Universidade do Minho
Escola de Economia e Gestão

Aurélio Marcel Rodrigues Alves

Socially Responsible Corporate Bond Fund Performance: Empirical evidence for the European market

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Professor Ph.D. Florinda Cerejeira Campos Silva

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DECLARAÇÃO

DIREITOS DE AUTOR E CONDIÇÕES DE UTILIZAÇÃO DO TRABALHO POR TERCEIROS

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

Desempenho de Fundos de Obrigações Empresariais Socialmente Responsáveis: Evidência empírica para o Mercado Europeu

Resumo

O objetivo desta dissertação é avaliar o desempenho de fundos socialmente responsáveis, de obrigações de empresas domiciliados na Alemanha e França. Esta avaliação é efetuada recorrendo quer a modelos não condicionais, como condicionais.

A amostra recolhida contem 24 fundos que investem quer a nível global, quer a nível Europeu/EuroZone, ao longo do período de janeiro de 2007 até novembro de 2018.

Os modelos não condicionais implementados são baseados em estudos similares, expandindo estes devido à necessidade de acomodar a existência de fundos que investem globalmente. Em relação ao modelo condicional, duas variáveis de informação pública foram implementadas – *term-spread* e o rácio *inverse relative wealth.*

Os resultados para o modelo não condicional mostram que, em média, os fundos têm um desempenho ligeiramente pior (estatisticamente significativo ao nível de 10%) que os *benchmark*s representativos do mercado. Em relação ao modelo condicional, estes resultados persistem, porém, a qualidade do resultado aumenta – os fundos continuam a apresentar um desempenho que está abaixo dos *benchmarks* do mercado, porém este resultado é agora estatisticamente significativo ao nível de 1%. O desempenho da carteira média criada para fundos que investem globalmente é ligeiramente pior que o desempenho da carteira média para fundos que investem na Europa/ZonaEuro.

O uso de modelos condicionais resulta num aumento do R^2 ajustado da regressão, quando comparado com o valor obtido no modelo não condicional, o que significa que a inclusão de variáveis de informação pública resulta num aumento do poder explicativo do modelo, aumentando, portanto, a qualidade global dos resultados. Para além disso, existe evidência estatística da presença de betas variáveis ao longo do tempo, ao longo do período analisado.

Palavras-chave: Avaliação de Desempenho, Condicional, Fundos, Mercado Europeu, Obrigações, SRI.

Socially Responsible Corporate Bond Fund Performance: Empirical Evidence for the European Market

Abstract

The objective of this dissertation is to evaluate the performance of socially responsible corporate bond funds domiciled in Germany and France. This evaluation is conducted using both conditional and unconditional models.

The dataset considered for this research consists of 24 funds that invest either globally or in Europe/EuroZone, throughout the period from January 2007 to November 2018.

The unconditional models used are related to those considered in similar studies, expanding on these due to the need to account for funds investing globally. As for the conditional model, two public information variables were included to better capture time-varying corporate bond returns – the term-spread and the inverse relative wealth ratio.

The results for the unconditional model show, in general, a slight underperformance (significant only at the 10% level) of the SRI corporate bond funds throughout the period under analysis. As for the conditional model, the underperformance persists, however, the quality of the result is severely increased, being this underperformance now statistically significant at the 1% level. The performance of the created equally weighted portfolio of funds that invest globally is slightly worse than the performance of the equally weighted portfolio of funds that invest in Europe/EuroZone.

Conditional models show an increase in the adjusted R^2 in comparison to unconditional models, meaning the inclusion of public information variables increases the explanatory power of the model, thus improving the overall quality of the results. Furthermore, there is a strong evidence of the presence of time-varying betas throughout the analyzed period.

Keywords: Bond, Conditional, European Market, Funds, Performance Evaluation, SRI.

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1. Introduction

1.1. Objectives and motivation

The market for socially responsible investing (SRI) is ever-growing and has received a great deal of attention in the past few years. The European Sustainable Investment Forum (EUROSIF) defines SRI as "a long-term oriented investment approach which integrates Environmental, Social and Governance (ESG) factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factors in order to better capture long term returns for investors, and to benefit society by influencing the behavior of companies" (EUROSIF, 2018). Allowing individuals to simultaneously invest their money and attend to their sense of social duty, this investment policy has quickly gained popularity, reaching as of 2017 a total market value of 22.5 trillion euros, in Europe (EUROSIF, 2018).

Given the quick rise in importance of SRI in the finance world, it is necessary that academic studies regarding this subject stay on par with this massive growth over the last decade. While that is mostly the case when it comes to academic research on equity SRI, the same cannot be said regarding SRI fixed-income studies. The finance literature is still far underdeveloped and, given that bonds account for 40% of the European SRI market value (EUROSIF, 2018), furthering research on this matter is extremely relevant.

Although fixed-income returns aren't affected by as many non-diversifiable risk factors as equity returns, corporate bonds present firm-specific risk that can be exploited by managers to produce abnormal returns (Derwall & Koedijk, 2009). As such, the inclusion of an SRI filter in a fund's investment policy, and consequently, the exclusion of firms that partake in controversial activities, has potential to significantly alter the performances of those funds.

The focus of this study is therefore to investigate whether there is a statistically significant difference in performance between SRI corporate bond funds and their respective market benchmarks. Corporate bonds make up for approximately 60% of the European SRI bond market as of 2017, making their performance assessment imperative (EUROSIF, 2018). The studied sample consists of all of the funds I was able to identify, domiciled in either France or Germany, investing both globally or in Europe/EuroZone, that meet the SRI criteria. The period analyzed ranged from January, 2007 until November, 2018.

To the best of my knowledge, only two studies analyze the performance of SRI corporate bond funds in isolation: Henke (2016) and Leite & Cortez (2018). The first concludes that SRI corporate bond funds outperform a matched sample of conventional funds, while the latter defends that corporate bonds do not outperform the market indices. While there may be several reasons for these controversial results, like methodology or sample differences, this study aims to add to the literature by furthering research on this type of SRI fund, hopefully clearing the mentioned controversy. Although this study has some similarities in the regional focus when compared to Leite & Cortez (2018), it uses a more updated sample, heavily focused on finding the maximum number of corporate bond funds for the studied markets and analyzing them through a somewhat different methodology.

1.2. Structure

This study is structured into six sections. The second section presents the relevant literature review. The methods used to evaluate performance are described in the third section. In section four, the dataset is described. The fifth section presents and discusses the empirical results of this study. The final section contains the main conclusions of the study and suggestions for further research.

2. Literature review

This section presents the most relevant literature that was reviewed to fundament the theory and methods implemented in this study. Conventional bond-funds already have a reasonable library of published academic work, with studies such as Elton et al. (1995), Detzler (1999), and, more recently, Clare et. al (2019). The first two document an underperformance of the funds in relation to the benchmarks, and this is the case with most studies. Clare et. al (2019), however, studying a more recent sample, find and outperformance in relation to the market.

As for corporate bond funds, Dietze et al. (2009) study the performance of German corporate bond funds, finding that these underperform relevant indexes. More recently, Choi & Kronlund (2017) research whether funds reaching for higher yields produce abnormal returns. Conclusions show that, although these funds produce higher returns, they are attributable to common risk-factors, and are, therefore, not abnormal.

