A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics.

Responsible investing, financial performance, or both?

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17-12-2021

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Abstract

Are investors sacrificing risk-adjusted returns by incorporating Environmental, Social, and corporate Governance considerations into their portfolios? Based on Refinitiv data, we analyze and compare the risk-adjusted performance of the buy and hold strategy of equally weighted portfolios composed of US based, high and low ESG ranking stocks from 2006 to 2020. I apply the same approach on portfolios composed of high and low Social, Environmental, and Governance scores separately. I found that, the equally weighted portfolios composed of high-ESG scores stocks from the S&P 500 Equal Weight Index universe, stage lower absolute returns than the benchmark yet acts as a tail-risk mitigation tool. It also generates close but lower absolute returns and significantly inferior risk-adjusted returns than the equally weighted bottom quartile ESG portfolio during the analysis period.

Keywords: ESG, Responsible Investing, Positive screening, Long-only strategy, Financial Performance, Risk-adjusted returns Analysis.

Acknowledgment

I would like to thank my supervisor, Melissa Porras Prado for her guidance, encouragement, and highly esteemed feedback. Throughout the writing of my master's thesis, as I have acquired a great deal of new valuable knowledge, I have also accumulated lots of love, friendships, and support. I would also like to sincerely thank my dear family and friends for all the encouragement, unconditional love, and their presence in my life.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1. Introduction

Even though it is more often recognized as a recent practice, ESG investing has been around for multiple decades since the 1960's where it was referred to as "Socially Responsible Investing" (SRI). During that time, investors started to exclude stocks and even whole industries from their portfolios embracing commercial activities such as alcohol, involvement with apartheid regimes, tobacco production, gambling, firearms etc. However, the main difference was that, during that time, the SRI screening process was solely based on virtuous and moral criteria and practices mostly negative screens, while ESG investing supposes that embedding ESG factors also have a financial relevance. Four decades later, SRI morphed officially into ESG and started encompassing a much wider agenda "when ex UN Secretary General Kofi Annan, who in 2004, reached out to 50 CEOs of major financial institutions and invigorated them to participate in a collaborative initiative sponsored by UN Global Compact and endorsed by the International Finance Corporation (IFC) and the Swiss Government to integrate ESG into capital markets. The outcome of this reunion was a report titled "Who Cares Wins," in which Ivo Knoepfel made the case that embedding environmental, social and governance factors in capital markets makes good business appreciation and leads to more ecological markets and better effects for societies. Simultaneously, UNEP/Fi produced "Freshfield report" which revealed that ESG issues are significant for financial valuation. These two reports formed the pillar for Responsible Investment (PRI) principles launch at the New York Stock Exchange in 2006 and the launch of the Sustainable Stock Exchange Initiative (SSEI) the following year" (Kell, 2018). Additionally, prompted by consumers pressure and the continuously growing demand over the years, ESG criteria seized an important spot and became a chief factor behind investment decisions and a growingly indispensable part of the investment process. Investors are integrating ESG data into their investments processes to benefit from a more complete understanding of the companies in which they invest their money in, ensuing them to achieve

and even improve their desired financial performance while staying aligned with their own values. Lately, ESG investing attained mainstream and its considerations for improving investment performance have become prevalent, even among classical investment managers who are starting to acknowledge the importance of the inherent risks and prospects when choosing securities. In section 2, I give a literature review on responsible investing, its financial performance and risk analysis. In section 3, data selection and limitations are presented. Section 4 explains the methodology applied to assess the risk-adjusted returns of the high-scores, the low-scores portfolios, and the benchmark. In this section, the metrics used to compare the portfolios performance are defined, displayed, and analyzed. In section 5, I exhibit the portfolios financial performance results, risk estimations and regression analysis and make the appropriate comparisons. Eventually, section 6 comprises the thesis conclusion where I sum up the analysis results and make deductions.

First, let us plainly define sustainable investing and ESG criteria. Environmental, Social and Governance criteria, or ESGs are arranged standards created to help investors find companies with values that match their own. ESGs also help investors avoid companies with bigger financial risk due to certain environmental and social practices. Because of its socially conscious roots as aforementioned, ESG investing has been called responsible investing, impact investing, sustainable investing, or even socially responsible investing. Starting with the Environmental criteria (E), it denotes the way a company performs regarding the environment or as a "guardian" of nature. It includes the company's natural resources conservation, waste, pollution, and energy use. The Social criteria (S) scrutinizes how the company manages its relationships with employees, contractors, clienteles, and the community where it operates. Eventually, the Governance criteria (G) deals with the company's leadership, internal controls, audits, executive pay, and shareholders rights (Chen 2019) A non- exhaustive list of ESG factors is shown in Appendix 1. Nonetheless, it is important to highlight that most companies

won't often triumph all ESG dimensions at the same time. Thus, investors are counselled to choose which factor is most important to them in accordance with their values and perspectives. Once regarded as intangible or qualitative information, ESG factors are currently a quantifiable information thanks to the factors analysis, the identification refinement, and the easier access to corporate information. Nowadays, numerous brokerage firms, robo-advisors, and mutual funds offer products that engage ESG criteria due to the exponentially rising demand over the years (Investopedia Team, 2021). In fact, evidence backing ESG investing's attractiveness evolution is supported by the "Global ESG Survey 2021", a new BNP Paribas survey conducted in 2021 across 356 institutional investors across North America, the Asia pacific, and Europe representing more than 11 trillion € of assets under management. "Over a fifth of respondents (21%) say ESG is central or a necessity to their business – compared to just 10% in 2019. The survey found that 59% percent of the surveyed investors were motivated to invest in ESG by the brand and reputation, 45% by the improved long-term returns, 39% by the decreased investment risk and 46% by the external stakeholder requirements" (The ESG Global Survey, BNP Paribas, 2021). Furthermore, on a higher level, and according to investment research made by Morningstar, "the number of sustainable open-end and exchange-traded funds available to U.S. investors augmented to 392 in 2020, up by 30% from 2019. These funds experienced a nearly quadruple increase during the past 10 years. Sustainable fund flows represented practically one fourth of overall flows into funds in the U.S" (Morningstar, Inc, 2020). This high increase in the number of ESG funds perfectly explain the parallel increase in global sustainable assets under management. According to the Global Sustainable Investment Association, "ESG assets exceeded $35 trillion in 2020 up from $30.6 trillion in 2018 and $22.8 trillion in 2016 reaching a third of current total global assets under management". All these polls and surveys results analyzing ESG popularity among investors and its growth shed the light on the upward trend of this practice. ESG investing has moved from a complementary

element to the center of business decision making. Nevertheless, even though the popularity of ESG stocks has risen, investors still highly esteem financial performance when it comes to selecting investments. Raghavan Mayur, president of TechnoMetrica, the research firm which conducted the IBD/TIPP Poll about ESG investing in partnership with Investor's Business Daily, stated that "even among the groups that were more favorable to ESG values, they still ranked return on investment as more important". This thesis will try to verify, through a series of tests, whether a connection between positive screening investment approach and risk-adjusted returns is prevailing and whether it generates better results than investing in the benchmark (S&P500 Equal Weight Index), and in a non-socially responsible portfolio, during the analysis time horizon from 2006 till 2020.

2. Literature Review

Drawing considerable attention over the last decade, responsible investing fueled academic research and literature analyzing its different implications in terms of risk and returns when mainly investing in socially responsible stocks or integrating ESG factors in asset allocation, security selection, and portfolio construction decisions with other different trading strategies. Focusing on its risk implications, multiple experimental studies highlight the idea firms devoted to managing their environmental, social, and corporate governance risks verge to perform better in social ratings and subsequently diminish their financial risk (Benlemlih and Gerer-Potin 2017; Bouslah, Kryzanowski, and M'Zali 2013; Boutin-Dufresne and Savaria 2004; Harjoto and Jo 2014; Jo and Na 2012; Lee and Faff 2009; Oikonomou, Brooks, and Pavelin 2012). Other literatures emphasized the incorporation of the ESG approach into investment decisions since it minimizes the portfolio downside risks while seeking abnormal returns (Kumar et al. 2016; Berg and Lange 2020). On the other hand, a great deal of research has tackled the role of ESG issues in financial analysis, trying to attest a value-additive or value-detracting effect of ESG assimilation in portfolio management.

