



CATÓLICA
LISBON
BUSINESS & ECONOMICS

The Effect of ESG factors on Returns during COVID-19

Tomás Nunes

Dissertation written under the supervision of professor Eva
Schliephake

Dissertation submitted in partial fulfilment of requirements for the
MSc in Finance, at the Universidade Católica Portuguesa, 1st of June
2022

Environmental, Social, and Governance (ESG) factors and aspects are becoming more and more relevant to investment practices, used due to societal pressures and as material information to investment. In this research paper, I show how the European stock market changed in composition and in quality of ESG performance between January 2018 and January 2022, with a particular focus on data after January 2020 to account for the effects of the SARS-Cov-2 virus (COVID-19) in this market. Showing that the number of public companies in Europe decreased significantly, that the proportion of companies publishing ESG information also decreased and that average ESG quality dropped in the European market because of the virus. Furthermore, I analyze the performance of European companies fulfilling varied restrictions relative to ESG information during this period and how the performance of these companies accompanied the evolution of COVID-19. Through a series of regressions I complement these results and show how ESG scores were not reliable predictors of returns during this period despite the fact that groupings of companies with higher than median ESG performance showed reduced negative tail risk and reduced returns.

Fatores e aspetos relativos ao desempenho empresarial num contexto Ambiental, Social e Administrativo (ESG) têm vindo a ser cada vez mais relevantes ao investimento, tanto devido a pressões sociais como devido a esta informação ser considerada crucial em decisões de investimento. Neste estudo mostro a evolução do mercado público europeu, em termos de composição e em termos da qualidade da informação relativa a fatores ESG entre janeiro 2018 e janeiro 2022. Existe em particular, um foco em dados após janeiro 2020, para tomar em conta o efeito do vírus SARS-CoV-2 (COVID-19) neste mercado. Ao longo do estudo mostro como o número de companhias no mercado público europeu diminuiu significativamente, como a proporção de empresas que publicam informação sobre fatores ESG também diminuiu e adicionalmente mostro como em média as avaliações relativas a fatores ESG diminuíram devido ao COVID-19. Numa análise mais aprofundada mostro como o desempenho das empresas europeias que cumprem variadas restrições relativas a fatores ESG mudou durante o período analisado e como esse desempenho acompanhou a evolução do vírus. Para complementar este resultado utilizo várias regressões e mostro que as avaliações relativas a fatores ESG não foram bons indicadores de bons retornos financeiros por parte das companhias no mercado público Europeu durante o período de tempo analisado, apesar de terem mostrado reduções do risco de perdas e retornos reduzidos.

Keywords: ESG, stock price resilience, COVID-19, economic crisis

The Effect of ESG factors on Returns during COVID-19, Tomás Nunes

Contents

1	Acknowledgments	4
2	Introduction	5
2.1	Environmental, Social and Governance Factors	5
2.2	The Coronavirus Pandemic: Europe	7
3	Methodology	9
3.1	Data	9
3.2	Descriptive Statistics	11
3.3	The Consideration of ESG factors	18
4	Results	20
4.1	ESG Performance during COVID-19	20
4.1.1	Equal Weighted performance	20
4.1.2	Value Weighted performance	24
4.1.3	Correlation between returns and ESG performance	26
5	Conclusion	29
6	Appendix	30

1 Acknowledgments

I would like to thank the following people for their help in this research project.

My thesis advisor, Eva S., who guided me throughout this project and helped me further develop my research. All the professors at the Católica School of Business and Economics for their willingness to teach me and without whom I would not have been able to develop such extensive research.

My family and friends for their support and encouragement. Particularly, my mother for always being there and my father for his endless enthusiasm.

2 Introduction

Environmental, Social and Governance (ESG) factors have been increasingly considered in the analysis of company performance ever since they first started being analyzed in the 1970's. Touted as a form of risk mitigation, particularly in times of financial crisis, ESG factors are now frequently considered in financial analysis as signals of company performance.

This paper studies whether this is indeed the case by analyzing the performance of stocks in Europe between January 2018 and January 2022. This time period includes the first two years of the Coronavirus pandemic, from January 2020 to January 2022. The contribution of this paper is threefold. First, I assess whether portfolios that consider ESG factors show lower risk profiles or better excess returns during the Coronavirus Pandemic and during the full time horizon. Secondly, I aim to investigate whether there is a significant link between ESG performance and profitability. Lastly, I aim to establish whether the presence of a link depends on the type of consideration given to ESG factors and the time period.

2.1 Environmental, Social and Governance Factors

In addition to the mitigation of risk, the consideration of ESG factors in investment decisions allow investors to directly invest into more sustainable recipients through socially responsible investing (SRI) otherwise known as impact investing. SRI is defined by the Global Impact Investing Network (GIIN) as investment with the intention to cause a positive social or environmental impact in combination with creating financial returns.

In their annual survey from 2020, the GIIN shows a growing impact investing market and notes a steady improvement in the sophistication of impact measurement management practices.

In general investment practices the measurement of impact is also becoming more relevant and translates to an increasing consideration of ESG factors. This is seen both in the increase in the number of companies which publish ESG information and reports but also in the number of financial assets and analysis based on this information. The aforementioned survey, the Annual Impact Investors survey published by the GIIN in 2020 shows that a large majority of impact investors consider that the industry has grown particularly in the context of “Research on market activity, trends, performance, and practice”.

Riedl and Smeets (2017) shows in the context of SRI that these considerations on the investor side come in part from a willingness by investors to create a positive social or environmental impact. Additionally, these authors state that investors also take into consideration the public perception of the positive social and environmental impacts of their investment, engaging in so called social signaling. For these reasons, the authors show that some investors are even willing to sacrifice returns. The Annual Impact Investors surveys shows a similar willingness with around one third of respondents in 2019 and 2020 targeting below market returns.

Amel-Zadeh and Serafeim (2018) shows that in addition to the willingness to create a positive

social or environmental impact most investors consider ESG factors material in investment performance compounding on several studies which show links between ESG performance and corporate measures, namely lower capital constraints (Cheng et al., 2014), lower costs of capital (Dhaliwal et al., 2011), and less negative stock price movements around mandatory ESG disclosure regulations (Grewal et al., 2019).

On the other hand, for companies, sustainability reporting is increasing in part due to pressure from stakeholders including the mentioned investors (Chithambo et al., 2020) but also voluntarily to signal good, expected performance (Healy & Palepu, 2001; Rezaee, 2016) and to increase the legitimacy of the company in a social context (Rezaee, 2016; Tilling, 2004)

In the context of financial analysis, good ESG factors have not conclusively been shown to cause an effect on returns and studies that do find any significant effect are not congruent in its degree and direction. With some studies showing a negative link, meaning that increased ESG scores lead to decreased returns and others showing the opposite, while others still propose that it has no effect at all. Hong and Kacperczyk (2009) for example shows that sin stocks, usually excluded from ESG integrated portfolios particularly in the context of SRI, outperform a market benchmark by 3-4% per year in terms of returns. Given these higher expected returns from sin stocks, their exclusion from portfolios, particularly those with ESG considerations, likely reduces expected returns. In another study, Cornell (2021) argues that good ESG performance is likely to translate to lower returns for investors. On the other hand, papers such as Giese et al. (2019) show that ESG information is transmitted to the price of stocks and good ESG performance creates long lasting positive effects not only on returns but also in reductions of tail risks.

In accordance with this last paper, one of the widely touted benefits of ESG investing is not necessarily higher returns but instead a reduction of risk through a reduction of overall variance of returns or specifically through a reduction in tail-risk. But even these benefits are in question. With some arguing that ESG integration in investment reduces risk only in certain contexts. For example, Drei et al. (2019) shows that the effect of ESG factors depends on geography and time period, and that companies with good ESG performance outperformed the market between 2014 and 2019 in Europe and North America, but fell short of the benchmark between 2010 and 2013. Another perspective is that ESG integration does not have an effect at all or that the effect is instead caused by other corporate factors with which ESG factors are correlated but don't necessarily have an effect in, as argued in Demers et al. (2021). Another potential problem of taking ESG considerations in investment is that excessive screening based on ESG factors could cause increases in portfolio exposure to risk should it significantly reduce diversification opportunities. As such, a delicate balance must be struck such that the potential benefits, if any, from the consideration of ESG factors do not excessively reduce the selection universe in terms of companies to invest in. What constitutes an excessive reduction of the stock universe in portfolio construction is a bit more dubious and likely very conditional. (Verheyden et al., 2016) show that, in both a global and a developed markets universe, the removal of companies

with the lowest 10% in terms of reported ESG scores from selection has several positive effects on portfolios, including the reduction of tail-risk and higher returns. Even the removal of the bottom 25% can have positive effects despite creating a larger deviation from a non-screened portfolio.

2.2 The Coronavirus Pandemic: Europe

Given the potential benefits of ESG considerations in investment, namely, the reduction of risk exposure and increases in returns it is interesting to assess its effect in crisis periods. As mentioned, this study will be focusing on the time-period coinciding with the coronavirus (COVID-19) pandemic.

COVID-19 caused by the SARS-CoV-2 virus is the virus responsible for the current pandemic affecting to a certain degree every country in the globe. As stated in the beginning of the introduction, I consider, in the scope of this research, that the coronavirus begins in January 2020 in China as per information provided by the World Health Organization (W.H.O.) in their website (W.H.O., [n.d.-a](#)). This same organization declared the virus a pandemic on the 11 of March 2020. COVID-19 also had a severe economic impact which closely followed its spread. As the virus spread from China to other countries so too did its economic ramifications (Contessi & De Pace, 2021). Because of this, the economic effects of the pandemic were felt first in China and only months later in Europe and the U.S.. To better understand how COVID-19 spread to Europe, I will rely on the framework established in Ramelli and Wagner (2020). In this paper, the authors define three separate stages to describe the beginning of the pandemic. The first, the *Incubation* stage is defined as lasting from January 2 to January 17. This stage begins on the first trading day after the first signs of the COVID-19 and comprises a period of mild reaction by governments and markets and ends on the last trading day before the next stage, *Outbreak*. This second stage is defined as starting on January 20, the day when human-to-human transmission of COVID-19 is confirmed. The first market crash in China is observed during this stage in the beginning of February, with the value of the CSI 300 index dropping around 8% between January 23 and February 3. As with the previous stage the *Outbreak* stage ends with the start of following stage, *Fever*. Beginning in February 23 and ending in March 20, this stage is characterized by the first lock downs in Europe, particularly in Italy where the first deaths to the virus were occurring, as per data sourced from the database developed in Hale et al. (2021). It is after the beginning of this stage that we start seeing the economic repercussions of the coronavirus in the European markets, as seen in Figure 1 showing the prices of the STOXX Europe 600 Index. Note the drop in price between the end of January and the end of March which was of around 22%, additionally in March 12 specifically the index saw a staggering price drop of around 11%, less than one week before the widespread implementation of lock downs in Europe.