As such, the overall conclusion tends to underperformance in relation to the benchmarks when it comes to fixed-income mutual funds. However, as mentioned in the introduction section, corporate bond funds present firm-specific risk, and managerial exploitation of this risk can result in abnormal performances (Derwall & Koedijk 2009). SRI funds, by screening companies that do not meet the required social responsibility criteria, do just that, and, as such, there is possibility for a pattern of abnormal returns associated with this investment policy.

The following sub-sections are structured the following way: (1) Literature regarding the effects caused by ESG factors on the performance of corporate bonds; (2) Literature regarding SRI mutual fund performance.

2.1. Effects of ESG and SRI criteria integration

Evaluating the performance of SRI mutual funds has some limitations, given that performance is affected by more than one factor, and it can prove challenging to separate them. SRI fund performance is related to both the effects of including SRI criteria into their investment policy, as well as the effects of managerial decisions, and expense fees charged (Kempf & Osthoff, 2007). Since allocating fund performance correctly between these factors is a tough task, it is important to verify what effects these factors generally have, to create a basis to assess results later on. This sub-section focuses on the effects of ESG/SRI criteria.

From a theoretical point of view, one can look at the expected performance of SRI funds from three main perspectives: One argument is that SRI funds underperform conventional funds by losing some portfolio diversification capability, due to their investment restriction policies, and also due to beliefs that these funds charge higher prices. Other argument says that SRI funds outperform conventional funds, since companies with higher ESG ratings tend to generate abnormal returns due to these practices being associated with better management, and that social awareness is a source of financial benefit that regular fund managers ignore, leading to an outperformance when compared to conventional funds. A case can also be made to where both these effects coexist simultaneously, and cancel their effects out, leading to no change in expected performance when comparing SRI funds to conventional ones.

Laying focus to corporate bonds, several studies of the relationship between bond ESG scores and performance have been conducted.

Barclays (2016) does so in relation to US corporate bonds, finding that those with a higher ESG score tend to benefit from a small but consistent performance advantage. Furthermore, they note that the factor that mattered most for this performance advantage was "G" – Companies with a higher governance rating tend to benefit the most, although having high Economic and Social ratings is also not associated with lower performances. Polbennikov et al. (2016) reach similar conclusions, also finding that corporate bond portfolios with high ESG ratings benefit from incremental returns, and the factor that is most responsible for this is, again, corporate governance. However, whether this advantage is persistent is not guaranteed. An argument in favor of persistence is that ESG scoring might capture risk factors that have not been priced yet, such as regulatory changes – an event for which highly ESG rated portfolios and companies are better prepared for.

On the other hand, Pereira et al. (2018) study the performance of high ESG/CSR corporate bond portfolios and find that portfolios formed based on high economic or social ratings lead to outperformances, however those formed with base on high corporate governance ratings do not. Furthermore, the abnormal returns are decreasing over time, and the authors defend investors today should not expect them by investing in high ESG rating portfolios.

Bauer & Hann (2010) find that higher environmental concerns lead to higher cost of debt for firms, as well as lower credit ratings. However, proactive environmental practices tend to lead to lower costs of debt.

According to Oikonomou et al. (2014), issuers with good ESG and corporate social responsibility (CSR) scores present lower bond yield spreads, as well as better bond ratings, and vice-versa. Hsu & Chengs's (2015) study is in accordance, finding that positive ESG scores lead to reduced financial risk, and negative ESG scores to the opposite. Furthermore, they conclude that companies considered socially responsible have lower credit risk and better credit ratings.

Hoepner & Nilsson (2017) studied whether a trading strategy based around ESG ratings of issuing companies lead to abnormal returns. They find that "no news is good news" – companies without any real strengths, concerns or controversies are the ones that lead to an outperformance.

Amiraslani et al. (2017) find no overall relationship between CSR and bond yield spreads. However, the studied sample included the 2008-2009 financial crisis, and, during this period, companies with higher CSR scores benefited from lower bond spreads.

Insight investment (2016) studied the particular effect of an exclusion screening on corporate bond portfolios – The approach used by most SRI mutual funds. They find that broad ethical screens have minimal effects on performance. However, if this screen is more focused, the impact on performance rises, and the direction of said impact (positive or negative) cannot be predicted.

With regard to investment grade corporate bonds, Allianz (2016) find that exclusion screens seem to not lead to significant performance downsides. They further that ESG benefits/prejudices may not be fully priced into the markets, causing therefore the possibility of abnormal returns.

There is still no defined general conclusion about the effect ESG/CSR scores have on corporate bonds, as observable by the ambiguity of results in the previously mentioned studies. This leads to no basepoint for SRI mutual fund research, and whether abnormal performances are due to expense fees, managerial activity or SRI screening is, therefore, unclear, without studying the matter further.

2.2. SRI mutual fund performance evaluation

As with conventional funds, most of the academic research that has been conducted regarding SRI funds' performance has been directed towards equity funds. Studies like Hamilton et al. (1993), Bauer et al. (2005), Kempf & Osthoff (2007) and Shank et al. (2007) show that, in general, there is no statistical evidence of an underperformance of SRI equity funds when compared to their conventional counterparts.

However, as discussed in the introduction section, bonds are an essential part of a well-balanced asset-mix, and the lack of available studies regarding the matter neglects vital information useful in portfolio construction. For European SRI investing specifically, these fixed-income assets represent 40% of the market value, meaning a huge section of the market is not yet well documented.

One of the pioneer studies regarding SRI mutual fund fixed-income is Derwall & Koedijk (2009). They study US bond and balanced funds, labeled as SRI by the US Social Investment Forum, and use matched samples of conventional US fixed-income funds for comparison, all this throughout the period ranging from January 1987 to March 2003. Each SRI fund is matched to an equally-weighted portfolio of five conventional funds similar in fund age, fund size and investment objective. They first analyze this sample using a four-factor model following Elton et al. (1995). This model contains a broad market term, a default term, an option term and an equity term. They then extend this model to a five-factor model, a seven-factor model and a nine-factor model. These additional factors are, respectively, a term structure variable, two expectational variables, regarding inflation forecasts and yearly industrial production changes, and finally, two components resulting from regressing passive indexes on the seven-factor model, useful in capturing pricing errors. Overall, the conclusions show that SRI bond funds produce similar results to their conventional counterparts over the studies sample, across the various models implemented. For the case of SRI balanced funds, these outperformed their counterparts over the period under analysis. Finally, the authors find the expenses charged by SRI funds to be in-line with those charged by their conventional counterparts, rejecting the possibility of this being a disadvantage for SRI mutual funds.