"Can ESG Add Alpha? An Analysis of ESG Tilt and Momentum Strategies" is one of the "Journal of Investing" articles. It analyzes two relatively high tracking-error global trading strategies, a tilt strategy and a momentum strategy constructed using ESG data (Nagy, Kassam, Lee, 2016). They found that both model portfolios outperformed the MSCI World Index from 2008 till 2016, while also refining the ESG profile of the portfolios. contrastingly, different results arise from another research paper entitled "Corporate social responsibility and stock market performance" analyzing a large sample of socially responsible stocks performance compared to a control sample of equivalent size for 14 years (Becchetti and Ciciretti, 2009). They found that single socially responsible stocks (high ESG rating stock) have on average significantly poorer returns and unconditional variance than control sample stocks when monitoring for industry effect. This viewpoint is also supported by "ESG preferences, risk and return" paper (Cornell, 2020) that analyses investor preferences and risk factors which affect expected returns for high-ESG ratings companies. The paper also supports the hypothesis of sacrificing returns for the sake of social benefits. Consistently with this finding, research papers such as "The price of sin: The effects of social norms on markets" claimed that excluding "sin" stocks, which are usually publicly traded companies involved in producing tobacco, gaming, and alcohol, comes with a cost as It was found that they generate "higher expected returns than otherwise comparable stocks consistent with them being neglected by norm-constrained investors and facing greater litigation risk heightened by social norms" (Hong and Kacperczyk 2009). Yet, even though investors preferences for high ESG rating companies can contribute to "lowering costs of equity capital and function as a hedge against unexpected changes in environmental regulations and climate shocks", there is still a cost of doing so in the form of inferior expected returns for investors. Thus, to current times, studies have not given a reliable and coherent conclusion about the relationship between financial performance and ESG scores. All these studies found a concrete basis in a field where there is still much to explore. This

thesis contributes to the empirical corporate social responsibility studies by aiming to shed light on this important issue as I break down the ESG score into its three components and evaluate the risk-adjusted performance of US based firms selected from the S&P 500 Equal Weight index according to their ESG scores over a sample period of fourteen years starting from 2006 till 2020.

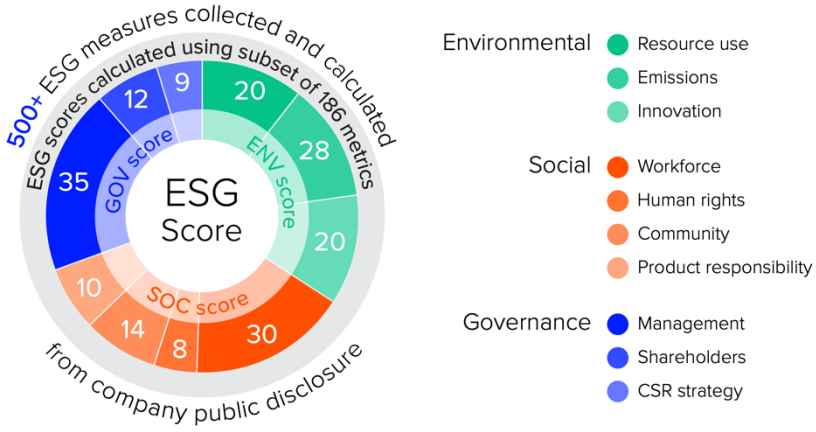
3. Data selection and limitations

3.1 ESG scores

An ESG score is multidimensional numerical measure that evaluates a company's performance established on a wide range of environmental, social and governance themes. As the trend of ESG investing is unceasingly rising, so do companies' disclosures of ESG data and the importance of ESG rating agencies metrics. Nevertheless, it is crucial to underline that a company can carry simultaneously different scores and rankings across different rating agencies due the variety of techniques used in quantifying ESG scores (ACCF, 2018). ESG ratings differ from an ESG ratings source to another as each one has an exclusive methodology for conveying company-specific ratings. Hence, when relying on ESG scores to take investment decisions, investors must extensively verify agencies score calculation methodologies and make sure they are aligned with their personal ESG preferences. The main ESG database used for this thesis is provided by Refinitiv, a universal provider of financial market data and infrastructure. Refinitiv ESG scores are calculated based on incontestable reported data in the open domain and accessible for all companies and historical fiscal periods in the ESG global coverage. "It reverts to fiscal year 2002 for approximately 1,000 U.S based and European companies covering 10 main themes including environmental product innovation, emissions, shareholders, human rights, etc. These themes are classified according to three columns: environmental (E), social (S) and corporate governance (G). The Refinitiv ESG score is the categories weightings sum

which adjust according to the sector for the "environmental", "social", "governance" categories as displayed in Exhibit1. Every pillar along with the overall ESG score range from 0 being the worst to 100 as the best possible score" ("ENVIRONMENTAL, SOCIAL and GOVERNANCE (ESG) SCORES from REFINITIV" 2021).

Exhibit 1 : ESG scores composition



3.2 Data sample

The data sample used for this thesis is entirely extracted from the U.S. market. It comprises all the S&P 500 index companies which is considered as the most used U.S benchmark index and the best single estimate of large-cap U.S equities representing around 80% of the U.S. market. After eliminating companies without return record over the analysis time horizon, the final data set yielded 504 firms spread over 11 sectors consisting of 6675 observations over the full sample from 2006 to 2020. The upward trend of ESG scores over the last decade can be seen in Exhibit 2 displaying the dissimilarity of the average ESG scores and its three pillars separately from 2006 to 2020. The average ESG scores of the S&P 500 companies increased by 25.1% in 14 years transitioning from an average score of 37.87 across all companies in 2006 to an average score of 62.93 in 2020 demonstrating the overall improvement and integration of large U.S companies to corporate social responsibility ethic strategies especially over the last decade. A higher slope can also be noticed over the four curves starting from 2014 which can

be explained by the new ESG information disclosure reforms and frameworks, whether they are voluntary, or required at the federal level by the U.S Securities and Exchange Commission (SEC) and imposed in the European Union by the European Commission (EC) such as the Sustainable Finance Disclosure Regulation (SFDR), the Corporate Sustainability Reporting Directive (CSRD) and the Green Taxonomy. In addition, the Paris Agreement at COP21 held on the 12th December of 2015, unprecedently created a landmark and a legal framework on an international level, bringing all states into a common cause to contest climate change and adjust to its effects through a binding agreement.