As lock downs and other measures such as mask mandates and social distancing were imple-

mented to combat COVID-19, the spread of the virus slowed down and markets started recovering to an extent. However cases continued rising over the course of 2020 with mutations of the virus occurring frequently. These mutations are designated as variants. Should any variant be associated with any of the following it is designated by the W.H.O. as a variant of concern (definition taken from W.H.O. (n.d.-b)):

1. "Increase in transmissibility or detrimental change in COVID-19 epidemiology"
2. "Increase in virulence or change in clinical disease presentation"
3. "Decrease in effectiveness of public health and social measures or available diagnostics, vaccines, therapeutics"

By the end of 2020, four variants, later declared variants of concern, had been identified in very close succession, the Beta variant first discovered in May, the Alpha variant in September, the Delta variant in October and the Gamma variant in November (W.H.O., n.d.-b). These successive variants appearing, particularly the Alpha and Beta variants coincided with the beginning of the second wave of the pandemic in Europe with lock downs being once again implemented in the middle of October 2020, after not being used since the end of May in most European countries (Hale et al., 2021). This caused a second economic shock in Europe with the STOXX Europe 600 index decreasing by around 5% in this month. By the end of the year, the first vaccines had been created to further aid in fight against COVID-19.

Based on data sourced from Our World in Data (n.d.), by the end of April 2021 the United Kingdom was the first European country and the second worldwide to have 50% of the population with at least one shot of a vaccine. And by July the same country was the first in Europe to have a percentage greater than 50% of its total population fully vaccinated. Given this rate of vaccination and a continued practice of social distancing and mask mandates, the end of the pandemic seemed to be in sight, despite some degree of vaccine hesitancy beginning to become more prevalent. However, the discovery of a fifth variant, the Omicron variant, in November 24 (W.H.O., n.d.-b), dampened that hope. This variant was characterized by higher immune evasion, meaning higher risks of reinfection than other variants and decreased effectiveness of many vaccines (Ferguson et al., 2021). Despite this, the infection caused by this variant has a lower severity than that of previous variants and as such many European countries did not implement lock downs to combat this variant leading less of an effect being felt in the economies of Europe. In fact, no noticeable effect appears in Figure 1 that can be clearly attributable to the pandemic in the overall European economy at this stage.

After the Omicron variant was discovered and with the beginning of 2022 restrictions due to COVID-19 have lessened in most European countries and as of May 2022 a return to normalcy seems likely very soon.

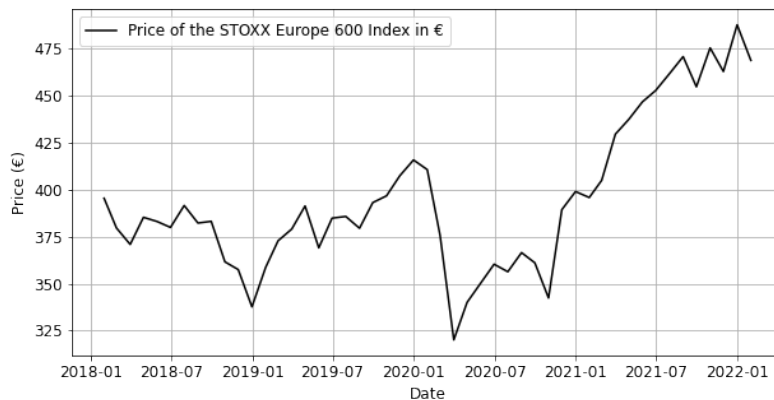


Figure 1: Price of the STOXX Europe 600 Index

3 Methodology

3.1 Data

To assess whether the consideration of ESG factors does indeed have an effect in stocks returns in Europe, I first determine what is defined as a European stocks. I decided to consider stocks headquartered in any country belonging to Europe. The list of countries belonging to Europe is shown in Table 1 and includes 51 countries. Having defined what constitutes a European country I use the Refinitiv Eikon Screener to find the list of public companies (whether active or inactive) in each of these countries. I find that seven of the countries in Europe are not the headquarters of any public company and as such only companies from the remaining 44 countries are included in the data set. The number of companies found in each of the countries in the list is also shown in Table 1. This initial data set includes 14167 companies split between the 44 countries of Europe.

With the list of companies headquartered in Europe completed, I can then begin to extract stock information for each of these companies. To this end, I use the Refinitiv Eikon API. The specific data I need to analyze the effect of ESG factors on stock returns starts with monthly data on the stock prices of all public companies in Europe for the period considered, January 2018 to January 2022. However, that is not enough to investigate the effect of ESG factors. Additional data on said ESG factors is needed at the very least. This data is also taken from the Refinitiv Eikon API, using the ESG scores provided by Refinitiv and relying on their methodology. I choose to extract some additional data for control purposes and to better contextualize my research. This data included figures for market capitalization, specific headquarter country and industry information for each of the companies in the initial data set. Industry information is taken in the form of The Refinitiv Business Classification (TRBC), with information for Business Sector, Industry Group, Industry Name and Activity Name being used to some extent in the course of

Table 1: List of all countries considered as being in Europe: This list contains all countries considered as being part of Europe as present in the Refinitiv Eikon Screener, besides each country listed is the number of public companies headquartered in that country. In total the list includes 51 countries, of which 44 are the headquarters of at least one company. The total companies considered in this initial data set number 14167

Albania 0	Austria 91	Slovak Republic 49
Andorra 0	Belgium 217	Ukraine 206
Bosnia and Herzegovina 718	France 1074	Denmark 198
Croatia 96	Germany 1189	Estonia 35
Cyprus 138	Liechtenstein 4	Faroe Islands 3
Gibraltar 6	Luxembourg 677	Finland 193
Greece 192	Monaco 10	Guernsey 136
Italy 444	Netherlands 173	Iceland 29
Macedonia 162	Switzerland 461	Republic of Ireland 774
Malta 45	Belarus 0	Isle of Man 30
Portugal 55	Bulgaria 257	Jersey 85
Republic of Montenegro 270	Czech Republic 26	Latvia 21
Republic of Serbia 350	Hungary 172	Lithuania 36
San Marino 0	Moldova 0	Norway 330
Slovenia 129	Poland 796	Svalbard and Jan Mayen 0
Spain 303	Romania 369	Sweden 1023
Vatican City State 0	Russia 852	United Kingdom 1743

this study. The list of the Business Sectors for companies considered in my research is shown in Table 4. Additionally, to better specify any linear regression I create later on I take the Fama and French factors relative to the European market from the Kenneth French website (French, n.d.).

The Refinitiv Eikon API already helps reduce errors in the final data set during data extraction, since if there are problems with the data of any company, it is automatically excluded from the extracted data set. As I extract some data types separately, each extraction removes from consideration different companies. The extraction of data on price, country of headquarters and industry specifications is done simultaneously and reduces the company universe from 14167 to 12729.

Having this new data set with price information, I calculate returns using the formula:

$$\ln(\text{Price}_{x,t}/\text{Price}_{x,t-1})$$

The return data set is then checked for companies with returns equal to 0 or infinity and if all the returns of a company are equal to these, the company is dropped from the data set. I do this because I consider that as companies with these returns are inactive during the whole time period, i.e. have delisted or no longer exist after the beginning of the considered time horizon. I also perform other checks to make sure that each of the companies in this data set

is indeed headquartered in Europe, this also implies the removal of companies with no data on the country of headquarters. Lastly, companies which do not belong to a valid industry are removed as the lack of data in this regard makes it so that industry controls are not possible later in the research. The transformation of the data and the checks performed further reduce the considered company universe from 12729 to 10921. I then extract ESG data for all companies with return data and obtain a data set with 2592 companies with valid ESG data for at least one of the months in the period considered. The reduction in the universe of companies considered in this data set is not replicated in the return data set to reduce the overall universe considered. This is because I aim to compare the overall market to companies with valid ESG information. To this end I create a separate return data set with the returns for all companies with valid ESG scores. This second return data set, the ESG Returns data set, only includes 2589 companies as 3 companies with ESG data are removed since they do not have valid return data. I would also like to note that for each company data point I consider as the respective ESG Score the most recent. While this may cause problems in the data further into the research, I believe this to be the best way to account for ESG information in investment decisions in the context of this research. Lastly, data for market capitalization is extracted. As I only intend to consider market capitalization in conjunction with return data I only attempt to extract data for companies belonging to the return data set. This cuts down the number of companies considered from 10921 to 8760. Only keeping in the return data set companies with both return data and market capitalization information. As with the return data set, the data sets with ESG information and market capitalization data were also checked for companies with no information or a value of 0 during the whole time period and these are removed. This is done simply to not solely rely on the data extraction process to verify my data sets.

Having all the relevant data extracted and cleaned, I create a complete data set with all the information compiled for each company and for the time period considered, from January 2018 and January 2022. A subset of this data set is also created using only data from January 2020 to January 2022 to contrast post-pandemic performance to overall performance. Both of these data sets are used later in the creation of regressions.

3.2 Descriptive Statistics

To better understand each of the data sets I defined and created in the previous section, Section 3.1, I calculate some descriptive statistics of the data. Particularly, in terms of the growth in the number of companies. First, to understand the growth in the number of stocks in Europe I refer to the cleaned return data set and build Figure 2 which shows the monthly growth in the number of stocks with valid returns and market capitalization.

For comparison with this figure I also build another figure, Figure 3, which shows the monthly evolution in the number of stocks with valid returns and market capitalization as well as valid ESG information in Europe. These two figures are accompanied by a table showing the descrip-

tive statistics of the monthly number of companies considered in each graph. Specifically, these tables show the mean (Mean), standard deviation (std), the minimum (min), maximum (max) and the 25th (25%), 50th (50%) and 75th (75%) percentiles.

Mean	6602.14
std	400.73
min	6017
25%	6297
50%	6511
75%	6836
max	7486

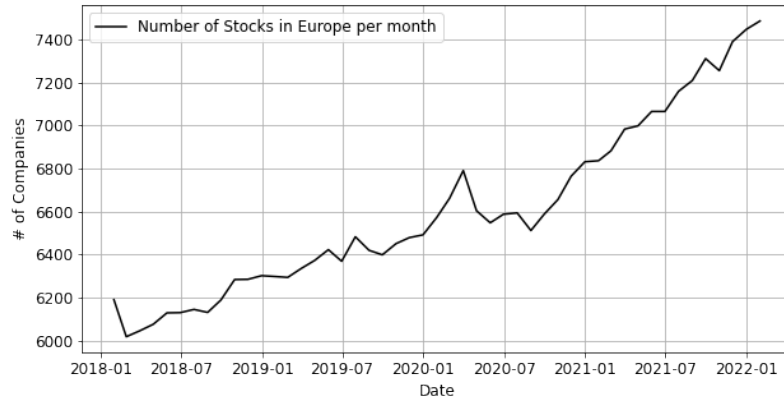


Figure 2: Number of Stocks with valid Returns in Europe

Mean	1751.04
std	416.11
min	1201
25%	1443
50%	1849
75%	2182
max	2589

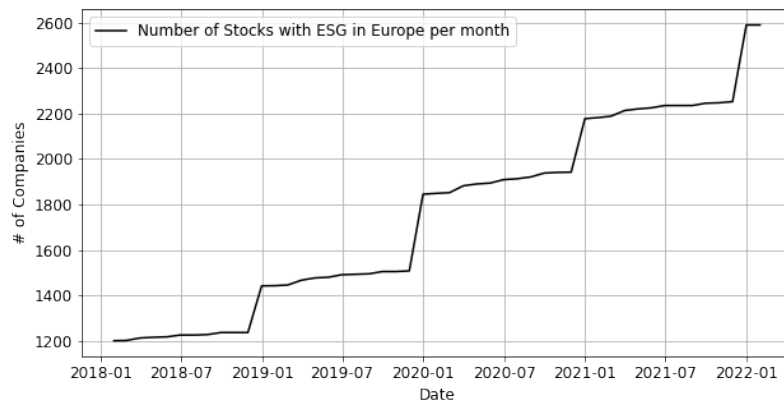


Figure 3: Number of Stocks with valid ESG Scores and Returns in Europe

Starting with a simple comparison of the data in the tables, one point of particular interest is the fact that the standard deviation is almost the same in both Figures. This is worrying as it means that the subset of companies that publish ESG scores tend to vary much more drastically in number, due to the smaller size of the universe considered. Which could in turn make any conclusions taken based on this subset of data much less reliable as time periods are less comparable with each other. Looking instead at the graphs, they are particularly interesting as they illustrate the monthly data in a very easy to understand manner. Figure 2 showing the overall number of stocks with returns in the European market reflects the reality of the pandemic during its beginning very well. Showing the number of public companies in the second quarter dropping sharply likely due to the global economic downturn and government imposed lock downs. This aspect of the pandemic is interestingly not very noticeable in Figure 3, with only a slight

dip in the growth of the number of ESG publishing companies in the beginning of 2020.