More recently, Henke (2016) studies the performance of corporate bond mutual funds for the US and Eurozone markets, and use matched conventional fund samples for comparison effects. Each SRI fund is matched with the equally-weighed portfolio of three conventional funds with similar maturity, size and yield objective. This performance is analyzed recurring to a five-factor model, containing a broad market factor, a default, an equity, an option and finally a term factor. The results showed that SRI funds managed to outperform their counterparts throughout the sample period. The model is a good fit to the data with R^2 falling in the 86-90% range. When analyzing fund constitution, the author finds some funds included in the sample with sufficient ESG scores do not actually apply any ESG screening. Upon separation and investigation of these two fund groups, the author finds that only funds that implement ESG screenings in their investment policy are able to generate an outperformance. Furthermore, the funds generating outperformances are funds whose managers implement a "worst-in-class" screening, instead of a "best-in-class" screening. This indicated outperformance comes from excluding companies with elevated ESG risks. The performance of these two portfolio groups was also studied with special attention during economic crisis times. During bear-market periods, SRI funds present strongly significant positive alphas when compared to their counterparts, while during non-crisis periods the difference alphas are non-significant. This indicates that SRI bond fund outperformance derives from their ability to perform in rough market conditions, which is an effect stated by Amiraslani et al. (2017) as well, as mentioned in the previous sub-section.

Lastly, Leite & Cortez (2018) study the performance of SRI bond and balanced funds, domiciled in the leading Eurozone markets of Germany and France, over the period ranging from 2002 until 2014. Portfolios of conventional funds are created and matched to SRI funds with same category, country and similar inception dates. They analyze this sample through a model that contains a basis similar to previously mentioned studies, with a default, and option and an equity term. The authors vary by including two separate market factors, one relating to corporate bonds, other to sovereign bonds, and also include a factor related to the sovereign debt crisis present in some EuroZone countries through a period contained in the sample. Furthermore, authors transform the model into a conditional one, with the implementation of three public information variables: A term-spread, an inverse relative wealth ratio and a real bond yield. The conclusions are that while SRI and conventional balanced funds, as well as conventional bond funds underperformed relevant benchmarks, SRI bond funds presented neutral performance. Regarding the comparison between SRI and conventional funds, SRI bond funds significantly outperformed their counterparts, while SRI balanced funds show no statistically significant difference in performance. The model used provided results with R^2 above 93%, proving effective in explaining fund returns. Furthermore, there is evidence of time-varying betas over the studied period, furthering the argument in favor of the use of conditional models. Given that only SRI bond funds outperformed their counterparts, and not SRI balanced funds, this hints that outperformance is linked with funds' bond holdings. To better assess the outperformance source, the authors study corporate bond funds and diversified bond funds separately. The results show that only the diversified funds managed to outperform, while corporate bond funds exhibit neutral performance. This hints at the fact that SRI bond fund outperformance is linked to their government bond holdings, and not corporate ones.

These last two studies present conflicting results, both studying (at least in part) the Eurozone market. While Henke (2016) finds an outperformance connected to exclusion of the worst ESG companies, Leite & Cortez (2018) find that outperformance is not linked to corporate bonds, and therefore, is most likely caused by sovereign bond holdings. Although these differences in results could be explained by different methodologies, it is still interesting to pursue further research and attempt to reach a conclusion for this controversy.

3. Methodology

This section introduces the models that are used to evaluate the performance of the collected sample. These models are in the form of multi-factor models. Evidence shows these are more effective evaluation tools, since single-index models fail to capture returns of all the diverse bond types, like high-yield bonds (Blake et al. 1993). The usage of a single-index model would lead to incorrect estimations of out/underperformance, due to the inability to explain returns from certain funds. The base model used is the one developed by Elton et al. (1995), also used in Derwall & Koedijk (2009) and Leite & Cortez (2018).

While the previously mentioned model has merit, it is an unconditional one, meaning that it assumes risk and returns are stationary over time. In a real-world scenario, this is not true, and managers often look to exploit changes in economic variables, attempting to create an edge in performance. Therefore, unconditional models might not fully explain returns of actively managed funds. This is especially true in the case of bond funds, since bond fund management focuses more on the forecasting of future interest rates than security selection (Leite & Cortez 2018). As such, public information variables were also included in the model, to better assess performance over time and obtain overall higher quality results.

3.1. Unconditional Model

The model developed by Elton et al. (1995) is a four-factor model. The first factor is an overall market factor, which, in the case of this study, corresponds to the excess returns of a corporate bond index over a risk-free rate proxy. The following factor is a Default factor, which is computed by the spread between a BBB Corporate bond index and a AAA Corporate bond index. This factor captures the risk premium associated with default in returns. The third variable is an Option factor, which is computed as the spread between an index of asset/mortgage backed securities and a treasury bond index. This variable is used to capture returns from bonds with option characteristics. The last included variable is an Equity factor, computed by the excess returns of a relevant stock index. This serves the purpose of accounting for either convertible bonds and general exposure bonds present to the stock market.

Given that funds may invest in different regions, it makes sense to use a global corporate bond index for the market factor, to not neglect any fund type.

The four-factor unconditional model is:

$$r_{p,t} = \alpha_p + \beta_{1p} GlobalCBond_t + \beta_{2p} Default_t + \beta_{3p} Option_t + +\beta_{4p} Equity_t + \varepsilon_{p,t} \quad (1)$$

Where $r_{p,t}$ corresponds to the excess returns of portfolio p over period t; $GlobalCBond_t$ represents the excess returns of a Global corporate bond index; $Default_t$ is the spread between a BBB corporate bond index and a AAA Corporate bond index; $Option_t$ is the spread between an asset/mortgage backed security index and a treasury index; $Equity_t$ represents the excess returns of a stock index; $\varepsilon_{p,t}$ is a residual term. α_p measures the abnormal returns of the fund. A statistically significant negative alfa means an underperformance, while a statistically significant positive alfa means an outperformance.

However, as will be discussed with further detail in the empirical results section, the usage of the unconditional model with a global market index presented relatively low R^2 values, indicating a lack of explanatory power.

As such, the same model but containing a European corporate bond index was implemented. However, by using solely an index reflecting European returns, returns originating from globally investing funds will not be fully captured. The solution for this problem is the expansion of the previous model to contain one additional factor – Global. This factor results from the residuals of regressing a global corporate bond index on a European corporate bond index. The obtained series is orthogonal to the European index, representing the portion of returns related to the global index that are perfectly uncorrelated to the European index (Detzler 1999).

The 5-factor unconditional model is then:

$$r_{p,t} = \alpha_p + \beta_{1p} EURCBond_t + \beta_{2p} Default_t + \beta_{3p} Option_t + \beta_{4p} Global_t + \beta_{5p} Equity_t + \varepsilon_{p,t} \quad (2)$$

Where $r_{p,t}$ corresponds to the excess returns of portfolio p over period t; $EURCBond_t$ represents the excess returns of a European corporate bond index; $Default_t$ is the spread between a BBB corporate bond index and a AAA Corporate bond index; $Option_t$ is the spread between an asset/mortgage backed security index and a treasury index; $Global_t$is a time-series of residuals orthogonal to European corporate bond returns that represent global corporate bond returns; $Equity_t$ represents the excess returns of a stock index; $\varepsilon_{p,t}$ is a residual term. α_p measures the abnormal returns of the fund. A statistically significant negative alfa means an underperformance, while a statistically significant positive alfa means an outperformance.