Exhibit 2 : Average ESG, E, S and G scores evolution of U.S companies

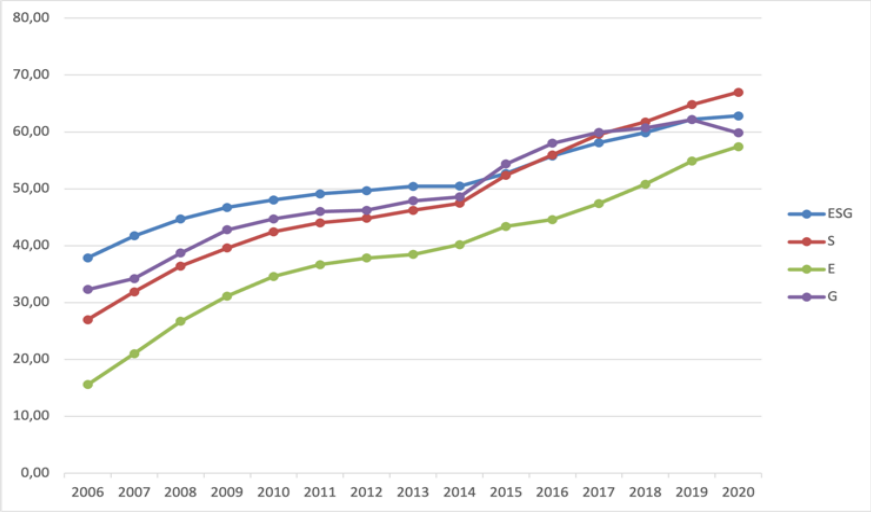
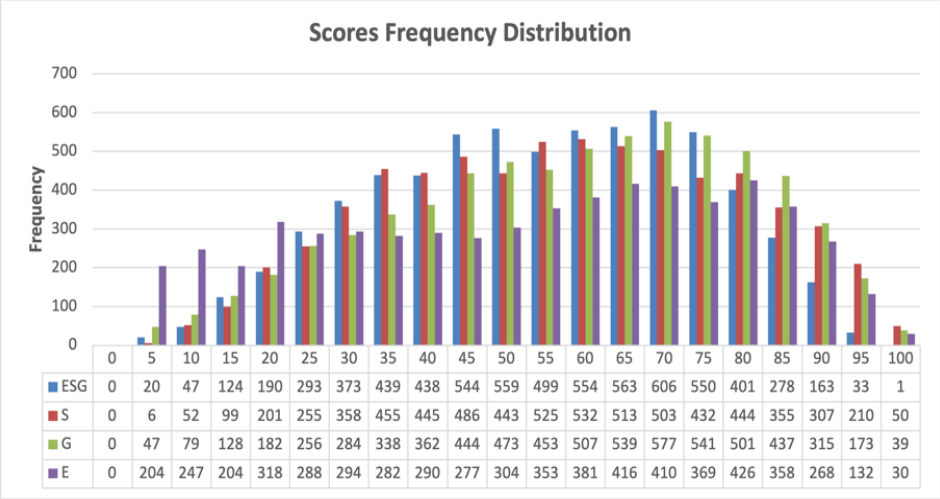


Exhibit 3 displays the frequency of ESG scores present for all firms in our sample data over the chosen time horizon (2006-2020). The distribution appears to be skewed vaguely to the right. It emphasizes that overall ESG scores are mainly concentrated between 40 and 75 telling us that most companies in the S&P 500 are spread on the second quartile and the third quartile which are described by Refinitiv as "satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly and good relative ESG performance and above average degree of transparency in reporting material ESG data publicly" respectively ("Scores ESG" n.d.). In addition, we notice a slightly higher frequency

of low Environmental scores within our sample during the analysis time horizon compared to the other pillars and the overall ESG score.

Exhibit 3 : ESG scores frequency distribution



	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
ESG	0	20	47	124	190	293	373	439	438	544	559	499	554	563	606	550	401	278	163	33	1
S	0	6	52	99	201	255	358	455	445	486	443	525	532	513	503	432	444	355	307	210	50
G	0	47	79	128	182	256	284	338	362	444	473	453	507	539	577	541	501	437	315	173	39
E	0	204	247	204	318	288	294	282	290	277	304	353	381	416	410	369	426	358	268	132	30

3.3 Limitations

ESG ratings and scores vary from a provider to another. Each provider has an exceptional methodology for assigning company-specific ratings. Consequently, when relying on ESG scores to take investment decisions, investors must extensively verify agencies score calculation methodologies and corroborate if they are aligned with their personal ESG preferences. Moreover, there is strong evidence of "a significant positive correlation between ESG ratings, firm size, company's available resources for providing ESG data, and the availability of company's ESG data on the company's sustainability performance" (Drempetic, Klein and Zwergel, 2020). The substantial positive correlation between these variables can constitute a potential bias for this study. Moreover, our analysis sample data is extracted from the S&P 500 Equal Weight index constituents of the year 2020 omitting the effect of companies that once existed in the index before and were removed. By viewing only, the performance of existing stocks in the market in 2020 can raise a potential survivorship bias in the analysis.

4. Methodology

4.1 Portfolios construction

The portfolios analyzed in this work are constructed at the end of each year starting from 2006 till 2020 based on Refinitiv ESG scores and separate Environmental (E), Social (S) and Corporate Governance (G) scores which are published in the middle of every year (during the month of June of every year). The S&P 500 companies price returns were computed on an annual basis for the same time horizon. After ranking the companies according to their scores in a descending order (1^{st} rank representing the best score and 100^{th} rank representing the worst), the investment universe used for every type of portfolio is filtered according to the interval of rank chosen. To convert into absolute values, a percentage ranking was used to easily control for the chosen fractile. For instance, when inputting a percentage rank interval ranging from 100% to 90%, the buy and hold portfolio will be only composed of stocks from the S&P 500 with ESG scores belonging to the worst decile. Contrariwise, a percentage rank interval from 0% to 10% include merely S&P 500 stocks in the best scores decile.

The constructed portfolios follow the capitalization weighting scheme as the S&P 500 benchmarks for a more realistic and convenient comparison. Eventually, quartile portfolios are created every year from the S&P 500 universe over 14 years after being filtered according to the stock ESG, E, S and G scores. The 2020 annual 10-year U.S government bond yield was used as the risk-free rate for this research since it is envisaged practically free of default risk on the grounds that it is fully backed by the U.S. government.

4.2 Performance metrics

To assess the risk adjusted performance of our portfolios, this research will analyze the following performance metrics:

1) **The Information Ratio** (IR) is a ratio of a portfolio's outperformance or underperformance compared to the returns of a benchmark, the S&P 500 Equal Weight index in our case, over the volatility of those returns.

R-BR/w

(1)

Where “R” is the portfolio annual return, “BR” the benchmark annual return and the denominator is the tracking error. It shows the consistency of a portfolio in generating superior risk adjusted performance

2) **The Treynor Ratio** (TR) (Treynor, 1966) or the reward to volatility ratio measures the return of an investment per unit of systematic risk while completely excluding the firm specific risk unlike the Sharpe Ratio that uses the total risk. It adjusts only for market volatility and the risk associated with it.

$$\textbf{Treynor Ratio} = (R_p - r_f)/ \beta_p$$

(2)

Where (Rp-rf) is the portfolio’s excess return and βp is the regression coefficient of the portfolio annual excess returns against the markets.

3) **The Sharpe Ratio** (SR), one of the most common and well-known measures of risk adjusted performance, a more appropriated for evaluation entire portfolios, is calculated by dividing the portfolio’s excess return by the volatility measured via the standard deviation which include both systematic and idiosyncratic risks (Sharpe 1966,1994).

$$\textbf{Sharpe Ratio} = (R_i - R_f) / \text{STDev } R_i$$

(3)

The higher the ratio, the better the investment annual return relative to the amount of risk taken, and accordingly, the better the investment.

4) **The adjusted Sharpe Ratio** was initiated by Pézier and White to adjust for skewness and kurtosis by integrating a penalty factor for negative skewness and excess kurtosis (Pézier and White, 2008).

$$\textbf{Adjusted Sharpe ratio} = SR \times [1 + (S/6) \times SR - ((K-3) / 24) \times SR^2]$$

(4)

5) **Skewness** is an asymmetry measure deviating from the symmetrical bell curve, or normal distribution with a skewness of 0. It tells us whether returns have been extreme or not. **Kurtosis** is another statistical quota which defines how heavily the tails of a distribution vary from the tails of a normal distribution. A high Kurtosis tells us our returns are heavy-tailed and a low kurtosis indicate a light-tailed returns.

6) **Jensen's Alpha** is centered around market risk. It represents pricing error. It is the result of regression between the annual returns of the portfolio against the annual returns of the market (CAPM). Then Jensen's alpha is indicated by the change between the actual return of the portfolio and the calculated or modeled risk-adjusted return.

$$\textbf{Jensen's alpha} = \alpha p = Rp - [Rf + \beta p(Rm - Rf)]$$

(5)

A positive alpha tells us the portfolio has outperformed the market while a negative alpha denotes an underperformance.