The reason for this fact is harder to determine and is most likely a conjunction of different factors. First, ESG information is typically published on a yearly basis by most companies. The yearly nature of ESG data publication can be easily seen in Figure 3 in the sudden jumps in the number of companies in the beginning of each year. As such, ESG data might not reflect the reduction in the number of companies in the market during the latter quarters of 2020, specifically after March 2020, which can be seen in the monthly data of Figure 2. In fact, the number of companies in the overall market had returned to pre-pandemic levels by January 2021 as seen in Figure 2 which could hide the reduction in ESG publishing companies in the middle of the year.

Another possible factor is that the supposed advantages of considering ESG profiles in investment decisions were emphasized during the pandemic. This emphasis could have caused an increased percentage of companies to begin publishing information, compensating for any eventual reduction in overall companies in the market.

An additional figure, Figure 4, helps better understand this potential compensation. This figure shows the percentage of companies with valid ESG Scores in Europe every month. As with Figure 2 and Figure 3 this figure is also accompanied by a table showing the descriptive statistics of the data used in the graph.

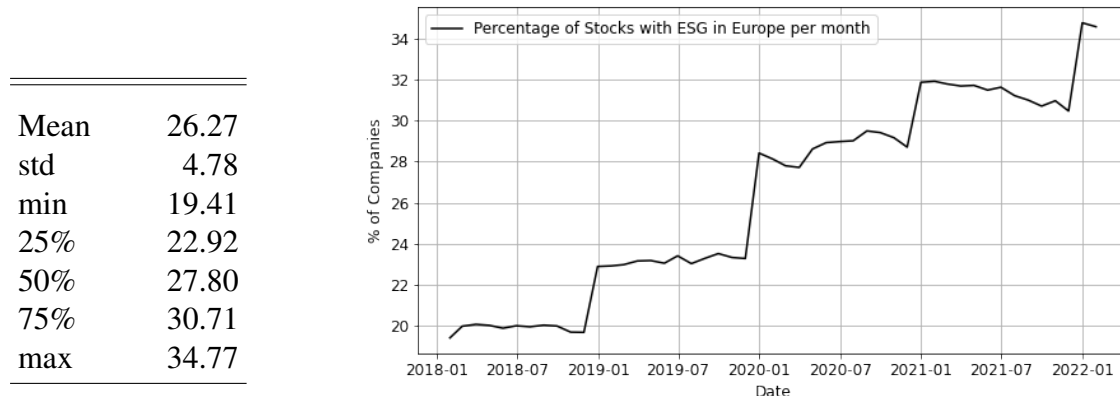


Figure 4: Percentage of Stocks with valid ESG Scores and Returns in Europe

The increase in the percentage of companies publishing ESG information in the second half of 2020 is concurrent with the recovery in the number of companies in the overall market is seen in Figure 2, and can be said to reflect this same compensation.

Most interestingly the percentage of companies publishing ESG information in Europe drops in the beginning of 2020. This could indicate a combination of the following four things:

1. First, that the large number of companies joining the market in the beginning of 2020, mostly did not publish ESG Scores. This, in combination with the fact that the percentage of companies with valid ESG information increased as the overall number of companies

in the market decreased after March 2020, supports the possibility of ESG publication creating resilience to crisis. Note, that this contrasts only ESG publishing companies versus non ESG publishing companies since these figures do not provide information on the quality of the ESG performance of these companies. As such these first graphs do not allow for conclusions regarding the effect of the quality of ESG performance on company performance during the pandemic.

2. Another possibility is that companies chose to delay ESG reporting in the beginning of the pandemic, this is consistent with the stagnation of the growth in the number of ESG reporting companies seen in the beginning of 2020 in Figure 3, growth which then continues after March 2020.
3. Alternatively, companies that published ESG information simply stopped existing or got delisted which contrasts with the increase in the number of companies in the beginning of 2020 seen in Figure 2. This could represent an earlier reaction to COVID-19 than the overall European market, but that is unlikely as the effects of COVID-19 were not felt in Europe prior to March.
4. Another possible explanation is that companies which used to publish ESG information simply stopped. I deem this possibility the most unlikely since after having built the data collection and analysis infrastructure required to publish ESG information it is unlikely that a company would stop as long as there is no perceived damage from the publication which is unlikely. However, this option becomes more likely if there was a significant decrease in the ESG performance of companies as it makes the publication of ESG information less desirable

To be able to take better conclusions and better understand these changes I create an additional figure with descriptive statistics I considered, Figure 5. This figure shows the average ESG Score of companies with valid ESG Scores in Europe and is also accompanied by a table with descriptive statistics. Note that this table has a particularity, instead of showing the descriptive statistics of the average ESG scores, the data used accounts for each individual data point of ESG data for all companies. This being the case the descriptive statistics have a different interpretation with the minimum of 0.38, for example, representing the minimum ESG Score of any company in any month in the data, instead of the minimum monthly average.

From this graph I can assess how the quality of the ESG performance of companies in Europe changed during the pandemic. And the data in the graph show an interesting picture with average ESG performance suffering a reduction during the first year of the pandemic, 2020. This could mean that companies which were delisted or stopped existing had better than average ESG Scores should option 3 in the previous list be the most prevalent. Or it could simply mean that overall ESG scores decreased during the pandemic, as companies would focus on surviving over maintaining a good ESG score, which would support option number 4 of the previous

Mean	49.54
std	21.57
min	0.38
25%	33.01
50%	50.66
75%	66.31
max	95.71

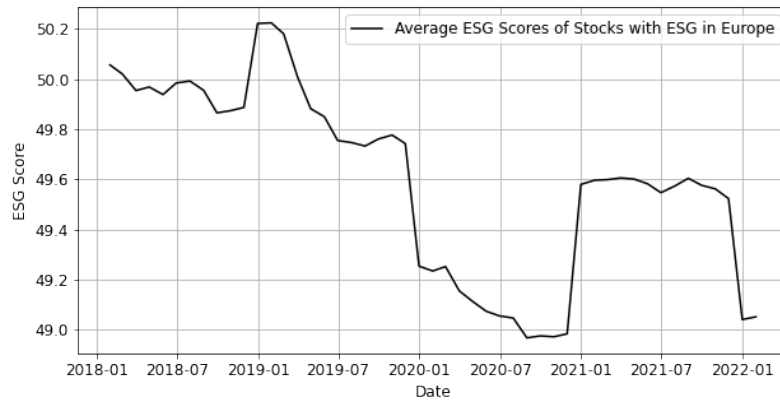


Figure 5: Average ESG Scores for companies that publish ESG Scores in Europe

list. Nevertheless, this implies that ESG performance is a secondary concern and could even interfere with good company performance rather than aid it.

To complement this graph and further explore the options listed, I sought to understand if there is any relationship between ESG performance and survival of companies to COVID-19. For this reason, I calculate the average ESG scores across all time periods for companies that don't have valid returns by the end of the time period considered and compared it to the mean ESG score across all time periods of companies with valid returns in the same period. The results of these calculations are in Table 2 and contrast with the conclusions from Figure 5. Here, companies with invalid returns at the end of the time horizon, some of which stopped existing, have a worse average ESG performance. This hints that ESG quality was factor of resilience in companies during the time period analyzed and could continue to be. Note, however, that the number of companies with invalid returns at the end of the time horizon is only 56, which reduces the reliability of these results.

Table 2: Average ESG Score of companies depending on the validity of their returns at the end of the time horizon

	Valid Returns	Invalid Returns
Average ESG Score	49.34	36.01

Widening the scope, I also compare the number and the percentage of companies without valid returns between the overall market and companies with valid ESG Scores, in order to understand differences between companies that publish ESG scores and those that don't. This is shown in Table 3. This table shows a very wide difference in the percentage of stocks without valid returns at the end of the time period between the overall market and the universe of companies with valid ESG scores. These results imply that companies which publish ESG scores were more resilient to COVID-19.

Table 3: Number and percentage of companies without valid returns in the overall market and within the universe of companies that publish ESG scores

	With ESG Score	Overall Market
# of companies without valid Returns	56	1274
% of companies without valid Returns	2.16%	14.54%

There are some differences in ESG Scores between different industries which are very relevant to the analysis of the evolution of ESG performance. To understand these differences I calculate the average ESG scores for all companies in each Business Sector for the time period from January 2018 to January 2022 and from January 2020 to January 2022. These results are shown in Table 5. The average ESG scores in the first period are labeled ESG Score and for the second ESG Score 2020+. Notice how the effect to ESG performance seen in Figure 5 is not a generalized effect to all of the industries considered despite the lower average ESG Scores in the second half of the time period considered. Some industries, particularly those with lower average ESG Scores (below 30), showed improvement in this area in this second part of the time period. This hints that the positive effects of increasing ESG performance are greater for companies with lower than average ESG scores and hence that the effect of ESG performance on company performance depends on thresholds. This will be explored further in this study.

Lastly in this section, I wanted to understand how companies with published ESG Scores differ from those in the overall market. To this end, I chose to investigate the difference in returns between these two sets of companies. This also serves to create a baseline for comparison within the universe of companies that publish ESG, which I will use later in my research.

To illustrate this difference I created four graphs. The first two, in Figure 6, show the average, or equal weighted (EW), returns of all companies in the market and of the subset of companies in the market that publish ESG Scores. This data could be interpreted as the returns of the average company. The other two, in Figure 7, show the performance of the same two sets of companies but instead of the average returns I consider the value weighted returns (VW) of all companies. This could be said to show the returns of the average Euro in the market.

