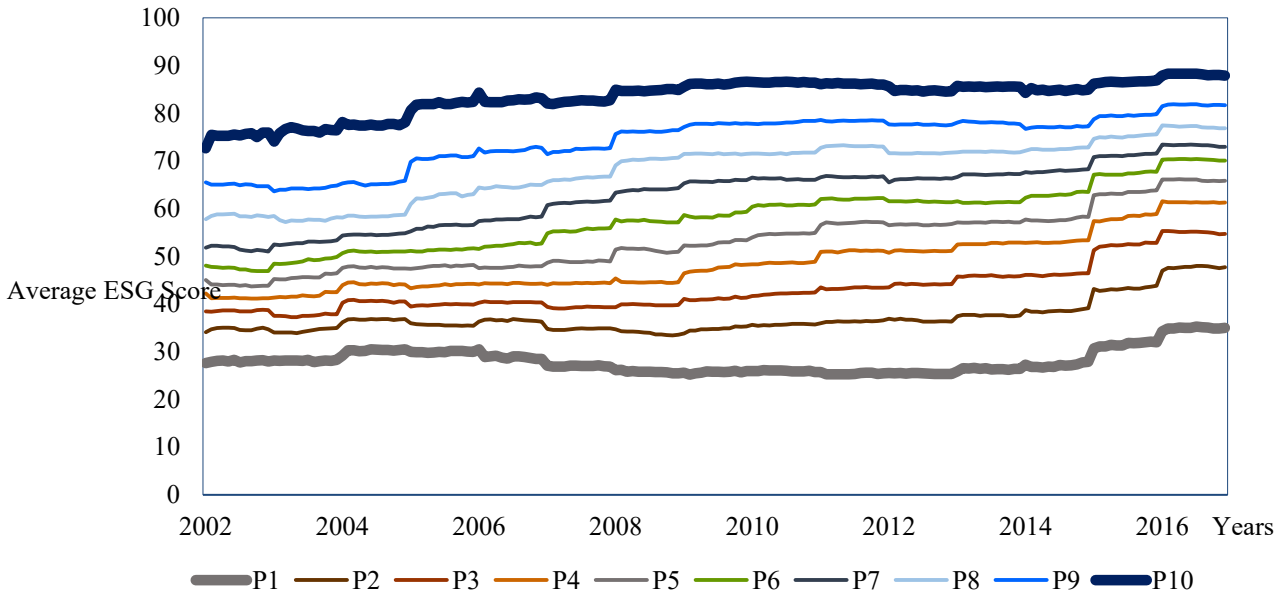
CMA is the return spread of firms that invest conservatively minus aggressively (i.e. investment factor)

4. Empirical Analysis and Results

In this section, I will demonstrate the results of the empirical analysis obtained for each procedure explained in the methodology section. Firstly, it will be presented the evolution of each portfolio in terms of absolute ESG Score, and the average monthly returns corresponding to the average ESG score of each portfolio will be shown. Secondly, the main question of the thesis will be answered, through the analysis of the average ESG Score and average returns, which mean that I will choose the best trading strategy for the sample used. Consequently, its descriptive statistics will be analyzed, and I will discuss the rationale logic behind the results. For a deeper analysis, the chosen strategy will be compared with other benchmark strategies, in terms of performance, and the cumulative results will also be presented. In third place, for the performance measurement it will be shown the results regarding asset pricing models starting with Carhart four-factor model and as robustness Fama-French five factor asset pricing model. The last analysis is about a rearrangement for the construction of each portfolio, a comparison between the decile method used and the quintile approach.

Graph 2
ESG Score Evolution

This graph shows the evolution of the ESG Score through the sample period from 2002 to 2016 for each equal-weighted portfolio of stocks. The first portfolio include the companies' stocks with the 10% lowest ESG Score and the portfolio 10, the companies' stocks with the 10% highest ESG Score.