3.2. Conditional Model

As mentioned previously, unconditional models present limitations resulting from assuming that alphas and betas are constant over time, regardless of time-varying market conditions. This leads to biases in results, since performance related to market time-volatility may be attributed to abnormal performance through unconditional models. For example, since fund managers attempt to exploit these market time-varying conditions, incorporating publicly available information into their investment strategies, unconditional models will perceive these actions as a source of abnormal performance. However, given the semi-strong form of the market efficiency hypothesis, prices should reflect all publicly available information, and, as such, managers should not be attributed superior ability for taking advantage of this information (Ferson and Schadt 1996).

The used conditional model is:

$$r_{p,t} = \alpha_{0p} + A'_p z_{t-1} + \beta_{1p} CBond_t + \beta'_{1p}(z_{t-1} CBond_t) + \beta_{2p} Default_t + \beta'_{2p}(z_{t-1} Default_t) + \beta_{3p} Option_t + \beta'_{3p}(z_{t-1} Option_t) + \beta_{4p} Global_t + \beta'_{4p}(z_{t-1} Global_t) + \beta_{5p} Equity_t + \beta'_{5p}(z_{t-1} Equity_t) + \varepsilon_{p,t} \quad (3)$$

Where z_{t-1} is a vector of deviations of Z_{t-1} from the mean; $\beta_{1p}, \beta_{2p}, \beta_{3p}, \beta_{4p}, \beta_{5p}$ are average conditional betas; $\beta'_{1p}, \beta'_{2p}, \beta'_{3p}, \beta'_{4p}, \beta'_{5p}$ are vectors that capture sensitivities of betas to the public information variables; α_{0p} is the average conditional alphas ; A'_p is a vector that measures the sensitivity of alfa to public information variables.

The used model follows Christopherson et al. (1998) and includes both time-varying alphas and betas. According to the authors, Z_{t-1} represents the public information available in period t-1, that could have been used by managers to forecast returns in period t, and, according to semi-strong form of the market efficiency hypothesis, should be reflected in market prices.

4. Data

This chapter describes the data collection process, for both funds and risk factors. It also discusses the selection and calculation of the public information variables included in the conditional model.

4.1. Funds and fund returns

Since this study aims to provide empirical evidence from the European market, funds collected are domiciled in the countries that better represent it: Germany and France. Together, these countries represent an SRI market value of over five trillion euros (Eurosif, 2018; Forum Nachhaltige Geldanlagen, 2018), which is a sizable amount of the whole European SRI market, valued at approximately 22 trillion € (Eurosif, 2018). Funds selected may invest either globally or in Europe/EuroZone. The chosen time interval ranged from January 2007 to November 2018.

To be included in the sample, funds need to meet the following criteria: (1) Include some sort of SRI screening in their investment policy; (2) Invest mainly in corporate bonds; (3) Have at least 24 monthly observations available on Datastream throughout the analyzed period; (4) Be actively managed.

The identification of funds proved challenging, and was performed using two separate databases – Firstly, a search conducted on YourSRI's database[1]. While this provided some results by itself, the resulting sample was still relatively small.

Afterwards, Datastream was searched, filtering this database in order to find every fixed-income fund in the sampled countries. Then, if the fund name hinted at SRI concerns, while being in accordance with the fund type and investment style required for this study, it would be included in a pre-selection sample. This sample is then checked using the Morningstar website relative to the specific fund's country, to confirm whether the fund meets all the required criteria for the sample. Funds that do so are then merged with the sample collected from YourSRI.

This results in a thorough collection, by allowing the databases to complement one another. Unfortunately, no dead funds are included in the sample, and survivorship bias might

[1] https://yoursri.com consulted 25th November 2018

therefore be present. This was, however, resulting from pure chance, as no screening was made to exclude dead funds for all the searches.

The final dataset includes 24 SRI Corporate bond funds. Of these 24, 14 invest in Europe/EuroZone, and the remaining 10 invest globally. The end of month total return index for these funds, were collected from Datastream. The proxy for the risk-free rates used to calculate excess returns is the Euro 1-month certificates of deposit, and was also obtained from Datastream.

Descriptive statistics regarding the returns on the equally weighted portfolio of all funds, as well as both the equally weighted portfolio of all globally investing funds and the one for funds investing in Europe/Eurozone are reported below, in table 1.

Table 1- Descriptive statistics for created portfolios of funds

Portfolio	Average	Median	Std. Dv.	Kurtosis	Skewness	Jarque-Bera	P-value	No. Of Obs.
Eq. Weight	0.18%	0.26%	1.10%	1.6973	-0.3721	18.2805	0.0001	142
Eq. WGlobal	0.19%	0.25%	1.21%	2.0411	-0.3807	25.3501	0,0000	142
Eq. WEUR	0.18%	0.28%	1.02%	1.1209	-0.3514	9.2594	0.0097	142

This Table reports descriptive statistics regarding the returns on the funds. The reported statistics are the mean excess return in percentage, the median of excess returns in percentage, standard deviation in percentage, kurtosis, skewness, the overall value of a Jarque-Bera normality test, the probability value associated with the test, and, finally, the number of monthly observations collected. Eq. Weight represents the equally weighted portfolio of all funds, Eq. WGlobal represents the equally weighted portfolio of all globally investing funds and Eq. WEUR represents the equally weighted portfolio of all funds investing in Europe/Eurozone.

The average statistics are similar between the created portfolios. The only difference in returns is in the global portfolio, with a 0.01% higher average return than the remaining two, which is accompanied by a slightly higher standard deviation as well. All three portfolio returns obtain values approaching zero in the p-value of the Jarque-Bera test, meaning that the hypothesis that these returns follow normality is rejected.

The descriptive statistics for the individual funds contained in the sample are present in annex 1. Naturally, fund returns are much more varied than average portfolio returns, with average returns ranging from 0.04% to 0.36%, with no sampled fund presenting negative average returns over the studied period. However, two funds report negative median returns. With regards to normality, only eight out of 24 funds can't reject the hypothesis of their returns being normally distributed.

4.2. Factor Returns

The included market indices are the ICE BofA Merril Lynch Global Corporates for the global market, and the iBoxx EUR Corporates for the European market. These are also the indexes used to perform the regression that originates the orthogonalized Global factor (ICE BofA Merril Lynch Global Corporates regressed on the iBoxx EUR Corporates).

The default factor is computed as the return spread between the iBoxx Euro Corporates BBB index and the iBoxx Euro Corporates AAA index. The option factor is measured as the return difference between the BofA Merrill Lynch € Asset & Mortgage Backed index and the iBoxx € Sovereigns index. Lastly, the equity factor is measured by the excess returns of the FTSE Eurofirst 100 index over the risk-free rate. Returns on all indices mentioned above were obtained from Datastream. Descriptive statistics for the computed risk factors are presented below, in table 2.

Table 2 - Descriptive statistics for risk-factors

Factors	**Average**	**Median**	**Std. Dev.**	**Kurtosis**	**Skewness**	**Jarque-Bera**	**P-value**
ICEBofAML Global Corp.	0.295%	0.288%	1.25%	8.0216	-1.0765	176.6227	0.0000
iBoxx EUR Corp.	*0.253%*	*0.386%*	*1.16%*	*6.4568*	*-0.6757*	81.5055	0.0000
Default	*0.052%*	*0.128%*	*1.38%*	*12.2264*	*-1.3562*	547.1936	0.0000
Option	*-0.006%*	*0.003%*	*0.93%*	*3.78*	*-0.0107*	3.6024	0.1651
Global	*7.33E-20*	*0.030%*	*0.56%*	*4.712*	*-0.2066*	18.3528	0.0001
Equity	*0.220%*	*0.798%*	*4.41%*	*3.9189*	*-0.3325*	7.6129	0.0222

This Table reports summary statistics for the risk factors. These statistics are, in order, the mean return in percentage, the median return in percentage, standard deviation in percentage, kurtosis, skewness, the value of the Jarque-Bera normality test, and the probability value associated with the test.