These graphs show a couple of trends which were common to both the overall market and stocks with published ESG information. First, both sets of data show significant drops in returns consistent with the pandemic's development described in Section 2.2. At the beginning of 2020 and at the end of 2020 all the graphs show these drops with varying degrees of intensity. Interestingly, whereas in Section 2.2 the effect of the Omicron variant was not clearly seen in the STOXX Europe 600 Index in these graphs there seems to be a drop in the value weighted returns of the overall market in the period where that variant came to light. This could mean that the effect of this variant was not generalized to all companies, and that instead large companies specifically were particularly affected or rather that the subsets of companies that were

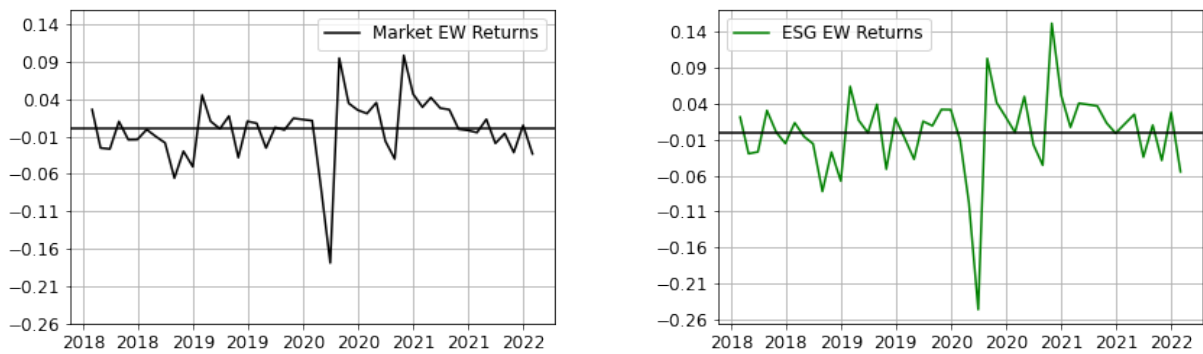


Figure 6: Equal weighted returns of all companies in the European market (left) and with a valid ESG Score (right)

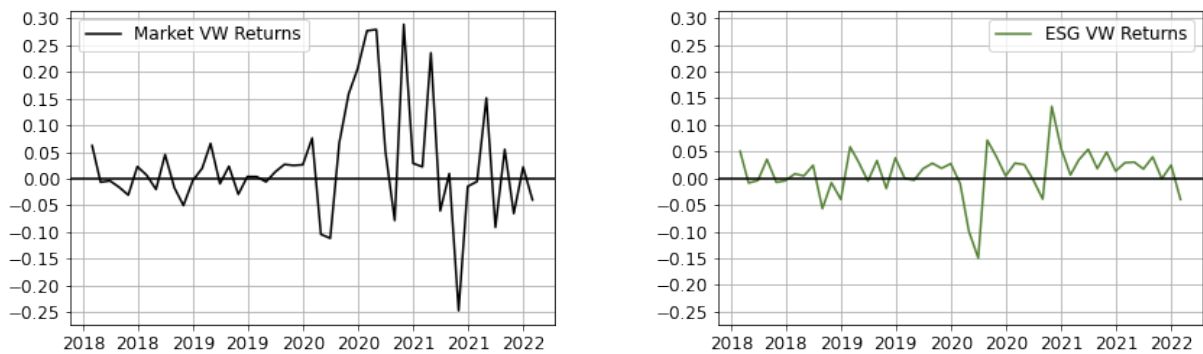


Figure 7: Value weighted returns of all companies in the European market (left) and with a valid ESG Score (right)

heavily affected by this variant tended to be large companies. This is consistent with the fact that companies in different industries tend to have vastly different average market capitalization and that the effect of COVID-19 varied heavily depending on the industry (Ramelli & Wagner, 2020). However, should that be the case why is this significant drop not replicated in the value weighted returns of companies with valid ESG scores. It could simply be that the industries more heavily affected do not tend to publish ESG scores and could indicate that the simple publishing of ESG information could be a good predictor of returns and a factor of resilience. Comparing the EW returns and VW returns of the market we can also see that in the overall market COVID-19 seems to have had less of a negative effect on larger companies, with smaller companies suffering much heavier losses. This is seen in the fact that the drop in the average returns at the beginning of 2020 is higher than that of the value weighted returns. Additionally, subsequent value weighted returns after the first drop in 2020 are much higher than in the case of EW returns. Overall, despite an additional drop in VW returns seen at the end of 2021 as compared to the EW returns, it seems that larger companies suffered much less during COVID-19 than the average company. If instead comparisons are drawn between the market and compa-

nies with valid ESG Scores, the first impression is that the average returns of companies with valid ESG scores tend to have bigger outliers. Note that this doesn't necessarily contradict the benefits described in Section 2.1 relative to the reduction of tail risk as those depend on the quality of ESG performance which is not considered here. In Figure 6 the presence of bigger outliers and larger variability of returns is observable.

In terms of value weighted returns shown in Figure 7 this is not as clear. 1-to-1 comparisons between the two graphs in this Figure are harder to establish because the peaks and valleys of these two graphs are significantly different in intensity and frequency. In this Figure, the market shows much higher volatility overall but with more frequent peaks when compared to fairly stable value weighted returns of companies with valid ESG information. If I were to consider that the drop at the end of 2021 in the VW returns of the market is unrelated to the contrast between companies that publish ESG information and the market, then I could argue that the trend observed in Figure 6 is replicated in Figure 7 in that negative tail risk seems to be higher for companies that publish ESG information. However, that drop cannot be ignored despite the argument that it is related to industry specifications and not to ESG performance. This is because it cannot be stated that the two are unrelated. As such no other trends are observable in the comparison between the two graphs in Figure 7, other than the sharp difference in volatility. Having analyzed all these graphs and tables and having some awareness of the reasons behind these figures, I begin to believe that ESG performance was either irrelevant to company performance and survival during the pandemic or even detrimental, despite the appearance of some resilience to COVID-19. The publication of ESG information however, seems to be a more robust cause of company resilience.

3.3 The Consideration of ESG factors

To establish comparisons between the performance of companies depending on the quality of ESG performance and management I create some methods to consider ESG performance in portfolio building. One of them, inspired by Verheyden et al. (2016), consists on removing from consideration the stocks with the $x\%$ worst ESG Scores at the end of month $t-1$ in a given month t . The time period is also changed to account for COVID-19 with comparisons being drawn between the whole time period considered and the periods after January 2020.

More specifically, I create data sets which remove from consideration the companies with the bottom 10%, 20% and 50% of ESG Scores from the data set containing the returns of stocks with valid ESG scores, the ESG Returns data set. To these new data sets I call Screen 10%, Screen 20% and Screen 50% respectively and they are used further into the research. The removal of companies is not directly to the data set but rather only to the months in which a given company had the bottom $x\%$ of ESG performance. Meaning that companies that were in the bottom in one month can be considered in the next. This causes the reduction to the stock universe in the data sets to not necessarily be equal to the percentage defined. In fact the

Screen 10% data set contains 2338 stocks a 9,7% reduction in the number of companies. The remaining data sets, Screen 20% and Screen 50%, include data from 2092 and 1333 companies respectively. Which implies a reduction of the overall company universe in 19.2% for Screen 20% and in 48.5% for the Screen 50% as compared to the initial ESG Returns data set.

Another method to integrate ESG considerations into portfolio building is to screen based on industry instead. This is a method more often associated with SRI and in this case will consist on removing from consideration sin stocks. To that end, I chose to use the definitions established in Sagbakken (2021) as they include the definition of a new category of sin stocks which contains many fossil fuel related industries, which I consider important in the current global context. Sagbakken (2021) creates a distinction between these new sin stocks and the more traditional sin stocks which I also consider.

The definition of traditional sin stocks is consistent with the mentioned paper, encompassing stocks from the Refinitiv Eikon Industry Groups: 'Aerospace and Defense', 'Casinos and Gaming', 'Brewers', 'Distillers and Wineries', and 'Tobacco'. Regarding these industries, only companies involved in production are considered sin stocks whereas retailers, for example, are not. Note that, for Aerospace and Defense specifically, not all companies with activities within the industry are considered sin stocks. Only companies with activities named as related to weapon manufacturing and the defense sector in Eikon are considered sin stocks. This distinction is particularly important for activity 'Aerospace and defense (NEC)'. For this activity, the description of each company involved is manually investigated and companies are considered a sin stock only if the description mentions words relating to weapons, the military, or the defense sector.

New sin stocks as defined in Sagbakken (2021) are also considered and I choose to change their name to ecological sin stocks to better convey the type of company included in this type of stocks. These are also taken into account in this SRI screen with the definition being consistent with the aforementioned paper. This type of sin stocks includes the Fossil Fuels Business Sector, namely Industry Groups, 'Coal', 'Oil and Gas', 'Oil and Gas related equipment and services', and 'Uranium'. Additionally, Industry Group 'Metal and mining' is also included in this type of sin stocks as it includes industries which are often associated with negative ecological impact. From this Industry Group, companies belonging to the 'Aluminum' industry are removed as they do not fit with the reasoning for the inclusion of the overall Industry Group. Another activity, 'Rock Mining', not belonging to this Industry Group is also included as it does fit with the mentioned reasoning, given that companies practicing this activity have a high ecological impact. As with traditional sin stocks retailers of products produced by companies in these Industry Groups are also not considered sin stocks in this work. Based on these two sin stock definitions I create three different data sets which remove from consideration certain types of sin stocks. The first is the Traditional data set which is simply the ESG Returns data set, defined previously, excluding companies defined as traditional sin stocks. In a similar vein, the second constructed data set, the Ecological data set excludes from the ESG Returns data set

the ecological sin stocks. The last industry based screen is the No Sin data set which excludes from the ESG Returns data set both types of Sin Stocks. Note that these data sets excluding sin stocks tends to be much less restrictive in terms of the reduction of the stocks universe as compared to the previously defined Screen data sets. In fact, the Traditional data set contains 2540 companies, the Ecological data set, 2431 and the No Sin data set, 2382. As with the initial ESG Score filters, the SRI screens are also the target of comparison between the two different time periods of January 2018 to January 2022 and January 2020 to January 2022.

4 Results

4.1 ESG Performance during COVID-19

4.1.1 Equal Weighted performance

To better contextualize this research, I decided to first investigate how the performance of companies with ESG information of varying quality compares to that of the overall market. To do this I rely on the data sets built using the methods described in the previous section, Section 3.3, in addition to the completed data sets described at the end of Section 3.1. Using this data I proceed to assess the performance of companies using simple grouping methods on the whole data sets. I opt to first calculate the average returns for each month for each of the data sets using both data between January 2018 and January 2022 and data between January 2020 and January 2022. As the methodology for this analysis is similar to that used in the construction of Equal Weighted (EW) portfolios I shall refer to these groupings as such. The results for the data between January 2018 and January 2022 are shown in Table 6 and for data after January 2020 are shown in Table 7. The portfolios built for these tables are constructed using the data sets of the same name, with some exceptions. The first exception is the Market portfolio which uses data on the returns of all the companies with valid returns and market capitalization data in Europe. This data is contained in the cleaned returns data set mentioned at the end of Section 3.1. Another exception is the ESG Only portfolio which uses data on all companies in the Market portfolio which also have a valid ESG Score published on Refinitiv Eikon. This data is instead contained in the ESG returns data set which is also described in Section 3.1. The EW returns of these two data sets are already illustrated in Figure 6. The data sets used for the remaining portfolios are detailed in Section 3.3.

The EW returns of the described portfolios show the statistics of average returns for an investment in the all companies in each of the data sets during the respective time periods. This could be used to better understand the distribution of returns of the average company in each of the data sets but is not necessarily the same in all aspects.

