

The Effect of ESG Scores on Portfolio Performance. Evidence from Europe

Diana-Mihaela SANDU*

Bucharest University of Economic Studies, Bucharest, Romania¹

*Corresponding author, sandulmihaela16@stud.ase.ro

Abstract. *The purpose of this study is to examine the performance of eight portfolios constructed based on environmental, social and governance scores. The main question I explore is whether portfolios that integrate ESG values generate a significant additional return. The sample consists of 1095 European stocks from 23 countries, and the period analyzed is 2021-2022. To form portfolios, all stocks are first ranked according to one-year lagged ESG scores (Total ESG score, Environmental score, Social score and Governance score) in a decreasing way. Then 10% of the highest-scoring stocks are included in the Top portfolio, while 10% of the lowest-scoring stocks are included in the Bottom portfolio. Portfolio evaluation was performed using two techniques: CAPM and Fama French five-factor regression. In addition, the Sharpe ratios of the portfolios have been calculated. The Sharpe ratio is positive for the top portfolio, showing that investors are compensated more per unit of risk. The Top Environmental portfolio is found to be the best performer for positive values. In contrast, the Sharpe ratio is negative for the Bottom portfolios. This means that these portfolios underperform the risk-free rate. The CAPM results show that all portfolios using ESG-based scores underperformed the market. The results of the Fama-French five-factor model are similar to those of the CAPM. The general findings of this study indicate that using ESG-based scores in the selection investment process does not add a significant additional return. These findings provide additional evidence to the literature on the relationship between ESG and portfolio performance in the recent European context.*

Keywords: ESG, portfolio performance, CAPM, Fama-French five-factor model, Sharpe ratio, Europe.

Introduction

With the growing concern about sustainable development and climate change, the environmental, social and governance (ESG) impact on companies has attracted the interest of regulators, investors and the companies themselves. Investors pay more attention to the ESG events reflected in the global media and incorporate this information into investment decisions. In addition, some companies include voluntary good practices of environmental, social and governance in their business policies (Bodhanwala and Bodhanwala; 2020).

Growing empirical evidence suggests that ESG generates a direct relationship with financial performance (Gao and Zhang, 2015; Ferrel et al., 2016; Fatemi, 2018; Aboud and Diab, 2019; Wong et al., 2021; Liu et al., 2022). Furthermore, previous studies found evidence on the relationship between ESG ratings and portfolio performance. Some studies found that the socially responsible portfolio outperformed conventional portfolios (Statman, 2006; Kempf and Osthoff, 2007; Statman and Glushkov, 2009; Goyal and Aggarwal, 2014; Kumar et al. 2016), other studies suggested that ESG portfolios underperformed non-ESG portfolios (Hong and Kacperczyk, 2009; Luo, 2022) or there is no relationship between these portfolios (Zehir and Aybars, 2020).

In this context, this study investigates the performance of eight portfolios constructed based on ESG scores. The main question I explore is whether portfolios that integrate ESG values

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generate a significant additional return. The sample consists of 1095 European stocks from 23 countries, and the period analyzed is 2021-2022. To form portfolios, all stocks are first ranked according to one-year lagged ESG scores (Total ESG score, Environmental score, Social score and Governance score) in a decreasing way. Then 10% of the highest-scoring stocks are included in the Top portfolio, while 10% of the lowest-scoring stocks are included in the Bottom portfolio. Portfolio evaluation was performed using two techniques: CAPM and Fama French five-factor regression. In addition, the Sharpe ratios of the portfolios have been calculated. The Sharpe ratio is positive for the Top portfolio, showing that investors are compensated more per unit of risk. The Top Environmental portfolio is found to be the best performer for positive values. In contrast, the Sharpe ratio is negative for the Bottom portfolios. This means that these portfolios underperform the risk-free rate.

The CAPM results show that all portfolios using ESG-based scores underperformed the market. The results of the Fama-French five-factor model are similar to those of the CAPM. The general findings of this study indicate that there is no relationship between ESG investment and portfolio performance, as market and value factors have effects of similar magnitudes for all portfolios. These findings provide additional evidence to the literature on the relationship between ESG and portfolio performance in the recent European context.

The remainder of the paper is structured as follows. Section 2 presents the theoretical background of ESG and its relation to portfolio performance. The methodology and data are described in Section 3. Section 4 presents and discusses the results. Finally, the last section concludes.