7) **The Capital Asset Pricing Model** (CAPM) is the first coherent framework that answered one of the fundamental questions in the field of finance: how an investment's risk affects its expected return? The model implies that an investor combines two types of assets: a risky and a risk-free asset. Thus, it assumes only one source of systematic risk: the market risk (Sharpe, 1964) (Lintner, 1965). The market risk exposure is described by the **β** which represents the stock sensitivity to the market fluctuation.

$$R_{i,t} - r_f = \alpha_i + \beta_i (R_{m,t} - r_f) + \varepsilon_{i,t}$$

(6)

8) **The Fama-French (1992) three-factor model** complements the Capital Asset Pricing Model (CAPM). It aims to describe the relationship between our portfolio's annual returns and 3 factors: Market risk, the outperformance of small-cap companies relative to large-cap

companies (SmB), and the outperformance of high book-to-market value companies versus low book-to-market value companies (HmL) ("Kenneth R. French - Data Library" 2019)

$$\mathbf{R_{i,\,t} - r_f = \alpha_i + \beta 1.\,(Rm - rf) + \beta 2.\,SmBt + ß3.\,HmLt + \varepsilon_{i,\,t}}$$

(7)

8) **The Fama-French five-factor model (2014)** takes further the three-factor model by adding the profitability and investment factors.

$$\mathbf{R_{i,\,t} - r_f = \alpha_i + \beta 1.\,(Rm - rf) + \beta 2.\,SmBt + ß3.\,HmLt + ß4.\,RmWt + ß5.\,CmAt + \varepsilon_{i,\,t}}$$

(8)

In the stated formula, RmWt equals the returns spread between diversified portfolios of stocks with Robust and weak profitability. CmAt is the spread between returns on diversified portfolios composed of low and high investments firms, which are referred to as conservative and aggressive respectively. If the exposures to the five factors **ß1**, **ß2**, **ß3**, **ß4**, and **ß5**, capture all the change in expected returns, the intercept **αi** in (8) is equal to zero for all securities and portfolios *i*.

5. Performance results

5.1 Best scores quartile VS worst scores quartile

Starting with the overall ESG score portfolios, we controlled for the percentage ranking to measure the risk adjusted performance of the best score quartile ([0%-25%]) and the worst score quartile portfolio ([75%-100%]). Exhibit 4 displays the results obtained from both portfolios and the S&P 500 Equal Weight benchmark for the same period.

Exhibit 4 :Top quartile VS Bottom quartile portfolios

	ESG Quartile Portfolios								**Benchmark**
	Best ESG score quartile Portfolio (0%-25%)				Worst ESG score quartile Portfolio (75%-100%)				S&P 500 EW
	ESG	E	S	G	ESG	E	S	G	
Av.an Return	2,7%	2,6%	2,7%	2,8%	3,4%	1,6%	2,8%	3,0%	6,10%
Ann. STDEV	4,4%	4,4%	4,5%	4,4%	3,0%	2,4%	2,7%	2,8%	12,30%
Ann. IR	**-0,42**	**-0,43**	**-0,42**	**-0,40**	**-0,26**	**-0,39**	**-0,31**	**-0,30**	**-**
Ann. SR	**0,51**	**0,49**	**0,51**	**0,55**	**0,99**	**0,48**	**0,87**	**0,92**	**0,460**
Adjusted ann. SR	**0,46**	**0,44**	**0,45**	**0,46**	**1,08**	**0,53**	**0,94**	**1,01**	**0,40**
Ann. TR	**0,061**	**0,059**	**0,062**	**0,065**	**0,142**	**0,101**	**0,124**	**0,130**	**0,06**
Jensen's Alpha	**0,017**	**0,001**	**0,0019**	**0,0031**	**0,0176**	**0,0051**	**0,0129**	**0,0079**	**-**
ß	**0,430**	**0,359**	**0,373**	**0,367**	**0,206**	**0,115**	**0,190**	**0,198**	**1,00**
Positive years	73,33%	73,33%	73,33%	80,00%	73,33%	60,00%	73,33%	73,33%	73,33%
Annual Skew	-0,96	-0,96	-1,09	-1,34	0,37	1,93	0,37	0,45	-1,81
Annual Kurt	1,87	1,72	2,16	2,55	-0,63	3,92	-0,69	-0,55	4,81
P-value Portf vs SP500 EW	6.3%	12,6%	12,7%	14,0%	33%	15%	25%	27%	-

Exhibit 4 table summarizes the risk-adjusted metrics outcomes comparing the equally weighted top quartile, the equally weighted bottom quartile ESG, E, S, G portfolios individually and the S&P 500 equal weight index. We can observe that the buy and hold strategy of the best ESG, E, S, and G scores quartile of stocks in the S&P 500 yield lower risk adjusted results than their equivalent worst quartile portfolio but better results than the S&P 500 benchmark. While having on average a lower annual return and standard deviation than the benchmark from 2006 to 2020, the difference between the top quartile average annual returns and standard deviations is way less considerable than the difference between the benchmark's respective average annual returns and standard deviation. This unproportionate difference yielded better risk-adjusted results for the top quartile portfolios. Indeed, the best quartile portfolio's annual information ratio, Sharpe ratio, adjusted Sharpe ratio, Treynor ratio and Jensen's alpha have all significantly exceeded the results of the S&P 500 equal weight benchmark. Still, the annual information ratio of the best quartile portfolio is negative (-0,420) showing that the portfolio's excess return is lower than the S&P 500 returns and thus failed to produce any excess returns. On the other hand, compared to the worst quartile portfolio, the top quartile portfolio displayed lower results over almost all the risk-adjusted performance metrics. This can be explained by the relatively high annual average returns, the inferior standard deviations, and the lower market risk exposure displayed by all the bottom quartile portfolios which increased specifically their respective Treynor Ratios suggesting that companies with low E, S, G and ESG scores are less exposed to market fluctuations than high scores firms. These results place the equally weighted top quartile portfolios as the least performant portfolio on both an absolute and risk-adjusted basis compared to the equally weighted the bottom quartile and a better performant than the S&P 500 equal weight index as of risk-adjusted performance. These risk-adjusted results work against the hypothesis of the best quartile ESG scores portfolios being both financially performant and socially responsible compared to the bottom quartile portfolios but in its favor

when comparing them to the benchmark. The top quartile portfolios results highlight fewer absolute returns compared to the benchmark but a proportionally higher risk mitigation effect when screening based solely on ethical performance and sustainability (selecting stock with high ESG scores) compensating the returns loss. Yet, in comparison to the worst scores portfolios, the best scores portfolios appeared to be a less attractive choice financially by generating less risk adjusted returns despite showing higher cumulative returns during the first half of the analysis period (Appendix). The t-statistics performed on the benchmark with each type of portfolio (Top, Bottom) exposed no statistically significant difference between the samples. The t-statistics performed on the high and bottom scores portfolios also revealed no statistically significant results. To better analyze the performance difference between both portfolios, I proceed to calculate the spread between the top quartile and bottom quartile E, S, G and ESG annual returns, the risk-adjusted returns for the difference portfolios, and test its statistical significance.

Exhibit 1 : Top quartile minus Bottom quartile portfolios

Top minus Bottom Portfolios				
	ESG	E	S	G
Average annual return	-0,72%	0,97%	-0,07%	-0,17%
Annual STDEV	3,28%	4,26%	3,31%	3,11%
Annual Information Ratio	**-0,648**	**-0,576**	**-0,623**	**-0,625**
Annual SR	**-0,353**	**0,125**	**-0,154**	**-0,196**
Adjusted-annual SR	**-0,354**	**0,122**	**-0,157**	**-0,182**
Annual TR	**-0,063**	**0,019**	**-0,024**	**-0,030**

Jensen's Alpha	**-2,21%**	**-1,85%**	**-2,36%**	**-2,35%**
ß	**0,185**	**0,275**	**0,213**	**0,201**
Positive years	33,33%	60,00%	53,33%	53,33%
Annual Skewness	-0,09	-0,31	-0,62	-0,91
Annual Kurtosis	0,70	0,65	2,30	2,24
P-value	**2,50%**	**3,02%**	**2,97%**	**4,24%**

As revealed in Exhibit 5, the spread calculation between the top and bottom quartile ESG portfolios generated interesting results. I started by calculating the top minus bottom ESG scores portfolio. The top minus bottom ESG generated negative annual average return since the top quartile average annual return was higher than the bottoms. This negative annual average return resulted to negative risk adjusted returns. The high minus low ESG portfolio's beta of (0,185) was the lowest among all the other spread portfolios.