For easier analysis please note that the tables contain figures for the annualized mean (Ann. mean), annualized standard deviation (Ann. volatility), skewness (skew), excess kurtosis (kurt),

sharpe ratio (sharpe), minimum (min), 25th percentile (25%), 50th percentile (50%), 75th percentile (75%) and maximum (max) of returns of all the described EW portfolios.

Starting the analysis of the data I first draw comparisons within the time period shown in Table 6. It is clear from the results in the table that some of the proposed methods to take into account the quality of ESG performance fail to show a significant improvement in comparison with the overall market in the time period considered. Of the data sets constructed it seems that the ESG Only portfolio has the best annualized mean returns in this time period, of 0.39%, despite a more variable distribution with higher annualized standard deviation, 19.63% and higher excess kurtosis, 6.42, than the market which boasts figures of 14.71% and 5.23 respectively for these measures. These figures back the argument made in Section 3.2, that perhaps rather than ESG performance quality it is the fact that a company publishes ESG information that is the determining factor of returns. Note that this riskier distribution is seen in all types of portfolios considering ESG information with greater standard deviation, lower minimum returns and higher maximum returns than the market. Other than the ESG Only portfolio, the remaining two types of ESG portfolios have very contrasting performances. The Screen portfolios (Screen 10%, Screen 20% and Screen 50%) show worse results than the market and the ESG Only portfolio in both annualized mean returns and standard deviation. The annualized mean returns of these portfolios are -1.65%, -1.79% and -1.26% respectively. As for annualized standard deviation, the figures are instead, 20.09%, 20.21% and 20.72%. The reason for the higher standard deviation could be the progressively increasing lack of diversification, which would be particularly relevant in such a volatile period. This lack of diversification is also likely the reason for such a larger value of excess kurtosis, measuring above 6.9 for all these three portfolios, higher than both the Market portfolio and the ESG Only portfolio. This larger value implies the existence of fatter tails in the distribution which means that the average returns of companies in these data sets are more likely to be outliers, both positive and negative. This could go against the hypothesis that ESG quality is negatively correlated to tail risk. In fact, these results might suggest the opposite since screens which remove from consideration more companies with ESG Scores lower than the median tend to show progressively higher excess kurtosis and hence bigger tail risks as average ESG Scores improve in the stock universe. Furthermore, other than the high excess kurtosis these portfolios also show a negative skewness lower than that of the market and on par with that of the ESG Only portfolio, which paints a very grim picture. One could argue that a comparatively high frequency of outliers shown in the excess kurtosis and the fact that outliers tend towards negative values shown in the negative skewness could mean that negative tail risk is specifically increased in these portfolios. On the other hand, the skewness of these portfolios grows less negative as more companies with ESG Scores below the median are excluded and could instead be said to represent a reduction in negative tail risk despite the increase in excess kurtosis. Additionally, the mentioned reduction in diversification is the factor that is likely responsible for the increased excess kurtosis and standard deviation of these portfolios, rather than the exclusion of companies with low ESG scores. Lastly, due to the

nature of these measures which give more importance to bigger outliers it could be that most outliers are positive and there is simply a very large negative outlier which unbalances these measures more than in the case of the overall market. This second hypothesis is also consistent with the performance of companies with valid ESG Scores shown in Tables 6 and 7 which show one major drop in returns and many smaller positive peaks.

Interestingly, the portfolios built using the alternative methodology for the consideration of ESG performance which is described in Section 3.3 show a marked improvement over the Screen portfolios in the time horizon considered in Table 6. Of these portfolios which ignore sin stocks, (Traditional, Ecological and No Sin), the No Sin portfolio shows the best performance with annualized mean returns of -0.04% and annualized standard deviation of 19.42%, this represents a minor increase in standard deviation over the Ecological portfolio, for which the figure measures 19.39%, but improved annualized mean returns over the -0.078% of this second portfolio. However, the problems with increased tail risk in the Screen portfolios are also seen in these three portfolios, with the excess kurtosis of all portfolios being higher than the market and the skewness more negative. Despite this, when compared instead to ESG Only portfolio, these portfolios show an improvement in risk profile relative to tail risks, with marginally lower excess kurtosis and very similar skewness and standard deviation. Do note that these portfolios do fall short in terms of annualized mean returns in comparison with the ESG Only portfolio. From this initial analysis it seems that the methods used to include ESG information in investment decisions tend to have a worse performance than simply investing and disregarding the quality of ESG performance of companies.

The analysis of EW returns for the same portfolios from January 2020 to January 2022 which is shown Table 7, seems to reinforce this first impression. The vast majority of portfolios with some measure of ESG considerations perform worse than the market portfolio in all measures. All except the 50% Screen portfolio show decreased annualized returns, increased standard deviation, more negative skewness and higher excess kurtosis. The 50% Screen portfolios shares in all of these failings, except in the comparison in skewness, where this portfolios beats the market by a small margin. Despite the failure of the portfolios considering ESG information being maintained between the two time periods there are substantial differences between the two time frames considered. The table using data from January 2020 to January 2022 shows better performance in all portfolios by most perspectives. With all portfolios showing much larger values for the Annualized mean returns accompanied by a comparatively minor increase in standard deviation as compared to the previous time period. This is reflected in the increased Sharpe ratios in the second table.

Another interesting piece of information in this Table is that the excess kurtosis of all portfolios in this period is also highly reduced. This does not seem consistent with the data shown in Figure 6, as outliers seem concentrated between January 2020 and January 2022. It is a combination of two facts that have an effect on the calculation of excess kurtosis that causes this decrease. First, the mean, used to calculate kurtosis, is less affected by outliers in the period

between January 2018 and January 2022 due to the increased amount of data and because of that outliers are larger in comparison to the mean. This is not the case in the reduced time period between January 2020 and January 2022. In this second time horizon, the reduced amount of data makes it so that outliers heavily influence the mean, and because of that the difference between the mean and said outliers is reduced. The second factor is that the standard deviation, a mitigating factor in the calculation of kurtosis, is higher in this second time horizon. This explains the reduction in excess kurtosis despite a seemingly higher frequency of outliers as compared to the period between January 2018 and January 2022.

The best portfolios in this time period also varied significantly, with the market portfolios showing the uncontested best performance in all the measures considered, except skewness, as mentioned. Consistent with the first impression that the inclusion of ESG information in investing could be detrimental. Nevertheless, there were also some changes in the differences between the portfolios which include ESG information which are also worth considering. Out of all of these portfolios, in this time period, the Ecological portfolio has the best performance in most measures, boasting higher annualized mean returns, lower standard deviation and excess kurtosis. The skewness of this portfolio contrasts with all these other good measures and while comparable to that of the other portfolios it is one of the most negative. The reason for the improved performance of this portfolio is the exclusion of companies in the fossil fuel industry group from consideration. Some sectors of this industry suffered heavily during COVID-19 with the average the price of crude oil futures and Brent crude oil futures for example dropping as much as 60% in the beginning of the pandemic and taking much longer to recover to pre pandemic levels than the overall market, with prices only recovering by the end of April 2021. This contrasts with the overall market which dropped around 20% as mentioned in Section 2.2 and recovered by the end of 2020. The No Sin portfolio also benefits from the exclusions in the ecological portfolio and reaps many of the same benefits. This performance is not reflected in the Traditional portfolio which does not exclude the Fossil Fuel industry group. In fact, this last portfolio has a worse performance than the ESG Only portfolio which is consistent with the conclusions of Hong and Kacperczyk (2009) mentioned in Section 2.1. The similarities between the performance of the Ecological and No Sin portfolios also suggest that the removal of ecological sin stocks is much more impactful than the removal of traditional sin stocks. Outside of the portfolios which exclude sin stocks and the market portfolio it is the ESG Only portfolio that has the best performance. The remaining portfolios, the Screen portfolios, show the worse performance out of all portfolios and their descriptive statistics show a similar evolution to that shown in Table 6. The standard deviation of these portfolios is the highest out of all portfolios, and further increases as more companies with ESG Scores worse than the median are removed. The same is the case with the excess kurtosis of these portfolios. Again, the gradual increase of these two statistics can be explained by reduced diversification. Lastly, the skewness of these portfolios also shows a similar evolution to that in Table 6. While initially, for the 10% Screen portfolio it is worse than that of the Market and ESG Only portfolios

it slowly increases as more companies with ESG Scores below the median being removed, with the 20% Screen portfolio showing a minor increase in skewness from -1.407 to -1.405 and the 50% Screen portfolio showing a marked increase to -1.334, a skewness slightly surpassing that of the market. Finally, having analyzed these two tables of EW returns I find some hints that within the universe of companies that publish ESG Scores that the quality of these ESG scores can be said to reduce negative tail risk in certain contexts as portfolios with better average ESG Scores show a less negative skewness. However, as this improvement is accompanied by an increase in excess kurtosis and standard deviation in the case of the Screen portfolios, these conclusions are not clear from these first two tables. Nevertheless, I tend to believe that this data does show this reduction in negative tail risk, as the lack of diversification is most likely responsible for the increase in these measures. Additionally, it seems that companies that publish ESG information tended to have much higher variability of returns than those in the overall market.

4.1.2 Value Weighted performance

To further understand if ESG quality had an effect on performance during COVID-19 I decided to create another two tables. Table 8 and Tables 9. These tables show the Value Weighted (VW) returns of the portfolios described in the previous sections using data from January 2018 to January 2022 and from January 2020 to January 2022 respectively. These tables contain valuable information and as opposed to showing the average performance of companies in each of the data sets as in the previous section's Tables they instead show the average performance of one Euro.

Starting with the analysis of Table 8, the results are already drastically different from Tables 6 and 7. All portfolios show positive annualized mean returns and there is a much clearer contrast between the market and the portfolios which consider ESG information in some way. Here, the market does not boast a clear best performance since risk profiles differ significantly between the market and portfolios which integrate ESG information. In fact, some portfolios which integrate ESG information have very similar Sharpe ratios to that of the market, which is around 0.8, such as the ESG Only portfolio and the Traditional portfolio, despite having heavily reduced annualized returns. One aspect where the market surpasses ESG integrated portfolios is in its skewness and excess kurtosis. These measures of tail risk are incredibly good in the case of the VW returns of the market, being equal to 0.79 and 1.59 respectively. The returns of the market have relatively low excess kurtosis and a positive skewness, which is very rare in modern investments. This can be explained by the large peaks in these VW returns, shown in Figure 7, which more than compensate the one comparable drop in returns at the end of 2021 in the calculation of the skewness. Note that these peaks are not seen in the VW returns of companies with valid ESG information, which is the reason for the large disparity in skewness. On the other hand, the large variability of the data is to blame for the relatively low value of

excess kurtosis despite the large amount of what seem to be outliers in the second half of the data set. As the standard deviation is again a very impactful mitigating factor in the calculation of kurtosis. Drawing comparison with the portfolios which consider ESG information, it can be seen in Figure 7 that these companies lack the large peaks shown in the VW returns of the market while maintaining some drops of the same intensity. In combination with their reduced standard deviation, this explains the large disparity in excess kurtosis.