Literature review

Previous studies used asset pricing models to compare the performance of environmental, social and governance (ESG) socially responsible and conventional portfolios. Kempf and Osthoff (2007) applied the Carhart four-factor model and used KLD Research and Analytics data to investigate ESG investing and stock performance of S&P 500 and DS 400 companies. The authors found that investors can earn extra abnormal returns by applying a long-short strategy (buy stocks with high ESG ratings and sell stocks with low ESG ratings). Similarly to this study, Statman and Glushkov (2009), using KLD Research and Analytics for the S&P 500 and DS 400 stocks, found that socially responsible portfolios have a return advantage against conventional ones. The results were tested in multiple factor models, namely, the CAPM, Fama-French three-factor model and the Carhart four-factor model.

Zehir and Aybars (2020) have studied portfolio performance of companies that are constructed based on environmental, social and governance scores from Europe and Turkey. Using CAPM and the Fama-French three-factor model, the authors found no relationship between ESG and portfolio performance. A recent study by Diaz et al. (2021) discovered that the influence of ESG scores differs among industries and explains returns in addition to the Fama-French three-factors.

A series of studies examined the relationship between ESG ratings and portfolio performance by comparing ESG and non-ESG portfolios. For instance, Statman (2006) showed that the returns of the indexes of socially responsible companies (Domini 400 Social Index, Calvert Social Index, Citizens Index and Dow Jones Sustainability Index) were higher than those of the S&P 500 Index of conventional companies. Furthermore, Goyal and Aggarwal (2014) found that ESG portfolios (S&P ESG Index) outperformed blue chip and market portfolios (S&P CNX 500). Consistent with the studies mentioned above are the findings of Kumar et al. (2016). The authors

demonstrated that companies listed on the Dow Jones Sustainability Index generate higher returns than companies that are not listed on the DJSI. Diaz et al. (2021) found that the top ESG portfolio outperforms the S&P 500 Index, while the bottom ESG portfolio underperforms the S&P 500 Index.

Although many studies found that ESG socially responsible portfolio outperformed conventional portfolios, other studies suggested that ESG portfolios underperformed non-ESG portfolios. Hong and Kacperczyk (2009) found that stocks of companies in ‘sin’ industries (alcohol, tobacco and gaming) had higher returns than stocks of companies in other industries. Bodhanwala and Bodhanwala (2020) found that ESG portfolios underperform their benchmark index in the case of developing countries (Brazil, India, China and Russia), adopting the CAPM model and the Fama and French three-factor model. This is contrary to the findings in the case of developed countries, where the US ESG portfolio has significantly outperformed the benchmark index, and the UK and Australia ESG portfolios have performed in line with the benchmark index. Luo (2022) found that companies with lower ESG scores earn higher returns than those with higher ESG. The author tests the results in four asset pricing models: Fama–French three-factor model, Carhart momentum, Frazzini and Pedersen betting against beta and Asness et al. quality-minus-junk.

As illustrated in this section, the existing academic literature found direct, inverse or insignificant relationships between environmental, social and governance scores and portfolio performance. Some studies found that the socially responsible portfolio outperformed conventional portfolios, other studies suggested that ESG portfolios underperformed non-ESG portfolios or there is no relationship between the two portfolios.

Methodology

The data used in this study are obtained from the Refinitiv database. The sample consists of annual ESG scores and daily stock market data of European companies, covering the period between 2021 and 2022. The environmental, social and governance score provided by Refinitiv reflects the ESG performance of a company based on the reported information in the environmental, social and governance pillars. The Refinitiv ESG score is calculated based on 10 different ESG topics and 630 company-level ESG measures. Refinitiv applies a scale from 0 to 100 for ESG total scores and its pillars (Environmental, Social and Governance).

The technique used in this study is to construct portfolios based on ESG scores and its pillars to measure the effect of ESG scores on portfolio performance. Since Refinitiv publishes ESG scores annually, portfolios in this paper have been created annually. For portfolios in the year 2022, scores of 2021 are used. The rankings are available for 1095 European companies. After ranking companies based on ESG scores in a descending way, following Kempf and Osthoff (2007) and Zehir and Aybars (2020), 10% of stocks with the highest scores are included in the ‘Top’ portfolio and 10% of stocks with the lowest scores are included in the ‘Bottom’ portfolio. The Top and Bottom portfolios are also constructed for each ESG pillar (Environmental, Social, and Governance).