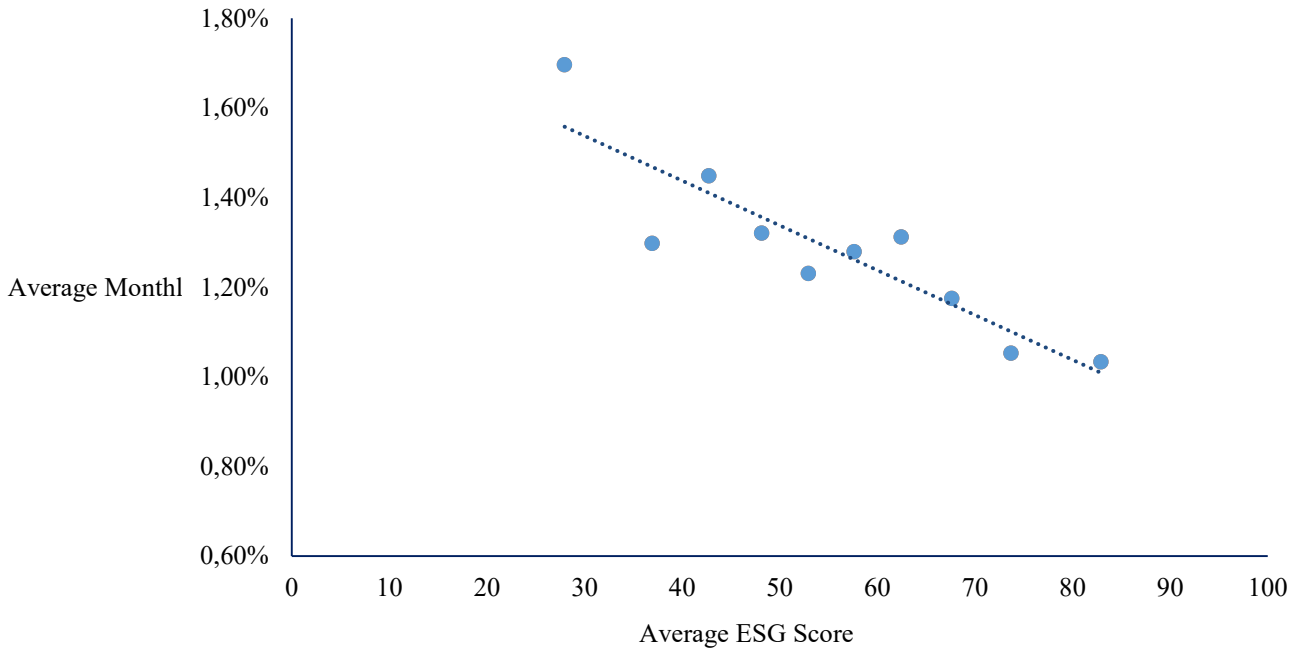


When observing the Graph 2, the trend is similar for almost all portfolios presented with the exception of the P1, P2, P3, being the first one the most discrepant. From a general perspective, focusing especially on P10, the average ESG Score is increasing smoothly over the time-span while the P1 follows the trend at a much lower level, but only from 2004 to 2006 and 2014 to 2016. From 2006 until 2014, P1 decreases smoothly and remains relatively stable. It is during this period, in mid of 2011, that the most absolute difference of the average ESG Score between P10 and P1 occurs, both extremes of the plot. Furthermore, from the plot we can extract the information of the approximately minimum and maximum ESG Score existent during the sample: 25 and 90, respectively.

Giving attention to Graph 3, it can be understood that the average returns are positive for all the portfolios, with considerably high values. Through the trend line one can identify that the trend is negative which means that setting up a trading strategy consisting of High ESG Score (H_{ESG}) minus (-) Low ESG Score (L_{ESG}) would result in negative returns, since the perfect scenario would be to invest in conscious companies and obtain returns to make up the socially responsible investment.