Considering only the portfolios which consider ESG information, all of them are fairly similar in terms of standard deviation, with the measure reaching around 15%. In terms of annualized mean returns, the ESG Only portfolio boasts the highest value of 13.19%. The portfolios which exclude Sin stocks lagged slightly behind with annualized mean returns above 10% but below 12.5% among the three portfolios. Consistent with their performance in terms of EW returns the Screen portfolios are the worst in terms of annualized mean returns. In the case of these three portfolios annualized mean returns progressively drop from 8.15% to 6.63%, as more companies are excluded. These portfolios do however see a gradual decrease in standard deviation, decreasing from 14.35% to 13.63% while the portfolios excluding sin stocks see the inverse trend, increasing from 15.02% to 16.37% between the Traditional portfolio and the No Sin portfolio. Note that there is only a marginal difference in this measure between the Ecological portfolio and the No Sin portfolio, again indicating that the removal of companies in the Fossil Fuel industry group is more impactful than the removal of traditional sin stocks in this case. As in the case of the EW returns, the Screen portfolios also show a progressively less negative skewness, increasing from -0.81 to -0.78, again implying that ESG quality could reduce negative tail risk. The trend in these tables for these three portfolios is also repeated in the case of the excess kurtosis which sharply increases between the 10% Screen portfolio and the 50% Screen portfolio, from 4.02 to 5.35 as more companies are excluded from consideration.

The contrast between the figures in Tables 8 and 9 is as drastic as it was in the case of the EW portfolios. In Table 9 all portfolios show higher annualized mean returns and higher standard deviation than in Table 8. Nevertheless, there are also similarities between these two tables. As in Table 8 there is also a very large difference between the market and the portfolios which consider ESG information. However, whereas there was no clear best portfolio in the first table, that is not the case here. Using the Sharpe ratio as a comparable measure of performance it seems that the ratio of the market largely surpasses that of the other portfolios despite the difference in risk profiles. Another similarity between Tables 8 and 9 is that the skewness of the market is considerably better than that of all the other portfolios from an investment perspective, despite decreasing from 0.79 to 0.23. The same is the case for the excess kurtosis of the returns which also decreases from 1.59 to -0.52. But whereas the decrease in skewness is a negative change as it implies more negative outliers, the decrease in kurtosis is positive as it implies the existence of less outliers. Again, this does not seem consistent with the data, which is illustrated in Figure 7. The explanation for this fact has already been used in previous sections and also applies here. Higher standard deviation reduces excess kurtosis, given that the large

outliers are mostly the same between the two time periods. Additionally, the reduced amount of data increases the effect of outliers on the mean and causes an increase in the annualized mean returns and reduces the overall intensity of the outliers as compared to the mean and that causes a reduction in excess kurtosis. As for the skewness, the increase in the annualized mean returns of the market reduces the effect of positive outliers in the calculation of skewness and causes a decrease in the measure. As in the case of the EW return portfolios, while the ESG Only portfolio had the best annualized mean return in the first time period considered, in the second period, the one relevant to this table, it is the Ecological and No Sin portfolios that have the best returns. Again, the exclusion of Fossil Fuels is very relevant as seen in the minute differences between these two portfolios and the heavy impact of this pandemic on companies in this industry group is seen in the positive effect of effect of their removal from consideration in these two portfolios. Lastly, a lot of the trends previously seen in the Screen portfolios are also seen here with the skewness decreasing gradually from -0.76 to -0.70 between the 10% Screen portfolio and the 50% portfolio. Portfolios excluding Sin stocks also keep showing the reverse trend with skewness decreasing from -1.02 to -1.48 between the Traditional and No Sin portfolios.

Overall, having analyzed both the EW and VW performance of all these portfolios it seems that considering the presence of ESG information is very informative to the prediction of returns, appearing to have a negative effect. Which further reinforces the conclusion of the analysis in Section 3.2. Additionally, taking into account the performance of the Screen portfolios specifically, it seems that ESG quality has a negative effect on annualized mean returns but could be useful in reducing negative tail risk should diversification opportunities not be heavily affected. This reduction of tail risk is consistent with Verheyden et al. (2016), but in that study they also saw increased annualized mean returns for certain levels of restriction which is not the case here. The removal of sin stocks could also be a good practice but seems to increase the risk of the portfolios while not providing consistent benefits in most of the cases in these four tables.

4.1.3 Correlation between returns and ESG performance

The last and perhaps most important part of my research is to establish whether there is any significant correlation between ESG Scores and Stock Returns and whether that correlation depends on thresholds of ESG quality. To investigate this, I proceed to create several linear regressions. All of them based on the CAPM model, the Fama/French 3-factor model or the Fama/French 5-factor model. All the regressions based on the CAPM model use as independent variables at least a constant and the excess returns of the market (Market-RF), calculated as the returns of the market minus the risk free rate. If other variables are added they will be explicitly mentioned. The same applies for the following two types of regressions. Regressions based on the Fama/French 3-factor model always use as independent variables at least a constant, Market-RF, the small minus big (SMB) factor and the high minus low (HML) factor.

The latter two factors are described in French (n.d.) and can be said to proxy the size and the Book-to-market ratio of companies respectively. Finally, regressions based on the Fama/French 5-factor model use as independent variables at least a constant, Market-RF, the SMB factor, the HML factor, the robust minus weak (RMW) factor and the conservative minus aggressive (CMA) factor. As with the SMB and HML factors the RMW and CMA factors are similarly described in French (n.d.). These two factor can be said to proxy the operating profitability and the investment practices of companies. All regressions are made using R and all standard errors are made robust in cases of heterocedasticity using the covariance type HC3 as recommended in Long and Ervin (2000). All regressions are controlled for industry specifications using the Business sector defined in Refinitiv Eikon.

The first regression I choose to build uses all of the defined models with the addition of a single variable, ESG Score. These regressions are shown in Table 10. In the two time periods considered, these regressions do not show a significant effect of ESG Scores on the forecast of returns. Note that as expected, most of the Fama and French factors are significant. However, the CMA factor is not significant in the second time period considering, which could imply that COVID-19 affected companies independently of investment practices. I thought the lack of variability in the ESG Scores of companies which are mostly updated yearly as opposed to the excess returns which are monthly in nature could be behind the low values of the coefficients for the ESG Score. As such, for robustness, I built the same regression using quarterly data for returns and for the Fama and French factors so that the yearly ESG Score updates would not be as constant by comparison. This regression showed similar coefficients for the ESG Score variable and also did not attribute significance to any of them. Note that quarterly Fama and French factors for Europe are not widely available and I calculated them using the portfolio returns which are given in the Kenneth French website (French, n.d.).

Other than this first regression, I opted to create an additional one, using as dependent variable the Excess returns of all the stocks of companies headquartered in the European market and as dependent variables the Fama and French factors as used in the CAPM model, the Fama/French 3-factor model and the Fama/French 5-factor similarly to the previous regression. However, whereas in that regression there was an additional dependent variable in the form of the ESG Score in this regression the additional dependent variable is a dummy which shows whether the company has a published ESG Score in Refinitiv Eikon in a given month. This regression is shown on Table 11. The reason for the creation of this regression is that it serves to substantiate the hypothesis proposed in Section 3.2 which is supported by the results shown in Table 6 and Table 7. In this regression we can assess whether or not the hypothesis is verified and hence whether the fact that a company publishes ESG is a good predictor of returns. The results of this regression align with the hypothesis proposed and for all time periods considered the coefficient for the ESG dummy is significant at varying levels. However, this coefficient seems to indicate that the presence of ESG information for a given company has close to no effect on its returns, contrasting with the conclusions in Sections 4.1.1 and Section 4.1.2, in which a negative effect

was suggested. Note that this lack of effect is still significant during the time period considered in Panel B, from January 2020 to January 2022, but to a lesser degree which could mean that there is less certainty as to the correlation between the fact that a company publishes ESG information and its Excess returns during the period of the COVID-19 pandemic. In addition to this, it is interesting to note that the sign of coefficient is consistently positive in the first time period in shown in Panel A varying between 0.001 and 0.002 and consistently negative in Panel B varying between -0.002 and -0.001. This leads me to believe that companies that publish ESG information tended to do worse during COVID-19, despite the tenuous evidence. This is perhaps a generalized effect during periods of high market volatility but I cannot confirm that without analyzing other such periods, which could prove difficult given how recent the publication of ESG information is. As in the previous regression most Fama and French factors are highly significant except for CMA which is not significant in panel B.

Having found that in the universe of companies with valid ESG Scores, the quality of ESG scores does not have a significant impact on returns, I want to find whether subsections of this universe show a different result and whether different levels of ESG performance see a better correlation between excess returns and ESG Scores. I do this as I hypothesized that the returns of companies in subgroups with higher average ESG Scores would tend to have, on average, more correlation between their ESG Scores and their excess returns. To investigate that I create two regression tables.

First, Table 12 has the regressions of data for all stocks present in the universe of Table 10 except for those considered sin stocks as defined in Section 3.3 of the methodology. With the traditional regressions having traditional sin stocks removed from consideration and Ecological regressions having ecological (or new) sin stocks removed from consideration. The regressions labeled No Sin select sin stocks based on both definitions and remove them from consideration. Lastly, if a regression is labeled 2020+ it considers only the time period from January 2020, whereas if not it considers data based on the whole-time frame from January 2018. Regressions in Table 12 are made based on the Fama/French 5-factor model with the addition of the ESG Score as an independent variable. As with the regression in Table 10, here the coefficients for the ESG Score are also not significant. As such, against my initial expectation, within the universe of non-sin stocks there is no significant correlation between ESG Scores and excess returns. The final regression table I build is Table 13, which has regressions based on data screened each month for the stocks with the lowest ESG Score the previous month as delineated in the beginning of Section 3.3 of the methodology. The regressions labeled 10% remove the companies with the bottom 10% of ESG scores from consideration from the universe of stocks considered in Table 10. The regressions labeled 20% and 50% follow an analogous logic and remove the bottom 20% and 50% from the data considered respectively. As in Table 12 regression labeled with 2020+ considered only the time periods following January 2020, whereas if not the whole time period from January 2018 is considered. As with the previous regression table, the coefficient of the ESG Score on all regressions in Table 13 is not significant. This was

the most surprising result. I initially assumed that ESG performance would become gradually more impactful to excess returns as it became better and better high scores imply a heavier focus on such performance. But it seems that ESG Scores have no significant effect on excess returns regardless of the average quality of ESG scores in the selected universe.

5 Conclusion

Over the course of this research paper I have mentioned some of the many benefits of considering ESG performance in investment practices are touted in the papers mentioned in Section 2 including an increase in average returns and a reduction of negative tail risk as well as increased resilience to crisis periods. The descriptive statistics analyzed in Section 3.2 and the portfolio performance analyzed in Section 4.1.1 and 4.1.2 show that most of these benefits did not apply to a selection of portfolios integrating ESG information between January 2018 and January 2022. In fact, specifically in the periods in which the COVID-19 pandemic was ongoing, ESG performance seems to have a detrimental effect on company performance. The information in Section 3.2 also shows that ESG performance suffered during COVID-19 and that it was likely a secondary concern rather than a quality synergising with company performance. Disregarding the quality of ESG information, Figures 6 and 7 of the same section show how the performance of companies with valid ESG information tended to have worse returns with bigger negative tail risks. Despite this fact, in Section 6 and Section 7 I show that some measures of negative tail risk were reduced as companies with the worst ESG Scores were removed each month. However, this was accompanied by a heavy reduction in mean returns. Lastly, in Section 4.1.3 I show that ESG Scores were not good predictors of excess returns during the analyzed period, further reinforcing how ESG score is likely irrelevant to company performance. Overall, while good ESG performance can indeed be said to have reduced negative tail risk during the time period analyzed, I do not consider this reduction sufficient when considering the trade-off in the reduction of mean returns. The reduction in negative tail risk is also not guaranteed to be consistent over time. I would not recommend the consideration of ESG Scores in isolation in performing investment decisions as they are not good predictors of excess returns. Further research can be done to analyze the use of ESG Scores in predicting the variability of company returns, to verify whether there is a predictable reduction in tail risk and hence cause to use this information to invest. For now, I believe that ESG information alone is not relevant to investment decisions.