In Table 1, the geographical distribution of the companies shows that the sample is from 23 countries. The sample is predominantly from Germany, France, Switzerland and Sweden, with 530 of the companies headquartered there. The Top ESG portfolio is predominantly from Germany, France and Switzerland, while the Bottom portfolio is from Switzerland, Germany and Sweden. Companies from Romania and Slovenia were not included in any portfolios, since these countries do not have representatives in the top or bottom 10% of stocks. The Top Environmental portfolio is predominantly from France, Germany and Spain, while the Bottom portfolio is from Sweden,

Germany and Switzerland. The Top Social portfolio is predominantly from France, Germany and Spain, while the Bottom portfolio is from Switzerland, Germany and Sweden. The Top Governance portfolio is predominantly from Germany and France, while the Bottom portfolio is from France, Sweden and Switzerland.

Table 1. Geographical distribution of portfolios

Country	Sample	ESG		ENV		SOC		GOV	
		TO	BOTTO	TO	BOTTO	TO	BOTTO	TO	BOTTO
		P	M	P	M	P	M	P	M
Austria	32	-	1	1	-	-	-	1	2
Belgium	45	1	7	3	5	1	7	2	11
Cyprus	2	-	2	-	1	-	1	-	1
Czech Republic	3	-	-	-	-	-	1	-	-
Denmark	42	-	2	1	3	1	1	5	1
Finland	33	5	1	6	-	4	-	5	2
France	134	19	9	26	8	20	10	12	16
Germany	157	26	19	13	18	20	19	32	10
Greece	25	-	5	1	5	1	4	2	6
Hungary	5	-	1	-	1	-	1	-	-
Ireland	45	3	4	5	4	6	3	3	8
Italy	78	11	4	7	4	9	3	8	6
Luxembourg	23	2	2	1	2	1	3	1	2
Malta	4	-	2	-	2	-	3	1	1
Netherlands	67	8	5	8	8	5	4	9	1
Norway	44	3	5	4	5	3	6	5	5
Poland	36	1	5	1	4	1	10	1	5
Portugal	13	-	1	1	1	3	1	1	2
Romania	2	-	-	-	-	-	-	-	-
Slovenia	1	-	-	-	-	-	-	-	-
Spain	65	11	2	13	2	17	1	4	7
Sweden	116	8	11	9	22	7	11	9	13
Switzerland	123	12	22	10	15	11	21	9	11
Total	1095	110	110	110	110	110	110	110	110

Source: Authors' own research, using Stata.

Table 2 compares the performance of Top and Bottom portfolios, providing information on mean returns, maximum and minimum returns, standard deviations and Sharpe ratio of portfolios. It can be seen that the Top portfolios outperform the bottom portfolios. The mean returns of the Top and Bottom ESG portfolios are 0.029% and -0.024%, respectively. The highest mean return is obtained by the Top Environmental portfolio. On the other hand, the standard deviations of portfolios are very close to each other. The maximum and minimum values show that the return of the Top ESG portfolios varies between -4.4% and 5%.

The Sharpe ratio is positive for the top portfolio, showing that investors are compensated more per unit of risk. The Top Environmental portfolio is found to be the best performer for positive values. In contrast, the Sharpe ratio is negative for the Bottom portfolios. This means that these portfolios underperform the risk-free rate.

Table 2. Descriptive statistics of portfolios

Variable	Obs.	Mean	Std. Dev.	Min	Max	Sharpe ratio
TOPESG	246	.00029	.014	-	.050	.021
TOPENV	246	.00061	.014	.044	.046	.043
TOPSOC	246	.00047	.013	.040	.047	.035
TOPGOV	246	.00014	.015	.054	.050	.010
BOTESG	246	-	.012	.045	.039	-.018
BOTENV	246	.00021	.013	.046	.042	-.024
BOTSOC	246	.00032	.012	.046	.039	-.028
BOTGOV	246	.00033	.012	.046	.038	-.021
		.00024	.038			

Source: Authors' own research, using Stata.

For testing CAPM, the following regression is employed:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}, \quad (1)$$

where $R_{i,t} - R_{f,t}$ is the daily excess return of portfolio i at time t , α is the abnormal return, $R_{m,t} - R_{f,t}$ is the daily excess return of market portfolio, β is the factor coefficient and ε is the error term.