Exhibit 6: Cumulative Returns (2006 to 2020)

Top-Quartile Portfolios (25%-0%) Bottom-Quartile Portfolios (75%-100%)

As displayed in both charts of Exhibit 6, the cumulative returns of both the top and bottom quartile portfolios (ESG and its three separate dimensions) are neighboring the S&P 500 cumulative returns but not exceeding it on average during the analysis time horizon. The buy and hold scheme for the best and worst ESG scores portfolios over the 14 years test period (2006-2020) did not outperform the S&P 500 benchmark in absolute measures. Starting with the left chart, we can notice that all the top quartile portfolios generated roughly the same

cumulative returns over the analysis period and behaved as tail-risk mitigation portfolios remarkably during the 2008 housing crisis. In fact, the top quartile ESG portfolio's cumulative return in 2008 was equal to (-2,56%) against (-16,99%) of the benchmark. The following year, the top quartile ESG portfolio recorded a healthier recovery translated by a (6,95%) cumulative return against the benchmark's (2,00%). Still, the top quartile separate dimensions portfolios generated the same results except for the Social (S) portfolio which outperformed slightly the S&P500 equal weight index also in 2010. All the top and bottom quartile portfolios cumulative returns results alongside the benchmark's can be verified in tables 5,6,7 and, 8 (Appendix). On the other hand, the bottom quartile portfolios displayed slightly different results. First, I noticed that the bottom quartile ESG portfolio cumulative returns outperformed the top quartile portfolio starting from 2015 till 2020 but not the S&P500 Equal Weight index. Besides, the low scores ESG portfolio did not produce any returns in 2006 and 2007. It started generating returns in 2008 negatively and performed better recovery the next year (3,30%) than the benchmark (2,00%) but less than the top quartile portfolio (6,95%). In fact, the bottom quartile portfolio underperformed the top quartile in absolute measure until 2015.

5.2 Risk estimation

Due to a downside risk mitigation observed from the ESG portfolios cumulative returns charts displayed in Exhibit 5, I proceed to a specific risk calculation to analyze closely the risk exposure of each portfolio including the benchmark. As a measure of portfolios risk exposure, I use the Value at Risk (VaR) method in this research to estimate the annual expected loss at 95% confidence interval of 14 years holding period. In absolute terms, the Value at Risk method stated as "a distinct, summary statistical gauge of probable portfolio losses. Using a probability of x percent and a holding period of t days, an entity's VaR is the loss that is expected to be exceeded with a probability of only x percent during the next t-day holding period. Put in straightforward terms, it is the expected loss to be exceeded for x percent probability of t-day

holding periods" (Linsmeier and Pearson 2000). In our case, we estimate the annual variance-covariance Value at Risk of all our portfolios during our sample time horizon of 14 years at a 95% confidence interval. To quantify the amount of tail risk in our investment portfolios, we also estimate the expected shortfall also identified as the "Conditional Value at Risk" (CVaR). Presented by Rockafellar and Uryasev, the expected shortfall is an established instrument for managing risk. "CVaR roughly (or exactly, under certain conditions) generates the average of a certain percentage of the worst-case loss scenarios. CVaR risk measure is like the value-at-risk (VaR) risk measure, which is a percentile of a loss distribution. Yet, it is designed to address one of the most notable limitations of the original Value at Risk which is accounting only for a certain percentile of losses without providing whichever insight of what losses might occur in case the situation is even unhealthier than the presumed edge" (Sarykalin, Serraino, and Uryasev 2008). In our case, for instance, the Value at Risk at 95% interval will only do the cut off at 5% worst-case scenarios and would not give us intuition of what would happen falling even further down the left tail of the distribution. The CVaR tackles this limitation by calculating the conditional expectation of losses in n% worst case scenarios.

$$\boldsymbol{CVaR=1-c1\int-1VaRxp(x)dx} \quad (9)$$

Exhibit 6 : Portfolios VaR – CVaR

	ESG Decile Portfolios								**Benchmark**
	Best ESG score quartile Portfolio (0%-25%)				Worst ESG score quartile Portfolio (75%-100%)				S&P 500 Equal Weight
	ESG	E	S	G	ESG	E	S	G	
VCV-VaR	-4,54%	-4,63%	-4,63%	-4,38%	-1,50%	-2,41%	-1,67%	-1,56%	-14,12%
VCV-CVaR	-6,26%	-6,35%	-6,39%	-6,11%	-2,67%	-3,37%	-2,75%	-2,66%	-18,98%

*Note: the confidence interval used for the Value at Risk computation is 95%.

Exhibit 6 displays the Value at Risk and the expected shortfall measures for the equally

weighted top quartile scores, bottom quartile scores, and the benchmark portfolios at a 95% confidence interval. We notice that the equally weighted worst quartile scores portfolio displays the lowest annual expected losses during our time horizon compared to the benchmark and the best quartile portfolio. Besides, the S&P 500 benchmark has the highest Value at Risk of (-14,12%). In between both, the expected loss at a 5% chance of the equally weighted high quartile ESG scores portfolio is set to be equal (-4,54%) which is around 3 times lower than the benchmark. The highest extent of risk mitigation is observed at the bottom quartile ESG portfolio level with a VCV-VaR of (-1,50%) and VCV-CVaR of (-2,67%) setting it as the portfolio with the lowest annual expected loss at 95% confidence interval over the fourteen years holding period. The Value at Risk and expected shortfall metrics were chosen to quantify the extent of possible financial losses within two equally weighted opposite portfolios in terms of sustainability level and a benchmark (S&P 500 equal weight). This will help shedding the light over the risk mitigation effect of positive screening in portfolio constructions and compare it to the benchmark and to a portfolio that fully disregard sustainability and responsible investing. These Value at Risk measures support the idea of obtainable risk mitigation effect by investing in high ESG scores companies compared to the benchmark (S&P500) while generating higher risk-adjusted returns. However, this effect is considerably less important compared to investing in low ESG scores companies over the same period.

5.3 Portfolio regressions

Exhibit 7 : Top quartile ESG portfolio: CAPM, FF-3FM, and FF5FM regressions

	Intercept	**Rm - Rf**	**SmB**	**HmL**	**RmW**	**CmA**	**R-Square |Adjusted**
Coefficient	**-0,35%**	**0,360**	**-**	**-**	**-**	**-**	**0,89 | 0,88**
T-Stat	**-0,75**	**10,10**	**-**	**-**	**-**	**-**	

Coefficient	**-0,17%**	**0,03**	**0,10**	**0,35**	**-**	**-**	**0,92|0,90**
T-Stat	**-0,39**	**0,94**	**1,62**	**10,50**	**-**	**-**	**-**
Coefficient	**-0,09%**	**-0,22**	**0,08**	**0,09**	**0,20**	**0,35**	**0,96|0,93**
T-Stat	**-0,16**	**-2,18**	**1,08**	**2,25**	**3,15**	**10,02**	**-**