6 Appendix

Table 4: List of all Business sectors considered in this study

Business Sector
Academic & Educational Services
Applied Resources
Automobiles & Auto Parts
Banking & Investment Services
Chemicals
Collective Investments
Consumer Goods Conglomerates
Cyclical Consumer Products
Cyclical Consumer Services
Energy - Fossil Fuels
Financial Technology (Fintech) & Infrastructure
Food & Beverages
Food & Drug Retailing
Healthcare Services & Equipment
Industrial & Commercial Services
Industrial Goods
Insurance
Investment Holding Companies
Mineral Resources
Personal & Household Products & Services
Pharmaceuticals & Medical Research
Real Estate
Renewable Energy
Retailers
Software & IT Services
Technology Equipment
Telecommunications Services
Transportation
Uranium
Utilities

Table 5: Average ESG performance by Business Sector

	ESG Score	ESG Score 2020+
Academic & Educational Services	37.29523	40.32222
Applied Resources	52.94441	51.61672
Automobiles & Auto Parts	55.53679	55.1051
Banking & Investment Services	49.33715	49.60432
Chemicals	53.98328	54.65568
Collective Investments	32.65795	34.21124
Consumer Goods Conglomerates	48.33352	45.44848
Cyclical Consumer Products	50.71637	50.92552
Cyclical Consumer Services	50.52528	49.34949
Energy - Fossil Fuels	55.44434	56.35635
Financial Technology (Fintech) & Infrastructure	43.07352	43.61326
Food & Beverages	53.64292	53.80545
Food & Drug Retailing	56.07242	56.16374
Healthcare Services & Equipment	49.96202	50.00846
Industrial & Commercial Services	47.98716	47.89557
Industrial Goods	49.70218	48.87424
Insurance	54.51405	54.92148
Investment Holding Companies	28.17516	29.8343
Mineral Resources	55.7107	55.03018
Personal & Household Products & Services	55.38489	54.37873
Pharmaceuticals & Medical Research	43.95796	43.7346
Real Estate	50.49807	50.30273
Renewable Energy	45.23587	42.82707
Retailers	52.23236	53.04817
Software & IT Services	41.36415	41.74411
Technology Equipment	49.37277	48.36484
Telecommunications Services	55.27292	55.99124
Transportation	47.60993	47.52539
Uranium	11.52989	15.51397
Utilities	55.76895	54.35375

Table 6: Returns on Various Equal Weighted Stock selections between January 2018 and January 2022:

This table reports the annualized mean (Ann. mean), annualized standard deviation (Ann. volatility), skewness (skew), excess kurtosis (kurt), sharpe ratio (sharpe), minimum (min), 25th percentile (25%), 50th percentile (50%), 75th percentile (75%) and maximum (max) of returns of equal weighted portfolios built on different stock universes. Portfolios are all equal weighted and as such monthly returns are calculated using the monthly average of returns of companies included in the portfolio in that month. Depending on the portfolio, restrictions are imposed on company selection. The Market portfolio is an equal weighted portfolio containing the stocks of all companies headquartered in Europe. The ESG Only portfolio contains only stocks included in the Market portfolio with published ESG scores in Refinitiv Eikon in a given month. The Screen portfolios (10%, 20% and 50%) include the same companies as those in the ESG Only portfolio but remove from consideration companies with the bottom x% of ESG Scores, where x is stated in the name of the portfolio. The Traditional portfolio include the same companies as those in the ESG Only portfolio but remove from consideration Traditional sin stocks as defined in methodology. The Ecological portfolio is similar to the traditional portfolio but instead removes from consideration Ecological sin stocks as defined in methodology. The No Sin portfolio removes from consideration both Traditional and Ecological sin stocks from the stock universe considered in the ESG Only portfolio.

	Market	ESG Only	10% Screen	20% Screen	50% Screen	Traditional	Ecological	No Sin
Ann. mean (%)	-1.582	0.392	-1.653	-1.785	-1.264	-0.651	-0.078	-0.036
Ann. volatility (%)	14.709	19.637	20.089	20.207	20.716	19.747	19.392	19.426
skew	-1.171	-1.374	-1.394	-1.396	-1.346	-1.374	-1.382	-1.397
kurt	5.227	6.419	6.903	7.032	7.463	6.398	6.216	6.254
sharpe	-0.108	0.02	-0.082	-0.088	-0.061	-0.033	-0.004	-0.002
min	-17.873	-24.634	-25.704	-25.94	-26.689	-24.841	-24.256	-24.339
25%	-1.916	-2.691	-2.661	-2.515	-2.549	-2.794	-2.574	-2.511
50%	0.028	0.939	0.782	0.748	0.81	0.803	0.888	0.905
75%	2.06	3.059	3.005	3.001	2.707	2.937	2.854	2.804
max	9.816	15.187	16.035	16.322	17.719	15.171	14.691	14.674

Table 7: Returns on Various Equal Weighted Stock selections between January 2020 and January 2022:

This table reports the annualized mean (Ann. mean), annualized standard deviation (Ann. volatility), skewness (skew), excess kurtosis (kurt), sharpe ratio (sharpe), minimum (min), 25th percentile (25%), 50th percentile (50%), 75th percentile (75%) and maximum (max) of returns of equal weighted portfolios built on different stock universes. Portfolios are built using the same method as in Table 6 but restricting data to between January 2020 and January 2022

	Market	ESG Only	10% Screen	20% Screen	50% Screen	Traditional	Ecological	No Sin
Ann. mean (%)	4.787	4.194	1.862	1.614	1.438	3.958	4.553	4.55
Ann. volatility (%)	18.772	25.052	25.645	25.797	26.486	25.171	24.676	24.706
skew	-1.341	-1.393	-1.407	-1.405	-1.334	-1.416	-1.429	-1.444
kurt	3.645	4.336	4.68	4.772	5.007	4.39	4.302	4.345
sharpe	0.255	0.167	0.073	0.063	0.054	0.157	0.185	0.184
min	-17.873	-24.634	-25.704	-25.94	-26.689	-24.841	-24.256	-24.339
25%	-1.627	-1.681	-2.263	-2.302	-2.549	-1.707	-1.302	-1.311
50%	1.11	1.228	1.301	1.347	1.718	1.261	1.26	1.244
75%	2.915	3.883	3.843	3.732	3.762	3.836	3.853	3.843
max	9.816	15.187	16.035	16.322	17.719	15.171	14.691	14.674

Table 8: Returns on Various Value Weighted Stock selections between January 2018 and January 2022:

This table reports the annualized mean (Ann. mean), annualized standard deviation (Ann. volatility), skewness (skew), excess kurtosis (kurt), sharpe ratio (sharpe), minimum (min), 25th percentile (25%), 50th percentile (50%), 75th percentile (75%) and maximum (max) of returns of equal weighted portfolios built on different stock universes. Portfolios are built using the same restrictions described in Table 6, but instead of equal weighted these portfolios are value weighted.

	Market	ESG Only	10% Screen	20% Screen	50% Screen	Traditional	Ecological	No Sin
Ann. mean (%)	30.63	13.189	8.147	7.99	6.629	12.159	10.067	10.085
Ann. volatility (%)	35.289	14.922	14.353	14.316	13.627	15.015	16.323	16.365
skew	0.787	-0.97	-0.806	-0.787	-0.782	-0.957	-1.113	-1.118
kurt	1.593	3.979	4.021	4.137	5.346	3.938	3.213	3.223
sharpe	0.868	0.884	0.568	0.558	0.486	0.81	0.617	0.616
min	-24.739	-15.003	-14.675	-14.737	-14.655	-15.145	-17.148	-17.216
25%	-1.741	-0.479	-0.868	-0.853	-0.905	-0.657	-1.354	-1.438
50%	0.931	1.769	1.071	1.104	0.748	1.67	1.576	1.509
75%	5.122	3.266	2.501	2.409	2.253	3.069	3.611	3.717
max	28.897	13.441	13.251	13.369	13.429	13.45	11.875	11.876

Table 9: Returns on Various Value Weighted Stock selections between January 2020 and January 2022:

This table reports the annualized mean (Ann. mean), annualized standard deviation (Ann. volatility), skewness (skew), excess kurtosis (kurt), sharpe ratio (sharpe), minimum (min), 25th percentile (25%), 50th percentile (50%), 75th percentile (75%) and maximum (max) of returns of equal weighted portfolios built on different stock universes. Portfolios are built using the same restrictions described in Table 6 and value weighted as in Table 8 but data is restricted to between January 2020 and January 2022.

	Market	ESG Only	10% Screen	20% Screen	50% Screen	Traditional	Ecological	No Sin
Ann. mean (%)	53.1	15.714	8.543	8.58	7.334	15.493	17.75	17.774
Ann. volatility (%)	48.054	18.944	18.36	18.341	18.166	19.048	19.643	19.685
skew	0.231	-1.002	-0.762	-0.75	-0.696	-1.019	-1.48	-1.487
kurt	-0.524	2.445	2.215	2.281	2.383	2.472	3.231	3.255
sharpe	1.105	0.83	0.465	0.468	0.404	0.813	0.904	0.903
min	-24.739	-15.003	-14.675	-14.737	-14.655	-15.145	-17.148	-17.216
25%	-6.051	-0.133	-0.685	-0.735	-0.905	-0.032	-0.387	-0.353
50%	2.206	2.436	1.641	1.657	1.58	2.311	3.164	3.16
75%	15.117	3.931	2.501	2.589	2.854	3.903	4.374	4.281
max	28.897	13.441	13.251	13.369	13.429	13.45	11.875	11.876

Table 10: Regressions using data on companies with valid ESG Scores in the two time horizons considered:

Regressions use as dependent variable the Excess returns of stocks of companies in Europe with valid ESG Scores and use the Fama and French factors and the ESG Score as independent variables

(a) Panel A (Jan 2018-Jan 2022)

(b) Panel B (Jan 2020-Jan 2022)