To test the Fama-French (2015) five-factor model, the daily excess returns of each portfolio are regressed on the factors of the Fama-French model:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_1(R_{m,t} - R_{f,t}) + \beta_2SMB_t + \beta_3HML_t + \beta_4RMW_t + \beta_5CMA_t + \varepsilon_{i,t}, \quad (2)$$

where $R_{i,t} - R_{f,t}$ is the daily excess return of the portfolio i at time t , α is the abnormal return, $R_{m,t} - R_{f,t}$ is the daily excess return of market portfolio, SMB is the small minus big factor controlling for size, HML is the high minus low factor controlling for value, RMW is the robust minus weak factor controlling for profitability, CMA is the conservative minus aggressive factor controlling for investment level, β is the factor coefficient and ε is the error term. Daily data for each of these factors and risk-free rates of return were obtained from the website of Professor Kenneth French.

Daily returns were calculated using the formula given below:

$$R_{i,t} = \ln \frac{P_t}{P_{t-1}}, \quad (3)$$

where $R_{i,t}$ is the daily return of company i at time t , P is the closing price.

To determine the portfolio daily returns, the average portfolio returns with the same weighted (equally weighted) were calculated as follows:

$$R_{p,t} = \frac{1}{n} \sum_{i=1}^n R_{i,t}, \quad (4)$$

where $R_{p,t}$ is the daily portfolio return at time t , n is the number of stocks in the portfolio, $R_{i,t}$ is the daily return of company i at time t .

Some tests must be carried out to ensure that regression produces well-being parameters. Unit root tests were estimated to check the stationarity of the series. The results for the Augmented Dickey-Fuller (ADF) test reject the null hypothesis, which asserts that the series have unit root. To overcome possible serial correlation and heteroskedasticity problems, standard errors are corrected with the Newey-West (1987) method.

Results and Discussions

Table 3 reports the regression results of the CAPM model, which are regressed on daily returns in excess of the risk-free rate of eight portfolios based on the one-year lagged Total ESG Score, Environmental score, Social score and Governance score. The models cover the period January 2022 to December 2022. The CAPM results show that all portfolios constructed according to the different criteria have a negative abnormal return. The abnormal returns are significant for all portfolios and almost zero. The best performer of the eight portfolios is the Bottom Governance portfolio. This result is in line with Zehir and Aybars (2020); the authors found that the best performer in terms of abnormal return was the Bottom Governance portfolio, but the alpha value was insignificant.

Regarding the market factor, the factor provides significant but small coefficients for all portfolios, indicating that the market premium explains the excess return of the portfolios. This result is similar to Zehir and Aybars (2020).

Table 3. The CAPM regression results

	MKT-RF	_cons	Obs	Prob > F
TOPELG	.00004** * (.00001)	- .00927*** (.00169)	246	.0018
BOTTOMESG	.00004** * (.00001)	- .00919*** (.00156)	246	.0027
TOP ENV	.00005** * (.00002)	- .00903*** (.00179)	246	.0027
BOTTOMENV	.00004** * (.00001)	- .00917*** (.00172)	246	.0109
TOPSOC	.00005** * (.00001)	- .00924*** (.00168)	246	.0013
BOTTOMSOC	.00004** * (.00001)	- .00961*** (.00157)	246	.0011
TOPGOV	.00004** * (.00001)	- .00921*** (.00185)	246	.0078
BOTTOMGOV	.00004** * (.00001)	- .00898*** (.00150)	246	.0039

Newey-West Standard Errors are in parentheses
*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Authors' own research, using Stata.

Table 4 reports the regression results of the estimated Fama-French (2015) five-factor model, which are regressed on the daily returns in excess of the risk-free rate of eight portfolios based on a one-year lagged Total ESG score, Environmental score, Social score, and Governance score. The results for the Fama-French five-factor model show that all portfolios constructed according to the different criteria have negative abnormal returns. The best performer of the eight portfolios is the Top Environmental portfolio.