The table displayed above in exhibit 7 demonstrates the outcome of regressing the top quartile ESG score portfolio excess returns on the Capital Asset Pricing Model (CAPM), the Fama-French-Three-Factor Model (FF-3FM) and the Fama-French-Five-Factor Model (FF-5FM) explanatory variables. The R-squared results of the three regressions show us that we have a decent fit of data with a gradually mounting value starting from a correlation of (0,89) at the CAPM level, to (0,92) for the FF-3FM and (0,96) for the FF-5FM. In addition, the adjusted R-squared results neighbor the R-squared increase over the models with a slightly lower but high results of (0,88), (0,90) and (0,93) respectively which tell us that the new predictors of the FF-3FM and the FF-5FM enhanced the models more than would be expected by chance and that the R-squared growth is not due to overfitting. The equally weighted top quartile ESG portfolio's intercept results, the regressions' alphas, tell us how much better or worse the portfolio performed compared to the models' predictions. The top quartile portfolio underperformed the CAPM, FF-3FM and FF-5FM benchmarks by (-0,35%), (-0,17%), and (-0,09%) respectively. Despite the negative intercept results across the entirety of the models, we can observe a parallel increase in the alpha with the increase of the models' explanatory variables. Nevertheless, the intercepts t-stat and p-values tell us the results are not statistically significant. Subsequently, the beta loading of the CAP model representing the market risk or the portfolio's sensitivity compared to our analysis benchmark (S&P500- equal weight) is equal to (0,36). The beta's t-stat and the p-value approve the statistical significance of the result. The top quartile beta loading of (0,36) tells us that the portfolio is not exceedingly exposed to the market risk. Besides, the market risk exposure decreases in the FF-3FM and the FF-5FM to

reach (0,03) and (-0,22) respectively. However, except the CAP model, the systematic risk results are not statistically significant for the other models. Next, within the FF-3FM, the portfolio's SmB loading is positive and equal (0,10). This means the top-quartile portfolio comprises mostly small market capitalization companies. Yet, the result is not statistically significant. Conversely, the HmL loading is statistically significant and equal to (0,35) telling us that we are looking at a value portfolio. In other words, the equally weighted top quartile portfolio includes predominantly companies with prices deemed to be fundamentally undervalued. The SmB coefficient decreased slightly from (0,10) when adding the RmW and the CmA predictors to reach (0,08) and it remained statistically insignificant. As for the HmL, the decrease in the coefficient was more important on the FF-5FM level which can be explained by the supplementary profitability (RmW) investment (CmA) factors which are considered redundant to the value factor (HmL). A decrease in its statistical significance is also observed to an extent where its p-value exceeds faintly the 5% threshold but still significant under the 10% edge. Eventually, the FF-5FM displays positive and statistically significant RmW and CmA loadings of (0,20) and (0,35) respectively. These positive and significant coefficients show us that the equally weighted top quartile ESG portfolio contain profitable and conservatively investing companies. On a broader scope, these regressions also tell us that ESG investing is more suitable and appealing for value investors with long term investment horizon that are also interested in sustainability and ethics as it includes mostly value firms.

Exhibit 8 : Bottom quartile ESG portfolio: CAPM, FF-3FM, and FF5FM regressions

	Intercept	**Rm - Rf**	**SmB**	**HmL**	**RmW**	**CmA**	**R - Square|Adjusted**
Coefficient	**1,12%**	**0,206**	**-**	**-**	**-**	**-**	**0,44|0,40**
T-Stat	**1,33**	**1,21**	**-**	**-**	**-**	**-**	

Coefficient	**0,91%**	**-0,05**	**0,08**	**0,19**	**-**	**-**	**0,48|0,34**
T-Stat	**0,99**	**-0,85**	**0,65**	**2,75**	**-**	**-**	**-**
Coefficient	**1,38%**	**-0,24**	**0,00**	**0,03**	**0,18**	**0,17**	**0,53|0,27**
T-Stat	**0,94**	**-0,90**	**0,00**	**0,29**	**1,07**	**1,78**	**-**

Next, I proceed in regressing the bottom quartile portfolio's excess returns on the CAPM, FF-3FM, and FF-5FM. The regressions' outcomes are presented in exhibit 8. The first thing to notice is the lack of data fitness described by the R-squared and the adjusted R-squared. The data fitness in the bottom quartile regressions is two folds lower than the top quartile's across all models. It is even four times less for the FF-5FM adjusted R-square. The loading of the market excess return at the CAPM level is reasonably elevated (0,206) and statistically significant. It shows a systematic risk higher than 1 emphasizing the riskiness of the bottom quartile portfolio stocks. The intercept coefficient at the same model's level is equal to 1,12% which an important amount for a market outperformance. It also does not considerably decrease at the FF-3FM level to stabilize at 0,91%. On the other hand, the market excess return loading decreases substantially to attain a negative result of (-0,05). Contrarily to the CAPM, the FF-3FM beta is not statistically significant. The SmB and HmL loadings are positive but only the HmL is statistically significant. This result can also highlight a dominance of value companies within the bottom quartile ESG portfolio at the FF-3FM level. Eventually, I notice an increase of the alpha for the FF-5FM but a decrease in all the already existing factors. A big shift to the RwA and CmA coefficients is noteworthy (1,07 and 1,78). However, all the FF-5FM results are not statistically significant.

6. Conclusion

Introducing any new factors to a process will undoubtedly carry changes on it.

Yet, in these kinds of cases, the most decisive questions has always been what kind of effect will this alteration produce? A positive or a negative? And to what extent? In today's world of

globalization, interdependency, financial crisis, environmental and social issues such as climate change, human rights, biodiversity, business ethics and corporate governance which are at the forefront of public and political consideration, the way companies respond to these issues is becoming a crucial aspect in contributing not only to the globe's economical and financial health, but also to the environmental and social. Nowadays, metrics that shed the light on a company's situation on an environmental, social and governance level have become as important as traditional financial metrics when evaluating corporate performance, therefore playing a more central role in investors' decision-making processes to identify long-term prospects and perils for companies. This study attempts to analyze the tradeoff of sustainable investing and financial performance. It tries to answer an extensively asked question among investors of whether financial performance should be sacrificed for responsible investing according to a person's own values. This study primarily shows that ESG factors are linked to stock performance more by being a tail-risk mitigation tool resulting to higher risk adjusted returns than the study benchmark (S&P 500 Equal Weight index). Nevertheless, in comparison to a "non-responsible" investing approach, the risk mitigation effect and the higher risk-adjusted returns fade away. The low scores ESG portfolio outperformed the high scores in almost every aspect. This can mostly be explained by the "sin" stock effect as they are not excluded from the bottom scores' quartile portfolios. Empirical results also showed that responsible investing in the U.S market is allied with value investment style and long-term horizon. Thus, even though returns are somewhat affected by responsible investment decisions, it is well most compensated by the risk mitigation and the level of risk an investor must bear.

Appendix:

Table 1 : Additional examples of E,S, and G issues

Environmental issues	Social issues	Governance issues
○ Air and Water pollution ○ Deforestation ○ Waste management ○ Climate change and Carbon emissions ○ Biodiversity ○ Water scarcity ○ Energy efficiency	○ Labor standards ○ Human rights ○ Employee engagement ○ Community relations ○ Customer satisfaction ○ Data protection and Privacy ○ Gender and Diversity	○ Whistleblower schemes ○ Political contributions ○ Lobbying ○ Executive compensation ○ Bribery and Corruption ○ Board Composition ○ Audit Committee structure

Table 2 : Average ESG scores evolution

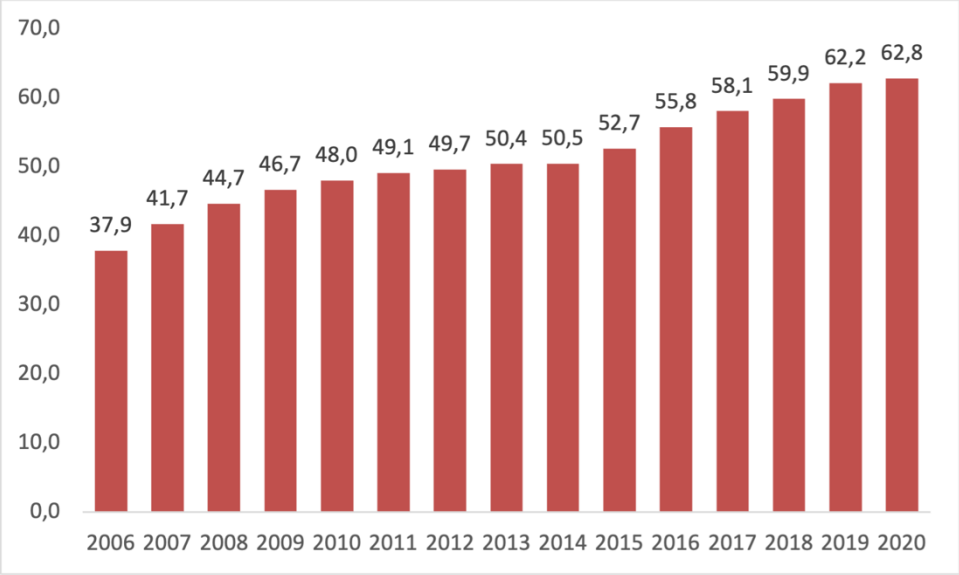


Table 3 : Top Quartile ESG score Portfolio vs S&P500 Equal Weight Index Cumulative returns