Graph 3
Average ESG Score vs Average Monthly Returns

This graph plots the average monthly returns of stocks corresponding to the average value of ESG Score of each equal-weighted portfolio that corresponds to deciles. The first portfolio is composed by the average ESG Score of the companies' stocks with the 10% lowest ESG Score and the last portfolio is composed by the average ESG Score of the companies' stocks with the 10% highest ESG Score. It also shows the trend line regarding those specific variables.



In contrast, the strategy that best addresses the ESG Score topic in order to make it profitable for investors is the L_{ESG} - H_{ESG}. This approach states that an investor should buy stocks of companies that are bottom-rated in terms of ESG score and sell the stocks of companies that are top-rated in terms of ESG Score.

This actually answers the main research question of the thesis, in contrary to what would be expected, according to Kempf and Osthoff (2007), since invest following the SRI principles and pursuing the personal values and convictions directly on an investment strategy is not profitable.

The logic behind this conclusion may be related to flexibility. For example, funds created for SRI as well as for all value minded investors have a very limited set of companies that can invest. In this sense, investing with the possibility of including the remaining stocks allow the investor to have an unrestricted choice.

The analysis of the individual components of the strategy indicates that, in general, the portfolios of low-ESG companies outperform the highly ranked portfolio throughout the entire sample period. One possible explanation may be due to the fact that financial institutions are increasingly concentrating on SRI assets and thus neglecting the stocks of bottom rated companies. This creates a high potential for undervaluation, since its actual performance could not be reflected in the share price due to a lower trade volume. On the contrary, portfolio ten does not achieve such high returns in times of a growing market, since the shares included are probably correctly priced as most of institutional investors already hold those securities in their portfolio.

Thus, it is possible to find an attractive investment following a strategy based on the ESG Score as previously mentioned. In order to pursue the values and convictions of conscious investors, with the obtained returns from the L_{ESG} - H_{ESG} approach, they should support specific projects that meet socially responsible initiatives.

After discovering which the trend line is related with ESG Score and returns, and the setting up the trading strategy according to it, it is crucial to analyze the descriptive statistics and compare them with the benchmarks.

In table 1, it is possible to observe that the L_{ESG} - H_{ESG} strategy has a monthly average return of 0,66%. This mean return is statistically significant with a p-value of 0.00004. The volatility of the strategy is 2,17. Thus, its annualized Sharpe ratio is 1.06. The good

thing about this strategy is that it has a positive skewness, 0,07, which an investor appreciates. Returns of this strategy are leptokurtic due to the high kurtosis and we test the normal distribution using *Jarque –Bera* test which rejects the normality assumption. This strategy has its worst returns of -5,46 and the its best returns of 8,15 which is a good sign of this strategy since the maximum amount an investor can lose is less than the maximum amount he can obtain.

Table 1

Descriptive Statistics of Low $_{ESG}$ - High $_{ESG}$ Trading Strategy

This table presents the descriptive statistics for the chosen trading strategy: Low ESG - High ESG. Following this strategy, the investor holds a long position in the bottom-rated ESG Score stocks and a short position in top-rated ESG Score stocks. The results were estimated using the full sample period from 2002 to 2016 on a monthly basis. The first p-value tests whether the mean is significantly different from zero and the second p-value whether the JB test statistic is significantly different from a normal distribution.

Summary Statistics	$L_{ESG} - H_{ESG}$ **ESG Score Level**
Mean (%)	0,66
p-value	0,00
Std. Deviation	2,17
Annualized Sharpe Ratio	1,06
Skewness	0,07
Kurtosis	1,35
JB test statistic	8,85
p-value	0,01
Maximum	8,15
Minimum	-5,46

As it can be seen in table 2, comparing with other set up strategies and with the S&P 500 index, L_{ESG} - H_{ESG} continues to provide the best results. Only the S&P 500 index seems to have higher returns but when looking at the annualized Sharpe ratio, it is verified that S&P 500 index Sharpe ratio is under the Sharpe ratio of the selected strategy. Another conclusion from the table 2 is that trading strategies constructed based on returns for the months with available ESG do not worth it since the results are very low. On a high level, it can be due to the fact that companies obtain the best returns in times which the ESG Score were not available and they are not included on this strategy.