Regarding the risk factors, their significance shows some differences between portfolios. Specifically, the market factor has a significantly direct effect on portfolio returns, with the exception of the Bottom environmental portfolio. The value factor has a direct impact on all portfolios. This indicates that all portfolios are exposed to the variability in returns of value stocks. These portfolios have a direct relationship with the value premium. In contrast, size, profitability and investment factors do not show any significance, and thus do not provide any explanatory power to portfolio returns. The general findings indicate that there is no relationship between ESG investment and portfolio performance, as market and value factors have effects of similar magnitudes for all portfolios.

Table 4. The Fama-French five-factor regression results

	MKT-RF	SMB	HML	RMW	CMA	cons	Obs.	Prob > F
TOPESG	.00003** (.00002)	.00002 (.00002)	.00005** (.00002)	.00001 (.00002)	-.00002 (.00002)	-.01231*** (.00274)	246	.0136
BOTTOMESG	.00002* (.00001)	.00002 (.00002)	.00005*** (.00002)	.00002 (.00002)	-.00002 (.00002)	-.01274*** (.00249)	246	.0051
TOP ENV	.00003** (.00002)	.00002 (.00002)	.00005*** (.00002)	.00001 (.00002)	-.00003 (.00002)	-.01156*** (.00290)	246	.0224
BOTTOMENV	.00002 (.00002)	.00002 (.00002)	.00007*** (.00002)	.00002 (.00002)	-.00003 (.00002)	-.01353*** (.00277)	246	.0054
TOPSOC	.00003** (.00002)	.00002 (.00002)	.00004** (.00002)	.00002 (.00002)	-.00002 (.00002)	-.01264*** (.00272)	246	.0117
BOTTOMSOC	.00003* (.00001)	.00002 (.00002)	.00005*** (.00002)	.00002 (.00002)	-.00002 (.00002)	-.01337*** (.00246)	246	.0020
TOPGOV	.00003* (.00002)	.00002 (.00002)	.00005** (.00002)	.00002 (.00002)	-.00002 (.00002)	-.01267*** (.00296)	246	.0186
BOTTOMGOV	.00002* (.00001)	.00002 (.00002)	.00004** (.00002)	.00002 (.00002)	-.00002 (.00002)	-.01246*** (.00247)	246	.0169

Newey-West Standard Errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Source: Authors' own research, using Stata.

As a result of the Fama-French five-factor regression, the portfolios constructed based on different criteria (Total ESG score, Environmental score, Social score and Governance score) do not outperform the benchmark. This result is in line with Zehir and Aybars (2020). Overall, the results indicate that the use of ESG-based scores in the selection investment process does not add a significant additional return.

Conclusion

This study examined the performance of eight portfolios constructed on the basis of ESG scores. The main question I explored was whether portfolios that integrate ESG values generate a significant additional return. The sample consists of 1095 European stocks from 23 countries, and the period analysed is 2021-2022. To form portfolios, all stocks are first ranked according to one-year lagged ESG scores (Total ESG score, Environmental score, Social score, and Governance

score) in a decreasing way. Then 10% of the highest-scoring stocks are included in the top portfolio, while 10% of the lowest-scoring stocks are included in the bottom portfolio. Portfolio evaluation was performed using two techniques: CAPM and Fama French five-factor regression. In addition, the Sharpe ratios of the portfolios have been calculated.

The Sharpe ratio is positive for the top portfolio, showing that investors are compensated more per unit of risk. The Top Environmental portfolio is found to be the best performer for positive values. In contrast, the Sharpe ratio is negative for the Bottom portfolios. This means that these portfolios underperform the risk-free rate.

CAPM regression results show that all portfolios using ESG-based scores underperformed the market. The results of the Fama-French (2015) five-factor model are similar to those of the CAPM. The general findings of this study indicate that there is no relationship between ESG investment and portfolio performance, as market and value factors have effects with similar magnitudes for all portfolios.

These findings provide additional evidence to the literature on the relationship between ESG and portfolio performance in the recent European context. In addition, the results have implications for investors, companies and regulators. Regarding investors, they should start considering ESG ratings when making investment decisions. In effect, companies will start to manage their ESG risk, and this will improve the ESG profiles of companies, with beneficial social effects. Essentially, regulators should provide an ESG reporting standard to help investors understand and compare ESG factors between companies.

A limitation that could be subject to further research is related to the use of a single ESG rating provider. Future research should focus on more rating providers since ESG scores depend on the specific provider methodology. My further work will expand the current model to include even other ESG rating providers and longer time horizons. This topic will be the subject of future research.

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