On average, the returns on the global market index are higher than the European market index, as well as slightly higher standard deviation. The option factor presents very low average and median returns throughout the sampled period and is the only factor that doesn't reject the hypothesis of following a normal distribution, through the Jarque-Bera test. The orthogonalized Global factor has an average value of approximately zero, however, presents more standard median values. The equity factor differentiates itself from the remaining ones through a much higher standard deviation, which is to be expected, given the fact that equities are affected by more risk-factors than fixed-income is.

4.3. Public information variables

For application in the conditional model, two public information variables are used: a term spread and the inverse relative wealth. According to Adcock et al. (2012), who study the performance of the inclusion of these variables, they are able to capture time-series properties of returns, including heteroskedasticity problems. These variables have also been used in studies like Ilmanen (1995), Silva et al. (2003) and Leite & Cortez (2018).

The term spread is measured by the annualized yield spread between a long-term bond yield (EMU 7-10 Year Datastream Government Index) and a short-term rate (European 3-month deposit certificates).

The inverse relative wealth is computed as the ratio between the level of past wealth and the level of current wealth. The proxy for the past wealth is an exponentially weighted average of the past levels of the FTSE Eurofirst 100, deflated using the Eurozone Consumer Price Index. Following Ilmanen (1995), Silva et al. (2003) and Leite & Cortez (2018), a smoothing parameter of 0.9 and a time window of 36 months are applied to the exponentially weighted average.

To control for non-stationarity issues, these variables are stochastically detrended by subtracting a 12-month trailing moving average, as suggested by Ferson et al. (2003). Furthermore, the variables are used in their zero-mean form, following Ferson & Schadt (1996).

All the required data to compute these variables was obtained from Datastream. Below, in tables 3 and 4, are descriptive statistics regarding both these variables, both pre-treatments mentioned above and post-treatments.

Table 3 - Descriptive statistics for Term-Spread variable

Term-Spread	Average	Median	Std. Dev.	AC1	AC1 P-value	Jarque-Bera	JB P-value
Pre-treatments	1.4775	1.271	107.32%	0.969	0.000	6.766	0.034
Post-treatments	0.0000	-0.0795	52.66%	0.897	0.000	181.68	0.000

This table presents the descriptive statistics for the term-spread variable. These statistics are presented both for the variable's original form (Pre-treatments) and for the stochastically detrended zero-mean form variable (Post-treatments). The reported statistics are, in order, the average value, median, standard deviation in percentage, the first order autocorrelation, the probability value for the Q-statistic associated with the autocorrelation of first order, the value of the Jarque-Bera normality test, and the probability value associated with the test.

Table 4 - Descriptive statistics for Inverse Relative Wealth variable

IRW	Average	Median	Std. Dev.	AC1	AC1 P-value	Jarque-Bera	JB P-value
Pre-treatments	0.9881	0.9579	12.44%	0.934	0.000	356.27	0.000
Post-treatment	0.0000	-0.0063	9.4%	0.88	0.000	58.165	0.000

This table presents the descriptive statistics for the Inverse Relative Wealth variable. These statistics are presented both for the variable's original form (Pre-treatments) and for the stochastically detrended zero-mean form variable (Post-treatments). The reported statistics are, in order, the average value, median, standard deviation in percentage, the first order autocorrelation, the probability value for the Q-statistic associated with the autocorrelation of first order, the value of the Jarque-Bera normality test, and the probability value associated with the test.

As expected, both these variables present post-treatment averages of zero. The main difference between these variables is that, both pre and post-treatments, the term-spread expresses much larger fluctuations, as noted by its much higher standard deviation. The high values of first order autocorrelations for both variables show that corrections are needed to resolve both non-stationarity issues and prevent biases resulting from spurious regressions. Although values remain high for autocorrelations post-treatment, the implemented corrections did reduce them. The variables do not follow normality, in any of their forms.

5. Empirical Results

This section presents the empirical results on the performance of the sampled SRI corporate bond funds, over the period ranging from January 2007 to November 2018. Performance evaluation is conducted through both unconditional and conditional models.

Performance estimates (alphas) are obtained by regressing the funds' return (or the equally weighted portfolio of all funds) on the risk factors. The presence of a statistically significant alpha in the regression results indicates evidence of abnormal performance in relation to the market. If the alpha is positive, there is an outperformance of the fund(s) in question; If the alpha is negative, there is an underperformance of the fund(s) in question.

Results are presented into two subsections. First, the analysis of results obtained through the unconditional models, and then, the analysis of results with regards to the conditional model.

5.1. Unconditional models

As mentioned in the methodology section, two unconditional models are used to assess fund performance – one containing a global market index (4-factor unconditional model), and one containing a European one (5-factor unconditional model). The analysis begins with the former. The obtained results for the created portfolios regarding the first unconditional model are presented below, in table 5. Furthermore, results for all individual funds are contained in annex 2.

Table 5 - 4-factor model regression outputs

Portfolio	αp	β1p	β2p	β3p	β4p	Adj. R^2
Eq. Weight	-0.0002	0.6279***	0.1376**	-0.1161**	0.0448***	80.84%
Eq. W. Global	-0.0003	0.6707***	0.1941***	-0.1160*	0.0503***	82.18%
Eq. W. EUR	0.0000	0.6098***	0.0555	-0.1363**	0.0370**	77.21%

This table reports the regression estimates for the 4-factor unconditional model. It contains performance estimates (Alpha) and coefficients on the risk-factors (Betas) for the created portfolios. β1p corresponds to the coefficient on the monthly excess returns of the ICE BofA ML Global Corporates index; β2p corresponds to the coefficient on the default spread, computed by the difference between the returns on the iBoxx BBB EUR Corporates index and the iBoxx AAA

EUR Corporates index; β3p corresponds to the coefficient on the option factor, computed by the spread between the BofA ML Asset & Mortgage backed index and the iBoxx EUR Sovereigns index; β4p is the coefficient on the equity factor, that corresponds to the monthly excess returns on the FTSE Eurofirst 100 index. All excess returns are calculated using the one-month euro deposit certificate rate as the risk-free rate. Adj. R^2 is the adjusted coefficient of determination. Eq. Weight represents the overall equally weighted portfolio of all funds, Eq. W. Global represents the equally weighted portfolio of all funds investing globally and Eq. W. EUR represents the equally weighted portfolio of all funds investing in Europe/EuroZone. Asterisks are used to determine the level of statistical significance of the coefficients - *** represent statistically significant the at 1% level, ** represent statistically significant at the 5% level and * represents statistically significant at the 10% level. Heteroskedasticity and autocorrelation corrections have been implemented for these coefficients, when specific tests revealed such problems.