Table 2
Descriptive Statistics Benchmark Comparison

This table presents the mean of monthly average returns, annualized Sharpe ratio and skewness for different trading strategies tested and for benchmark. The first strategy is established on ESG Score level, the deciles are ordered based on companies' ESG Score. In the second and third strategy, the deciles are ranked according to returns but only for the stocks with ESG Score available for the period. The difference between those strategies is as the noun says, one uses the last month return to predict and the second one uses the past twelve months excluding one. The benchmark index is the S&P 500 index.

Summary Statistics	$L_{ESG} - H_{ESG}$ **ESG Score Level**	$L_{Returns} - H_{Returns}$ **Last Month Returns**	$L_{Returns} - H_{Returns}$ **Last Year Returns**	**S&P 500 Index**
Mean (%)	0,66	-0,03	0,06	0,78
Annualized Sharpe Ratio	1,06	0,00	0,01	0,63
Skewness	0,07	3,64	1,93	6,54

Regarding the cumulative results of the strategy selected, presented on Graph 4, there were only a few decreases that rapidly recover while the common trend was the regular rise from the beginning of the time-span of this thesis, showed on Graph 5. It should be noted that the growth pace has accelerated subsequently to 2008, perhaps due to the investors' punishment especially to companies perceived as "good" after the financial crisis, which conducts to a better performance in the short position.

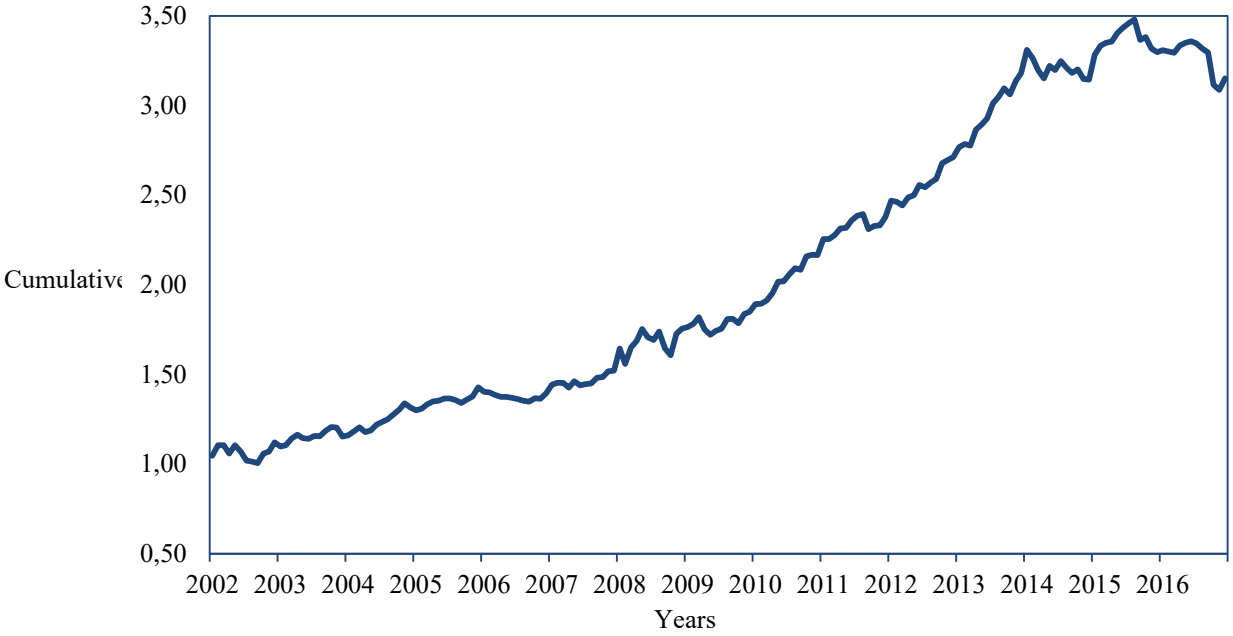
Following the last few years, Graph 6, there was a stabilization of the growth since from 2014 the cumulative returns are constantly increasing and decreasing softly. After all, it is difficult to predict what the trend is for the future.