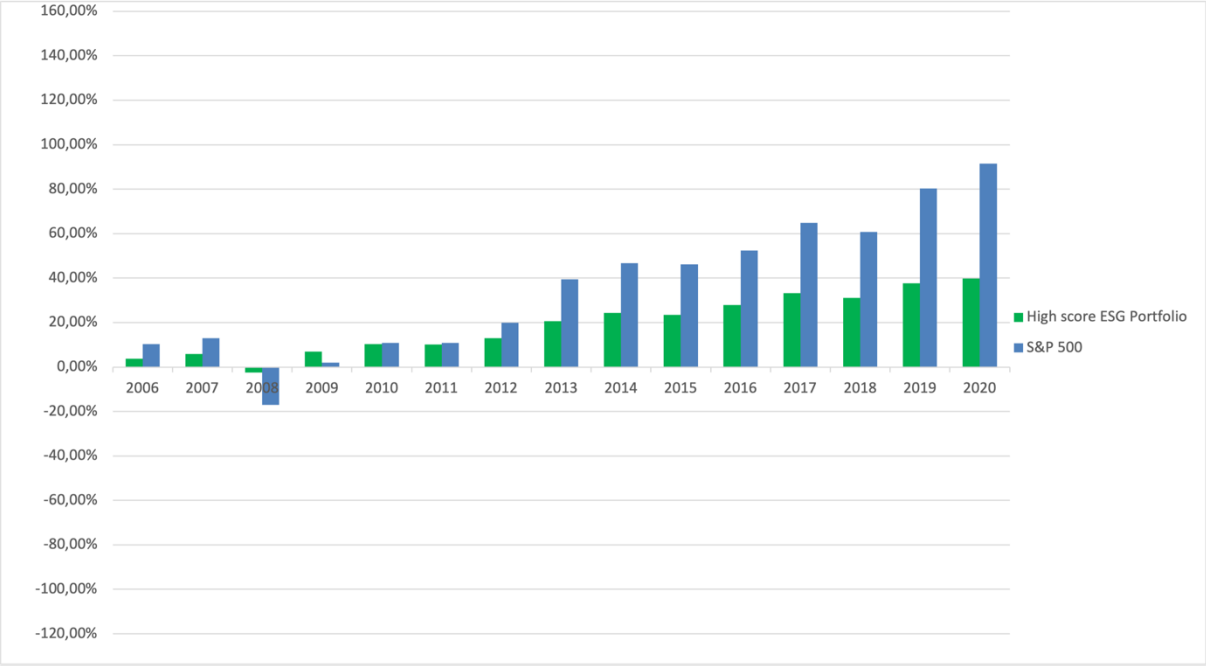


Table 4 : Bottom Quartile ESG scores Portfolios vs S&P500 Equal Weight Index Cumulative returns

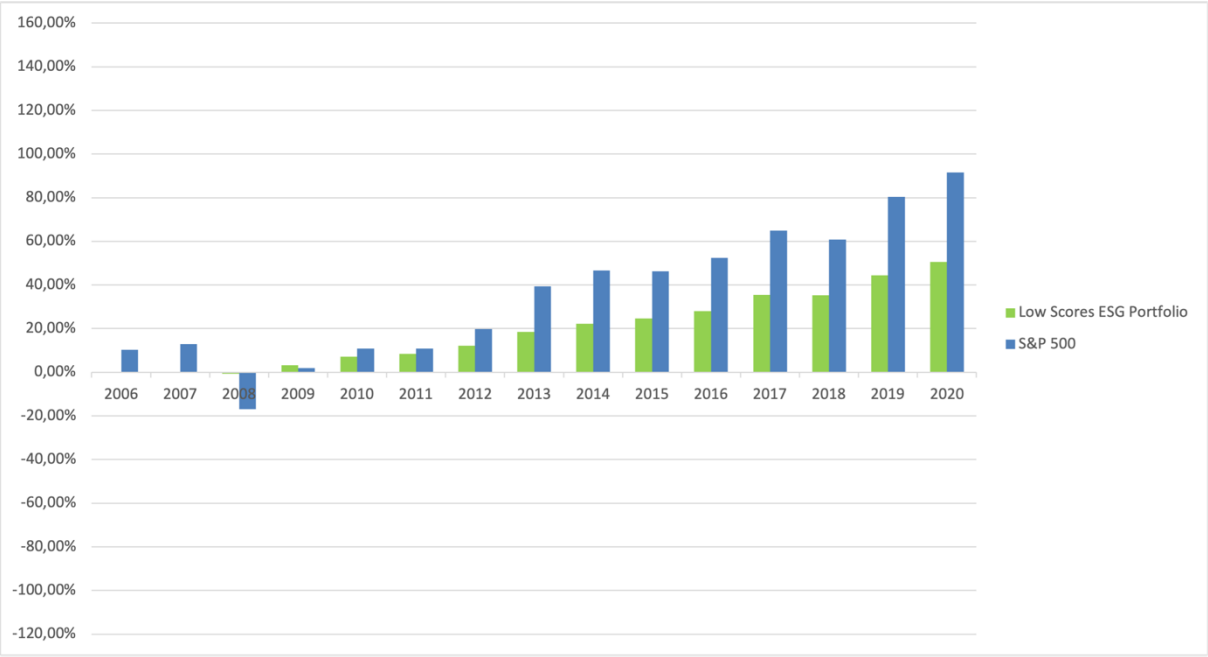


Table 5 : Bottom and Top Quartile ESG scores Portfolios vs S&P500 Equal Weight Index Cumulative returns:

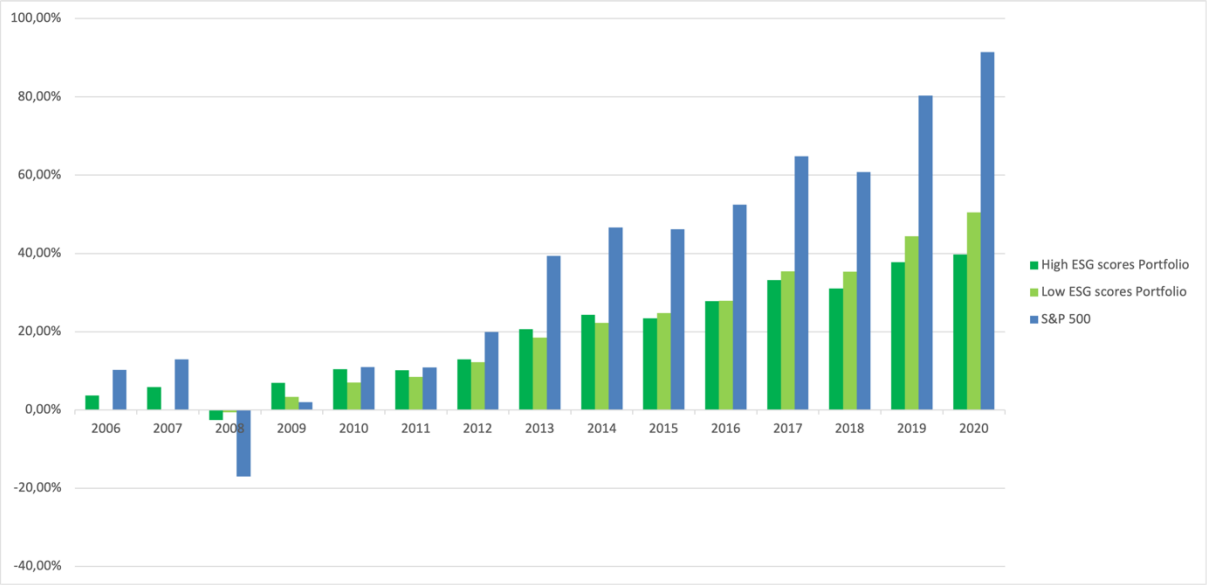


Table 6 : Bottom and Top Quartile E scores Portfolios vs S&P500 Equal Weight Index Cumulative returns:

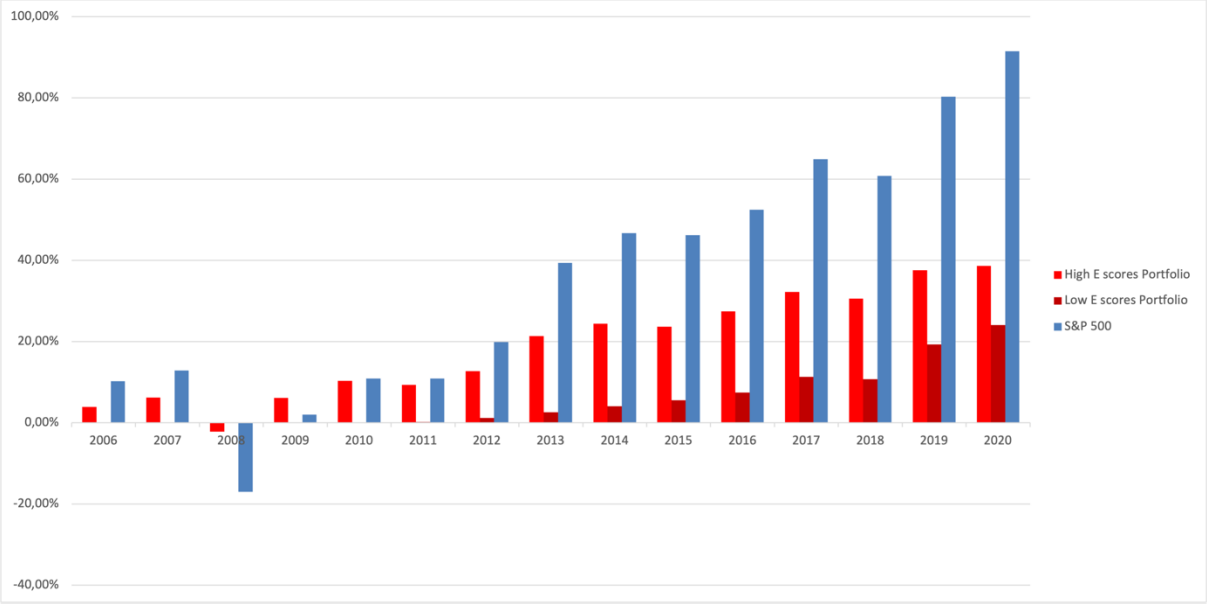


Table 7 : Bottom and Top Quartile S scores Portfolios vs S&P500 Equal Weight Index Cumulative returns:

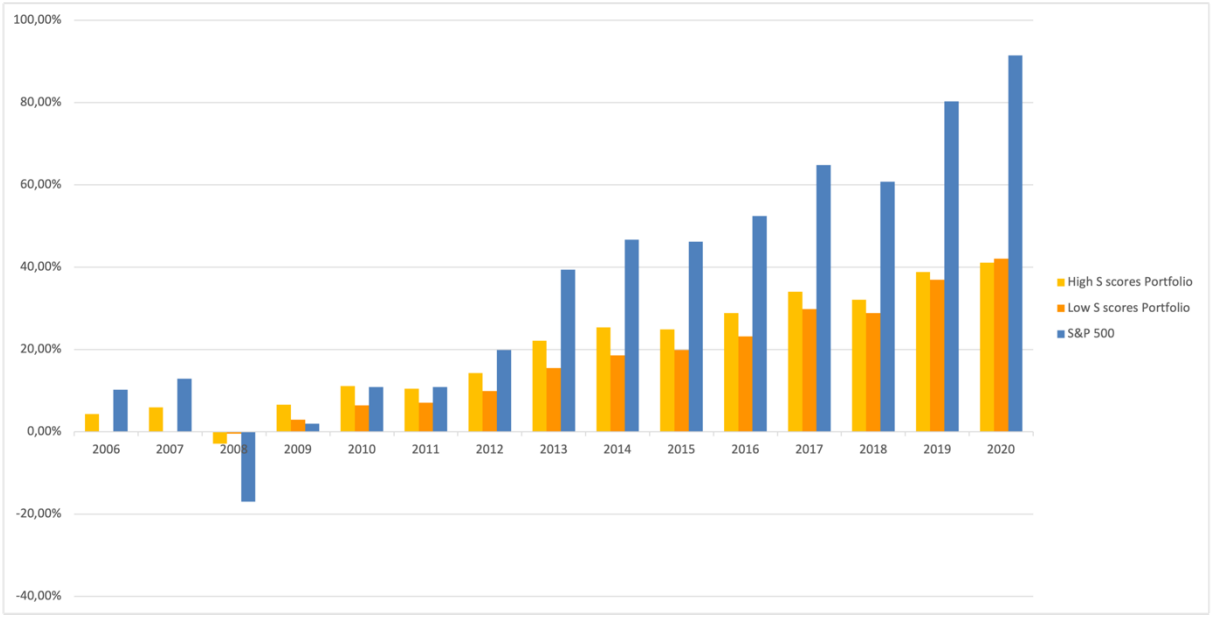
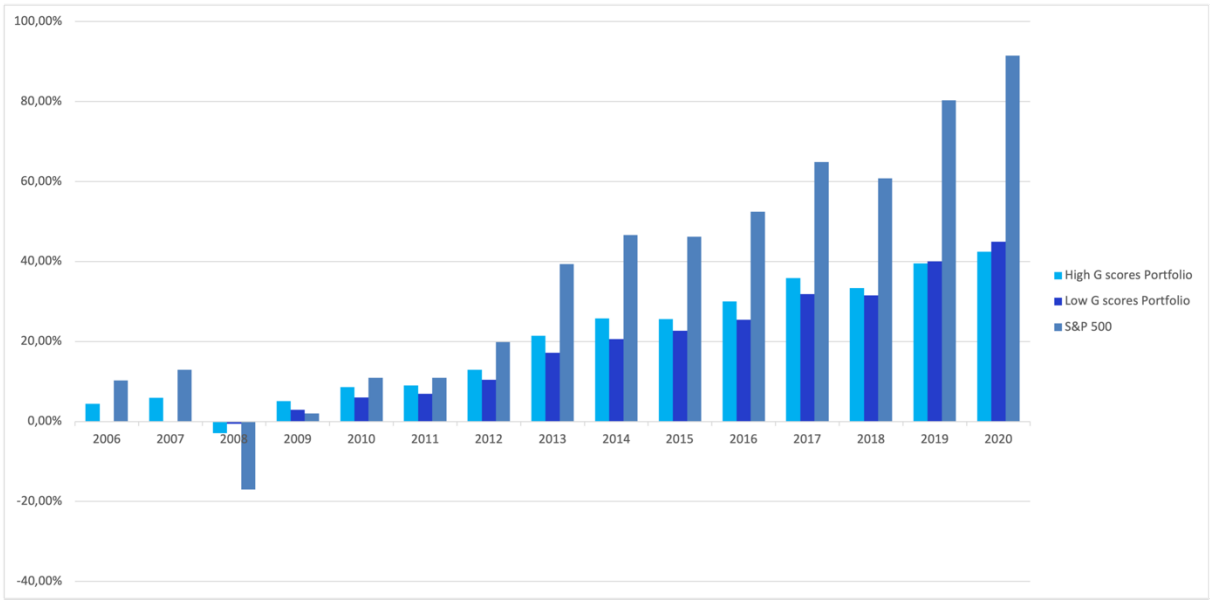


Table 8 : Bottom and Top Quartile G scores Portfolios vs S&P500 Equal Weight Index Cumulative returns:



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