For the created portfolios, although values of alpha indicate underperformance for the overall and the global portfolio, and no difference in performance for the European portfolio, none of these values are statistically significant. As for the risk-factors, all have some degree of statistical significance in explaining returns, indicating that funds are affected by these (except for the specific case of the Default factor for the European portfolio). As expected, the market factor is the one with higher coefficient, as it explains the majority of returns. Adjusted R^2 values range from 77% to 82%, and while these values already indicate reasonable explanatory power, they leave room for improvement.

As for the individual funds (Annex 2), only four of the 24 funds present statistically significant alphas, two of them negative and two positive. However, only the negative alphas are significant at least at the 5% level, while the positive ones are only significant at 10%. While the market factor still displays significance across the funds, the remaining factors are far less homogenous, being significant with relation to some funds, and others not. This is to be expected, given that investment styles naturally vary strongly form fund to fund. Adjusted R^2 values range from 57% to 86%, which shows a large spread, and again, suggests room for improvement of the model.

As such, results regarding the created portfolios for the 5-factor unconditional model used, containing a European market factor and the orthogonal global factor are presented below, in table 6. Again, results for all individual funds are presented in annex 3.

Table 6 - 5-factor unconditional model regression outputs

Portfolio	αp	β1p	β2p	β3p	β4p	β5p	Adj. R^2
Eq. Weight	-0.00045*	0.8485***	0.0902**	-0.0357	-0.0233	0.0153*	95.79%
Eq. W. Global	-0.0005*	0.9013***	0.1446***	-0.0317	-0.1129	0.0195	95.58%
Eq. W. EUR	-0.0003	0.8311***	0.0082	-0.0558*	-0.0416	0.0076	94.35%

This table reports the regression estimates for the 5-factor unconditional model. It contains performance estimates (Alpha) and coefficients on the risk-factors (Betas) for the created portfolios. β1p corresponds to the coefficient on the monthly excess returns of the iBoxx EUR Corporates index; β2p corresponds to the coefficient on the default spread, computed by the difference between the returns on the iBoxx BBB EUR Corporates index and the iBoxx AAA EUR Corporates index; β3p corresponds to the coefficient on the option factor, computed by the spread between the BofA ML Asset & Mortgage backed index and the iBoxx EUR Sovereigns index; β4p is coefficient on the orthogonal global factor, corresponding to the resulting residuals of regressing the BofA ML Global Corporates index on the iBoxx EUR Corporates index; β5p is the coefficient on the equity factor, that corresponds to the monthly excess returns on the FTSE Eurofirst 100 index. All excess returns are calculated using the one-month euro deposit certificate rate as the risk-free rate. Adj. R^2 is the adjusted coefficient of determination. Eq. Weight represents the overall equally weighted portfolio of all funds, Eq. W. Global represents the equally weighted portfolio of all funds investing globally and Eq. W. EUR represents the equally weighted portfolio of all funds investing in Europe/EuroZone. Asterisks are used to determine the level of statistical significance of the coefficients - *** represent statistically significant the at 1% level, ** represent statistically significant at the 5% level and * represents statistically significant at the 10% level. Heteroskedasticity and autocorrelation corrections have been implemented for these coefficients, when specific tests revealed such problems.

For the 5-factor model, there is statistical evidence (although only at the 10% level) that both the overall and the global portfolio underperform the market by 0.045% and 0.05%, respectively. For the European portfolio, the value of alpha is negative but not statistically significant. The coefficient for the market index increases when comparing this model to the previous one. This is also true for the case of the global portfolio, indicating that funds considered global investors contain heavy amounts of exposure to the European market, and their fund composition is certainly heavily weighted toward European/EuroZone corporate bonds. As for the remaining risk-factors, they aren't as significant as they were in the results of the 4-factor unconditional model. However, the Default factor still provides strongly significant results for two of the three portfolios. Adjusted R^2 values increase significantly when compared to the previous model, ranging from 94 to 96%, which indicates this model fits the data well, and has good explanatory power.

With regards to the individual fund results (Annex 3), ten funds present statistically significant alphas. Of these alphas, eight are negative, and two are positive. Only two of these are not statistically significant at least at the 5% level. The market factor is strongly significant for all funds, and all the remaining risk factors are significant at the 1% level for at least one of the funds. Of these, the default factor seems to do a better job than the rest in explaining the sample returns, being significant at the 1% level for eleven of the funds. The adjusted R^2 values range from 70 to 98%, averaging at approximately 89%, indicating, again, that the model does a good job at explaining fund returns.

The overall conclusion regarding fund performance according to these results is that they underperform the market (although statistical significance is weak). In comparison to the SRI corporate bond fund literature, these results are somewhat consistent with Derwall & Koedijk (2009), who find that SRI funds significantly underperform the market[2]. Leite & Cortez (2018), report an underperformance of corporate bond fund in relation to the market[3], however, this is not statistically significant. This study's results are therefore slightly inconsistent with those of Leite & Cortez (2018), as underperformance is slightly significant in these results. However, if one regards the 10% level of significance as not sufficient, the obtained results would be in accordance with the ones found by the authors. The obtained results are inconsistent with Henke's (2016) findings, that indicate outperformance of SRI corporate bond funds in relation to the market.

The results discussed above relate to an unconditional model and, as referred in the Methodology section, it doesn't allow for time-varying alphas or betas, meaning it doesn't account for different stages of economic expansion and recession. Therefore, the results above assume risk and performance are stationary over time, which is almost certainly never true in a real-world scenario. As mentioned before, this can lead to biases, and the quality of results may be hampered by these.

[2] Although the authors find neutral performance when compared to conventional funds.
[3] As above, authors also report neutral performance when compared to conventional funds.

5.2. Conditional Model

When it comes to actively managed funds, managers attempt to create extra value for their investors by recurring to their market timing and fund selection skills. Since fund managers themselves use public information to make their investment decisions, it makes sense to include these variables in models that aim to assess fund performance. Furthermore, as mentioned in the previous sub-section, the non-inclusion of these variables may lead to biases in the values of alpha, impairing the quality of results. The two lagged public information variables used to account for the market's changing conditions are a term spread and the inverse relative wealth (as described in the Data section).

Table 7 presents the results regarding the conditional model. It contains the results for the created portfolios of funds. Furthermore, results for all individual funds are presented in annex 4.

As table 7 shows, all portfolios underperform the market throughout the studied period. For the case of the overall portfolio, this underperformance of 0.04% is strongly significant (at the 1% level). The portfolios show similar performance levels, although the global one underperforms the other two by 0.01%. However, results for the global and European portfolios are statistically weaker, significant at the 5% level for the former and at the 10% level for the latter. The lack of big differences between the portfolios could be again explained by the fact that the globally investing funds mainly possess high exposure to the European market as well. Conditional alphas show statistical significance for all the portfolios, with five of six being significant at the 5% level and above. The market factor maintains itself as the most relevant in explaining returns, with high coefficients and strong significance across all portfolios. The Default factor shows that both the overall and global portfolios have reasonable exposure to it, results showing decently sized coefficients and strong significance.