The time split, Graphs 5 and 6, it is reflected in the results on Table 3 and it is possible to observe that the period before the crisis has a higher mean for the monthly returns but at the same time a lower Sharpe ration. This reflects the solid growth on "before crisis" period and the accelerated growth followed by uncertainty and stabilization on the "after crisis" period.

Graph 4

Low ESG - High ESG Cumulative Returns: 2002-2016

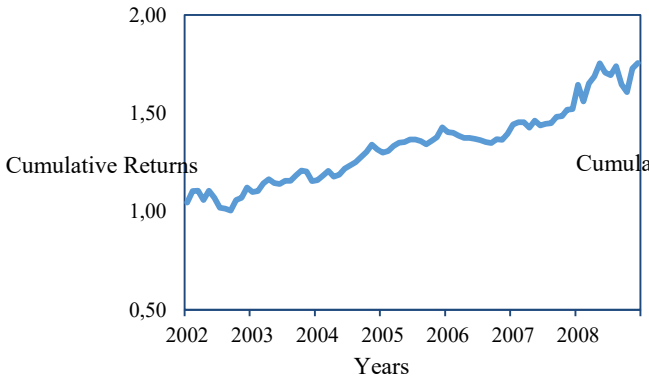
This graph plots the cumulative returns for the Low ESG - High ESG trading strategy from 2002 to 2016.



Graph 5

Cumulative Returns: Before Crisis

This graph plots the cumulative returns for the Low ESG - High ESG strategy for the period before crisis, from 2002 to 2008.



Graph 6

Cumulative Returns: After Crisis

This graph plots the cumulative returns for the Low ESG - High ESG strategy for the period after crisis, from 2009 to 2016.

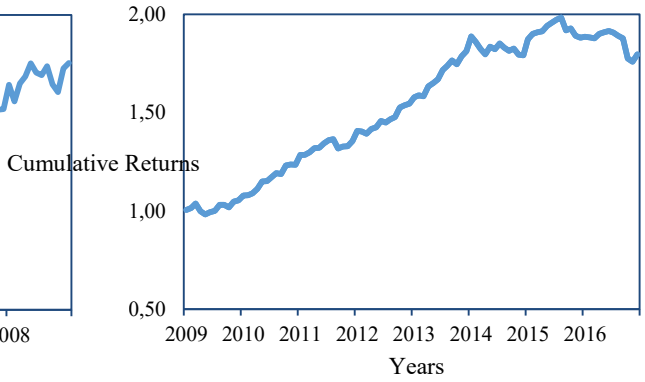


Table 3
Descriptive Statistics – Period Split Cumulative Returns
This table presents the average monthly excess returns, annualized Sharpe ratio and skewness all for the Low ESG – High ESG trading strategy but for different time periods. In the specific strategy the deciles are ordered based on companies' ESG Score. Firstly, descriptive statistics for the complete sample, then the time period before the crisis from 2002 to 2008 and, lastly, the time period after crisis 2009 to 2016.

Summary Statistics	$L_{ESG} - H_{ESG}$ **2002-2008**	$L_{ESG} - H_{ESG}$ **2009-2016**
Mean (%)	0,71	0,63
Annualized Sharpe Ratio	0,94	1,26
Skewness	0,22	-0,46

Regarding the performance measurement, it was initially regressed for the Carhart model comprising return spread, size factor, value factor, and momentum, which are not significant. As a robustness test, the Fama-French model has also been regressed and once again, neither return spread, size factor, value factor, investment factor nor profitability factor have explanatory power. Following these results, presented in table 4, it can be considered that none of the independent variables influences the returns obtained. The R^2 of both regressions are very low which means that the equations are not that helpful in predicting the value of the dependent variables. In this specif case, only approximately 0,03 of the observed variation can be explained by the model's inputs.