	<i>Dependent variable:</i>			<i>Dependent variable:</i>			
	Excess Returns			Excess Returns			
	CAPM	Fama/French 3	Fama/French 5	CAPM	Fama/French 3	Fama/French 5	
	(1)	(2)	(3)	(1)	(2)	(3)	
Constant	-0.0002 (0.010)	0.00001 (0.010)	-0.002 (0.010)	Constant	-0.006 (0.011)	-0.006 (0.011)	-0.009 (0.011)
Market-RF	1.015*** (0.011)	0.870*** (0.009)	0.806*** (0.010)	Market-RF	1.062*** (0.013)	0.852*** (0.012)	0.741*** (0.014)
SMB		0.680*** (0.030)	0.710*** (0.035)	SMB		0.823*** (0.039)	0.928*** (0.048)
HML		0.231*** (0.014)	0.527*** (0.029)	HML		0.270*** (0.015)	0.680*** (0.037)
RMW			0.629*** (0.051)	RMW			0.901*** (0.063)
CMA			-0.107** (0.052)	CMA			-0.094 (0.060)
ESG Score	0.00002 (0.00002)	0.00002 (0.00002)	0.00002 (0.00002)	ESG Score	-0.00004 (0.00003)	-0.00003 (0.00003)	-0.00004 (0.00003)
BSCName	Yes	Yes	Yes	BSCName	Yes	Yes	Yes
Observations	83,767	83,767	83,767	Observations	51,765	51,765	51,765
R ²	0.175	0.185	0.187	R ²	0.203	0.215	0.220
Adjusted R ²	0.175	0.184	0.187	Adjusted R ²	0.202	0.215	0.219
Residual Std. Error	0.118	0.117	0.117	Residual Std. Error	0.128	0.127	0.127
F Statistic	573.195***	574.601***	550.126***	F Statistic	423.849***	430.350***	416.229***

Table 11: Regressions using data on all companies in Europe in the two time horizons considered:

Regressions use as dependent variable the Excess returns of stocks of companies in Europe and use the Fama and French factors as independent variables and a ESG Score dummy which is 1 when there a valid ESG Score associated with a given Excess return data point

(a) Panel A (Jan 2018-Jan 2022)

(b) Panel B (Jan 2020-Jan 2022)

	<i>Dependent variable:</i>				<i>Dependent variable:</i>		
	Excess Returns				Excess Returns		
	CAPM	Fama/French 3	Fama/French 5		CAPM	Fama/French 3	Fama/French 5
	(1)	(2)	(3)		(1)	(2)	(3)
Constant	-0.009 (0.006)	-0.008 (0.006)	-0.009 (0.006)	Constant	-0.007 (0.009)	-0.007 (0.009)	-0.008 (0.009)
Market-RF	0.714*** (0.007)	0.579*** (0.007)	0.571*** (0.008)	Market-RF	0.758*** (0.008)	0.537*** (0.009)	0.507*** (0.011)
SMB		0.755*** (0.020)	0.692*** (0.023)	SMB		0.960*** (0.028)	0.968*** (0.033)
HML		0.143*** (0.009)	0.215*** (0.021)	HML		0.185*** (0.010)	0.308*** (0.028)
RMW			-0.072** (0.036)	RMW			0.221*** (0.045)
CMA			-0.244*** (0.041)	CMA			-0.081 (0.050)
ESG dummy	0.002*** (0.001)	0.001** (0.001)	0.001** (0.001)	ESG dummy	-0.002* (0.001)	-0.001* (0.001)	-0.001* (0.001)
BSCName	Yes	Yes	Yes	BSCName	Yes	Yes	Yes
Observations	380,202	380,202	380,202	Observations	202,322	202,322	202,322
R ²	0.038	0.042	0.042	R ²	0.054	0.061	0.061
Adjusted R ²	0.038	0.042	0.042	Adjusted R ²	0.054	0.061	0.061
Residual Std. Error	0.188	0.188	0.188	Residual Std. Error	0.196	0.196	0.196
F Statistic	483.747***	505.560***	477.749***	F Statistic	371.839***	395.812***	374.196***

Table 12: Stock Universe Screened for Sinless Stocks of several types

	<i>Dependent variable:</i>					
	Returns					
	Traditional	Traditional, 2020+	Ecological	Ecological, 2020+	No Sin	No Sin, 2020+
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.002 (0.010)	-0.009 (0.011)	-0.002 (0.010)	-0.009 (0.011)	-0.002 (0.010)	-0.009 (0.011)
Market-RF	0.806*** (0.010)	0.738*** (0.014)	0.792*** (0.010)	0.729*** (0.014)	0.791*** (0.010)	0.726*** (0.014)
SMB	0.714*** (0.036)	0.935*** (0.049)	0.699*** (0.036)	0.896*** (0.049)	0.703*** (0.037)	0.902*** (0.050)
HML	0.534*** (0.029)	0.689*** (0.037)	0.498*** (0.029)	0.660*** (0.037)	0.505*** (0.029)	0.670*** (0.037)
RMW	0.644*** (0.051)	0.919*** (0.064)	0.663*** (0.051)	0.939*** (0.064)	0.680*** (0.052)	0.959*** (0.065)
CMA	-0.105** (0.053)	-0.095 (0.061)	-0.101* (0.052)	-0.114* (0.060)	-0.098* (0.053)	-0.115* (0.061)
ESG Score	0.00003 (0.00002)	-0.00004 (0.00003)	0.00003 (0.00002)	-0.00003 (0.00003)	0.00003 (0.00002)	-0.00003 (0.00003)
BSCName	Yes	Yes	Yes	Yes	Yes	Yes
Observations	81,875	50,677	77,431	48,270	75,539	47,182
R ²	0.187	0.219	0.187	0.218	0.186	0.218
Adjusted R ²	0.186	0.219	0.186	0.218	0.186	0.217
Residual Std. Error	0.117	0.127	0.114	0.124	0.115	0.124
F Statistic	536.790***	406.320***	522.634***	396.090***	508.831***	385.849***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 13: Stock Universe Screened monthly for bottom x% of ESG Scores

	<i>Dependent variable:</i>					
	Returns					
	10%	10%, 2020+	20%	20%, 2020+	50%	50%, 2020+
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.004 (0.010)	-0.008 (0.011)	-0.009 (0.012)	-0.010 (0.013)	-0.003 (0.004)	-0.004 (0.005)
Market-RF	0.814*** (0.010)	0.748*** (0.013)	0.823*** (0.010)	0.758*** (0.014)	0.845*** (0.012)	0.781*** (0.017)
SMB	0.702*** (0.035)	0.911*** (0.047)	0.663*** (0.036)	0.873*** (0.049)	0.584*** (0.044)	0.806*** (0.059)
HML	0.547*** (0.029)	0.715*** (0.037)	0.566*** (0.030)	0.733*** (0.038)	0.645*** (0.037)	0.805*** (0.047)
RMW	0.683*** (0.051)	0.960*** (0.064)	0.696*** (0.053)	0.966*** (0.066)	0.787*** (0.064)	1.039*** (0.080)
CMA	-0.089* (0.049)	-0.102* (0.056)	-0.086* (0.051)	-0.103* (0.059)	-0.041 (0.062)	-0.057 (0.071)
ESG Score	0.00002 (0.00002)	-0.00002 (0.00003)	0.00003 (0.00003)	-0.00001 (0.00004)	-0.00002 (0.00004)	-0.00005 (0.0001)
BSCName	Yes	Yes	Yes	Yes	Yes	Yes
Observations	76,820	47,362	68,351	42,113	42,818	26,369
R ²	0.211	0.250	0.219	0.260	0.252	0.304
Adjusted R ²	0.210	0.249	0.218	0.259	0.252	0.303
Residual Std. Error	0.109	0.118	0.107	0.115	0.101	0.107
F Statistic	586.125***	450.213***	546.719***	421.986***	437.277***	348.139***

Note:

*p<0.1; **p<0.05; ***p<0.01

References

- Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use esg information: Evidence from a global survey. *Financial Analysts Journal*, 74(3), 87–103.
- Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, 35(1), 1–23.
- Chithambo, L., Tingbani, I., Agyapong, G. A., Gyapong, E., & Damoah, I. S. (2020). Corporate voluntary greenhouse gas reporting: Stakeholder pressure and the mediating role of the chief executive officer. *Business Strategy and the Environment*, 29(4), 1666–1683.
- Contessi, S., & De Pace, P. (2021). The international spread of covid-19 stock market collapses. *Finance Research Letters*, 42, 101894.
- Cornell, B. (2021). Esg preferences, risk and return. *European Financial Management*, 27(1), 12–19.
- Demers, E., Hendrikse, J., Joos, P., & Lev, B. (2021). Esg did not immunize stocks during the covid-19 crisis, but investments in intangible assets did. *Journal of Business Finance & Accounting*, 48(3-4), 433–462.
- Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review*, 86(1), 59–100.
- Drei, A., Le Guenedal, T., Lepetit, F., Mortier, V., Roncalli, T., & Sekine, T. (2019). Esg investing in recent years: New insights from old challenges. Available at SSRN 3683469.
- Ferguson, N., Ghani, A., Cori, A., Hogan, A., Hinsley, W., & Volz, E. (2021). Report 49: Growth, population distribution and immune escape of omicron in england. *Imperial College London (16-12-2021)*, doi: <https://doi.org/10.25561/93038>.
- French, K. R. (n.d.). *Kenneth R. French - Data Library*. https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (accessed: 25.04.2022)
- Giese, G., Lee, L.-E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). Foundations of esg investing: How esg affects equity valuation, risk, and performance. *The Journal of Portfolio Management*, 45(5), 69–83.
- Grewal, J., Riedl, E. J., & Serafeim, G. (2019). Market reaction to mandatory nonfinancial disclosure. *Management Science*, 65(7), 3061–3084.
- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., et al. (2021). A global panel database of pandemic

- policies (oxford covid-19 government response tracker). *Nature Human Behaviour*, 5(4), 529–538.
- Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, 31(1-3), 405–440.
- Hong, H., & Kacperczyk, M. (2009). The price of sin: The effects of social norms on markets. *Journal of Financial Economics*, 93(1), 15–36.
- Long, J. S., & Ervin, L. H. (2000). Using heteroscedasticity consistent standard errors in the linear regression model. *The American Statistician*, 54(3), 217–224.
- Our World in Data. (n.d.). *Coronavirus (COVID-19) Vaccination - Our World in Data*. <https://ourworldindata.org/covid-vaccinations> (accessed: 20.05.2022)
- Ramelli, S., & Wagner, A. F. (2020). Feverish stock price reactions to covid-19. *The Review of Corporate Finance Studies*, 9(3), 622–655.
- Rezaee, Z. (2016). Business sustainability research: A theoretical and integrated perspective. *Journal of Accounting Literature*, 36, 48–64.
- Riedl, A., & Smeets, P. (2017). Why do investors hold socially responsible mutual funds? *The Journal of Finance*, 72(6), 2505–2550.
- Sagbakken, S. T. (2021). *Sin stock returns on the european market: A study on traditional sin and new sin industries* (Master's thesis). OsloMet–Oslo Metropolitan University.
- Tilling, M. V. (2004). Some thoughts on legitimacy theory in social and environmental accounting. *Social and Environmental Accountability Journal*, 24(2), 3–7.
- Verheyden, T., Eccles, R. G., & Feiner, A. (2016). Esg for all? the impact of esg screening on return, risk, and diversification. *Journal of Applied Corporate Finance*, 28(2), 47–55.
- W.H.O. (n.d.-a). *Archived WHO timeline - COVID-19*. <https://www.who.int/news/item/27-04-2020-who-timeline---covid-19> (accessed: 18.05.2022)
- W.H.O. (n.d.-b). *Tracking SARS-Cov-2 Variants*. <https://www.who.int/activities/tracking-SARS-CoV-2-variants> (accessed: 20.05.2022)