Table 7 - Conditional model regression outputs

Factors	Porfolios		
	Eq. Weight	Eq. W. Global	Eq. W. EUR
α0p	-0.0004***	-0.0005**	-0.0004*
A'1p	-0.0013**	-0.0016***	-0.0014**
A'2p	-0.0060**	-0.0053**	-0.0058*
β1p	0.8783***	0.9386***	0.8657***
β1p*TS	0.0771	0.0713*	0.0755
β1p*IRW	-0.3773**	-0.5437***	-0.4088*
β2p	0.1111***	0.1576***	0.0239
β2p*TS	-0.1217***	-0.1313***	-0.0959**
β2p*IRW	-0.0234	0.1429	0.0461
β3p	-0.0565***	-0.0528***	-0.0730***
β3p*TS	-0.0565	-0.0089	-0.0729
β3p*IRW	-0.2699	-0.1968	-0.3732*
β4p	0.0301	0.0365	0.0196
β4p*TS	-0.0829	-0.0865	-0.0826
β4p*IRW	-1.1018***	-0.9955***	-1.2195***
β5p	0.0096*	0.0120**	0.0041
β5p*TS	-0.0016	0.0083	-0.0099
β5p*IRW	-0.0181	-0.0104	-0.0455
Adj. R^2	97.73%	97.46%	96.46%
W1 (p-value)	0.0026	0.0055	0.0101
W2(p-value)	0.0000	0.0000	0.0000
W3(p-value)	0.0000	0.0000	0.0000

This Table reports the regressions estimates for the conditional model. Performance (Alphas) and coefficients on the risk factors (Betas) for the equally weighted portfolio of funds are presented. A'1p and A'2p correspond to the time-varying alphas that relate to the public information variables term spread and inverse relative wealth, respectively. β1p corresponds to the coefficient of the monthly excess returns of the iBoxx EUR Corporates index; β2p corresponds to coefficient of the default spread, computed by the difference between the returns on the iBoxx BBB EUR Corporates index and the iBoxx AAA EUR Corporates index; β3p corresponds to the coefficient of the option factor, computed by the spread between the BofA ML Asset & Mortgage backed index and the iBoxx EUR Sovereigns index; β4p is the coefficient of the orthogonal global factor, measured by the residuals of a regression between the BofA ML Global Corporates index on the iBoxx EUR Corporates index; β5p is the coefficient of the equity factor, that corresponds to the monthly excess returns on the FTSE Eurofirst 100 index. All conditional betas correspond to the cross-product between the each factor the public information variables and are identified by a product between a factor and a public information variable. Excess returns are computed using the one-month euro deposit certificate rate as the risk-free rate. Adj. R^2 is the adjusted coefficient of determination. W1, W2, and W3 correspond to the probability value of the Wald test regarding time-varying alphas, time-varying betas, and the joint test of time-varying alphas and betas, respectively. Asterisks refers to the level of statistical significance of the coefficients - *** represent statistically significant at the 1% level, ** represent statistically significant at the 5% level and * represents statistically significant at the 10% level. Eq. Weight represents the overall equally weighted portfolio of all funds, Eq. W. Global represents the equally weighted portfolio of all funds investing globally and Eq. W. EUR represents the equally weighted portfolio of all funds investing in Europe/EuroZone. Heteroskedasticity and autocorrelation corrections have been implemented for these coefficients, when specific tests accused such problems.

Given that the European portfolio appears to have no significant exposure to the Default factor, the overall portfolio is likely reflecting the exposure coming from globally investing funds, when it comes to high-yield bonds. All portfolios present strongly significant exposure to the Option factor, which was not captured by the unconditional models discussed in the previous sub-section. The Global factor shows no significance for any of the portfolios, which is disappointing, especially for the case of the global one. The overall and global portfolios present low exposure to stock markets, significant at the 10% and 5% level, respectively. As for the conditional betas, there is evidence of significance across some of the factors for all portfolios. For example, the Term-Spread variable combined with the Default factor is significant at least at the 5% level for all portfolios.

The adjusted R^2 and tabled Wald tests show the increased robustness brought by the use of a conditional model. The Adjusted R^2 values range between approximately 97 and 98%, further increasing the already high values seen in the second unconditional model used. The Wald tests show the importance of including public information variables by assessing whether conditional alphas and betas are statistically different from zero. W1 refers to conditional alphas, W2 to conditional betas, and W3 to the joint-test of conditional alphas and betas. As displayed in the table, probability-values are close to zero or zero for all of the tests, rejecting the hypothesis that either conditional alphas, betas, and alphas and betas jointly can't be proven different form zero. This means the inclusion of these variables adds to the explanatory power over returns.

As for the individual funds (Annex 4), nine of them present statistically significant alphas, seven of them negative. Of these negative ones, all are significant at the 1% level except for one, which is significant at the 5% level. Of the positive performers, only one presents strongly significant results (1%), while the other outperforms the market at the 10% level only. Conditional alphas are significant for some funds, but not the majority. Statistically significant conditional betas vary heavily from fund to fund, as is expected due to different investments strategies. Adjusted R^2 values range from 72 to 98%, averaging at 91% approximately, showing, again, an increase in overall explanatory power of the conditional model when compared to the previously mentioned unconditional ones.

The usage of the conditional model improves the quality of the results and shows a more obvious underperformance of the sampled corporate bond mutual funds in relation to the market over the period analyzed. As such, the results obtained with this model further solidify the comparisons with other studies mentioned in the previous sub-section. This strongly significant underperformance is still consistent with Derwall & Koedijk (2009), who report the same conclusion in relation to their sample. In relation to Leite & Cortez (2018), these results are now more inconsistent with the authors, given that the use of the conditional model presented strongly significant negative abnormal performances in relation to the market, while the study finds no significant difference in performance. These results are the most inconsistent when compared to Henke's (2016) study, that reports an outperformance of corporate bond funds in relation to the market.

6. Conclusions

Funds that include economic, social and governance screening in their investment process are becoming an increasingly attractive venture for investors that want to cater to their social responsibilities. However, besides contributing to a better world, naturally these investors also want what's best for their capital. While the subject of SRI equity fund performance has been reasonably documented so far, the same can't be said regarding SRI fixed-income funds. This study aims to contribute to the existing literature by analyzing the performance of 24 SRI corporate bond funds, from the period of January 2007 to November 2018, domiciled in either Germany or France – two of the biggest EuroZone SRI markets.

This study presents limitations. Fund identification proved challenging, and there is unfortunately no guarantee that all corporate bond mutual funds were covered. Furthermore, survivorship bias is a possibility within the sample, since I was not able to identify any dead funds during the analyzed period.

Regarding the methodology implemented, three different models were used to assess fund performance: Two unconditional models, and a conditional one. A 4-factor unconditional model based on Derwall & Koedijk (2009) is implemented, however, due to relatively poor performance of the model, it is then expanded into a 5-factor model that fit the data better. The conditional model is an extension of the 5-factor unconditional model to include two public information variables, to capture time-varying aspects of the market. Regression outputs show that, although the unconditional model itself fits the data relatively well, the inclusion of public information variables improves the quality of the fit to the data, boosting R-squared values even higher. Besides that, there is strong evidence of time-varying alphas and betas throughout the studied period, for which the unconditional model does not account for.