Table 4
Results: Carhart Four Factor Model and Fama-French Five Factor Asset Pricing Model
This table presents, for the equal weighted portfolio low ESG - high ESG trading strategy, the Carhart four factor model and Fama-French five factor asset pricing model. The low-high ESG Score strategy holds a long position in the bottom rated ESG Score stocks and a short position in top-rated ESG Score stocks. Both regressions were run over the entire sample period from 2002 to 2016 on a monthly basis. The data for each factor was retrieved from Kenneth French data library. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Alpha	**Mkt-RF**	**SMB**	**HML**	**MOM**	**RWC**	**CMA**	**R^2**
$L_{ESG} - H_{ESG}$	0,0063***	0,0008	-0,0003	-0,0009	0,0004	-	-	0,0272
$L_{ESG} - H_{ESG}$	0,0061***	0,0008	-0,0002	-0,0013	-	0,0004	0,0012	0,0298

In order to test another approach to construct the portfolio, instead of deciles, it was ordered in quintiles. In consequence, there are five portfolios instead of ten and the logic is as follows: portfolio one includes the stocks of the companies corresponding to the 20% bottom-rated ESG Score and the portfolio five is composed by stocks of companies with the 20% top-rated ESG Score. The remaining methodology applied to this approach is the same as to the portfolios composed in deciles.

The portfolios have a lower average of ESG Score when comparing to the average ESG Score shown on Graph 3 but the average returns are still positive. The trend line continues with a negative slope which means that for this quintile approach the strategy that best meets the ESG Score parameter is once again the L_{ESG} - H_{ESG}.

On Table 5, it is possible to compare both approaches (quintiles and deciles) and conclude that the best approach is the one where the portfolios are constructed into deciles once the mean of monthly returns are greater as well as the Sharpe ratio and skewness are both higher.

These results are in line with our expectations since by doing it in quintiles we are including in our portfolio the values that are not as extreme as in the first and last deciles and consequently, it is expected that the return will be lower.

Table 5
Descriptive Statistics – Quintiles vs Deciles

This table presents the monthly mean excess returns, annualized Sharpe ratio and skewness for the Low ESG – High ESG trading strategy. Specifically, in the first strategy the portfolio is formed in quintiles and the second, the standard one, formed in deciles. Both strategies were estimated for the entire sample period from 2002 to 2008.

Summary Statistics	Quintile $L_{ESG} - H_{ESG}$ **ESG Score Level**	Decile $L_{ESG} - H_{ESG}$ **ESG Score Level**
Mean (%)	0,45	0,66
Annualized Sharpe Ratio	0,91	1,06
Skewness	0,02	0,07

5. Discussion

The research and analysis on SRI topic depends on the quality of the information included in the database used. As a consequence, the results achieved in the empirical study are also influenced by the selected database. And this is the preposition for this thesis. Thus, in this section, I will describe some weaknesses of some approaches, but also comments in areas for the further improvement of the SRI topic.

Firstly, as mentioned before, the results obtained in this study do not accurately show the impact of SRI on performance but instead, it points out the specific impact of the information collected from the Thomson Reuters Datastream, to which we resemble to SRI as the sample, on performance.

In this case, since this ESG Score is to some extent a new concept, the time span of the sample could not have been extended. Due to that, the results of the empirical analysis can be somehow skewed by short-term market trends prevailing in this short period of time. To overcome this, other social performance indicators, those existing over longer time frames, such as KMV score used by Kempf & Osthoff (2007), can be included in the study.

Moreover, regarding transparency of information, the criteria tend to benefit companies with large-cap stocks since it is easier for them to disclose their reports and to access to ranking agencies. It is truly important that all documents can be identified in publicly disclosed information. If not, the companies are assigned with a zero, decreasing the final score. This leads to the fact that sustainable performance of smaller companies cannot be truly reflected in ESG Scores. In the case of impact investments, it represents the fostering of "reporting good" and not really "doing good".

What can also be better reflected in the level of ESG Score is the company's attractiveness to socially conscious investors, since there is no linked connection between their products (eg Tesla cars) with their ESG score.

In addition, the approaches adopted can be improved in order to provide more reliable results. The recommendation and suggestion is, for both portfolios and in the long and short positions, a value-weighted strategy.

Regarding the ranking of the companies, what can be done to improve it is not only consider the companies' performance but also the size of companies.

The truth is that the results presented and their interpretation are closely associated with the motivations of the investors. Although, there is no common agreement about the SRI being conditioned to negative screening, many advocates have agreed that it is crucial because if investors follow their convictions, they will make the effort to avoid industries whose activities are against their principles and values.

Lastly, it is imperative to focus on the profitability of the strategy. The abnormal achieved returns in the empirical analysis do not consider transaction costs. Transaction costs are usually tied to trading volume and, in this thesis, the rebalancing occurs monthly. This means that it cannot be clearly assumed that the strategy is profitable without counting on transaction costs, especially given the abnormal returns obtained for the time-span.

To complete, another important topic is to deeply investigate the logic behind the return differences between the bottom and top-rated ESG portfolios. Answering these questions provides an interesting field for further research.

6. Conclusion

The relevance of SRI topic can be linked to the fact that there are a lot of investors attempting to invest considering their values and beliefs. This thesis comprises a meticulous insight for SRI. In this investment field, the investor can actively manage his portfolio by choosing stocks related to the socially responsible behavior of the companies measured by ESG Score.

It is really challenging to investigate this socially conscious approach to investing and the attitude of the investors: if they are willing to discard financial performance in exchange for investing in stocks of companies that are aligned with their values. The results of this empirical analysis have made it possible to clarify the research question on whether the CSR-based investment of firms actually offsets value-oriented investors or profit-oriented investors.

After answering the aforementioned question, the objective of this thesis was to evaluate the performance of each trading strategy where the portfolios were constructed based on the ESG Score. In order to do so we used some descriptive statistics such as the mean, Sharpe ratio, skewness which provides a good confidence for the strategy results and indicators of performance measurement due to the four and five factor model, the size,

market value, momentum, investment and profitability, that do not have explanatory power to explain the results.

The results showed that a long-short strategy that holds a long position on top-rated ESG Score stocks and a short position in bottom-rated ESG Score stocks have negative expected returns. On the contrary, a simple trading strategy based on ESG Score can lead to high abnormal returns and even outperform the benchmark, S&P500 index if the investor chooses to hold a long position on stocks of companies with the lowest 10% ESG Scores and a short position in companies' stocks with the highest 10% ESG Score.

There are two reasonable interpretations regarding the results. First, SRI strategy does not appear to be a profitable strategy for value minded investors, according to our sample, using Thomson Reuters Datastream. Therefore, the conclusion is in opposition to the theory written by Kempf and Osthoff (2007). Thus we recommend to value-driven investors to fully diversify their portfolio and then invest in projects that are tied to their values and beliefs. Second, the attractive investment opportunity of a trading strategy based on the ESG Score provides high abnormal returns to the purely profit-seeking investors, given its risk-return nature. The deciles approach appear to be the most profitable comparing to the quintiles since by doing it in quintiles it is included in the portfolio the values that are not as extreme as in the first and last deciles.

Nonetheless, it is not possible to conclude the impact that the CSR of a company measured by the ESG Score has on its financial performance once there is no statistical relation between those areas.

Additionally, due to what has been mentioned above and the fact that cumulative returns have stabilized in recent years, it is difficult to predict with confidence whether, in the future, the positive trend will remain as in previous years.

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