In relation to the performance of the SRI corporate bond funds, the funds that compose the dataset show an underperformance in relation to the relevant benchmarks. However, while the unconditional model's result is only statistically significant at the 10% significance level, and only for the global and overall portfolios, the conditional model provides a more robust evaluation, showing an underperformance of approximately -0.04% for the equally weighted portfolio of all funds, significant at the 1% level. The equally weighted portfolio of European investing funds underperformed the market also by approximately -0.04%, however this result is only significant at the 10% level. The Global investing funds equally weighted portfolio was the sole worse performer (although only slightly), underperforming the market by -0.05%, significant at the 5% level. The portfolios are somewhat homogenous in results, which could be explained by the fact that the sampled funds classified as global investors, possess in fact, a very high exposure to the European market anyway – which is the same reason why the 4-factor unconditional model performed worse than the 5-factor one.

In summary, according to these results, when it comes to SRI corporate bond funds, managers do not seem to possess the necessary skill to outperform relevant benchmarks. These results are consistent with Derwall & Koedijk (2009), slightly inconsistent with Leite & Cortez (2018) and majorly inconsistent with Henke (2016). This said, underperformance in comparison to relevant benchmarks is a common sight amongst bond (and equity) fund studies. Therefore, investors aren't necessarily losing value by investing in SRI corporate bond funds, since this underperformance is in line with what conventional funds achieve. For future research, It would be of interest to compare the performance of conventional corporate bond funds with that of SRI corporate bond funds, to verify if the difference in underperformance is statistically significant, possibly helping draw concluding remarks regarding the value of applying ESG screenings.

Furthermore, the analysis of passively managed SRI corporate bond funds during the same period would be useful to determine whether the stated underperformance is related to active management effects, or the effects of inclusion of SRI screenings.

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Annex

Annex 1 - Descriptive statistics for individual funds.

DS Fund Code	Average	Median	Std. Dv.	Kurtosis	Skewness	Jarque-Bera	P-value	No. Of Obs.	Inv. Focus
9299P5	0,09%	-0,08%	1,01%	0,6230	0,1511	0,5174	0,7720	46	Global
30739P	0,29%	0,36%	0,90%	3,1874	-0,2692	34,9182	0,0000	93	Europe
27733H	0,18%	0,16%	1,38%	3,0492	0,2590	51,3440	0,0000	142	Global
685939	0,30%	0,30%	1,14%	2,7452	-0,5153	46,3816	0,0000	142	Global
8884UC	0,19%	0,06%	0,69%	0,8230	0,6375	2,5999	0,2725	35	Europe
2569XE	0,08%	0,02%	0,53%	1,1966	0,5900	2,2837	0,3192	29	Europe
359699	0,05%	0,10%	1,88%	6,8388	-1,4352	302,2075	0,0000	142	Global
8930N2	0,10%	0,02%	0,62%	0,1487	0,5415	1,4707	0,4793	33	Europe
880029	0,21%	0,25%	1,16%	1,5427	-0,4366	16,8040	0,0002	142	Global
880146	0,17%	0,28%	0,69%	1,3388	-0,7185	21,2072	0,0000	142	EuroZone
67077Q	0,36%	0,36%	1,08%	1,5560	-0,5737	16,2005	0,0003	116	EuroZone
92240C	0,25%	0,28%	0,69%	0,5090	-0,2775	1,0949	0,5784	61	Europe
725589	0,30%	0,39%	1,03%	1,7301	-0,2267	10,6437	0,0049	95	Global
77814W	0,29%	0,33%	1,12%	2,2604	-0,1787	15,4642	0,0004	85	Global
75543Q	0,31%	0,39%	1,00%	1,0650	-0,3812	5,5682	0,0618	92	Global
88614Q	0,35%	0,39%	1,14%	1,1811	-0,2267	7,2622	0,0265	126	Europe
880283	0,18%	0,20%	1,03%	1,6511	-0,6550	24,1816	0,0000	142	Global
41538N	0,20%	0,25%	1,29%	2,5939	0,4167	39,8721	0,0000	142	EuroZone
74102K	0,27%	0,33%	0,94%	0,8606	-0,2809	3,4572	0,1775	95	EuroZone
91109L	0,08%	0,05%	0,76%	0,3540	0,2837	0,5419	0,7626	40	Europe
26191J	0,04%	0,14%	1,16%	5,0777	-1,3051	179,1362	0,0000	142	EuroZone
9289WC	0,06%	-0,10%	0,84%	0,2612	-0,0001	0,0215	0,9893	46	Europe
87523K	0,29%	0,36%	1,04%	1,5087	-0,6014	9,4169	0,0090	72	EuroZone
9453WE	0,09%	0,04%	0,94%	1,0260	-0,2679	1,5523	0,4602	43	Global

Annex 2 - Regression outputs for individual funds (4-factor unconditional model).

DS fund code	αp	β1p	β2p	β3p	β4p	Adj. R^2	Inv. Focus
9299P5	-0,0005	0,8089***	0,2123	-0,1478	0,0885***	72,23%	Global
30739P	0,0008*	0,5565***	0,0754	-0,3489***	-0,0109	63,96%	Europe
27733H	-0,0005	0,7052	0,1985	-0,1847*	0,0570*	72,05%	Global
685939	0,0010	0,6355***	0,1762**	0,0045	0,0094	63,95%	Global
8884UC	0,0001	0,6624***	-0,0782	-0,0487	0,0280	67,03%	Europe
2569XE	0,0000	0,5228***	0,1679	0,0102	0,0274	58,81%	Europe
359699	-0,0027**	0,9826***	0,1707*	-0,048	0,1247**	77,77%	Global
8930N2	-0,0002	0,5055***	-0,3741***	0,0109	0,0482*	69,39%	Europe
880029	0,0003	0,5273***	0,2684**	-0,1537*	0,0413**	70,60%	Global
880146	0,0005	0,3823***	0,0479	-0,1448***	-0,0088	57,03%	EuroZone
67077Q	0,0000	0,6723***	0,1650	-0,1968**	0,0384**	72,29%	EuroZone
92240C	0,0007	0,5447***	-0,1448	-0,0576	0,0540***	71,26%	Europe
725589	0,0004	0,7213***	0,2926***	-0,2081***	0,0178	77,23%	Global
77814W	-0,0001	0,7970***	0,1842**	-0,2757***	0,0207	74,92%	Global
75543Q	0,0005	0,7230***	0,2966***	0,0093	0,0544***	86,10%	Global
88614Q	0,0010*	0,6603***	0,1092*	-0,0976	0,0232	73,56%	Europe
880283	0,0002	0,4628***	0,2364***	-0,1730**	0,0152	60,56%	Global
41538N	-0,0002	0,7013***	0,0613	-0,1312*	0,0602**	68,60%	EuroZone
74102K	0,0002	0,7117***	0,2097***	-0,1098**	0,0301*	78,45%	EuroZone
91109L	-0,0002	0,4538	-0,0182	0,1012	0,1061***	60,61%	Europe
26191J	-0,0017***	0,6743***	-0,0445	-0,0730	0,0731***	74,80%	EuroZone
9289WC	-0,0006	0,7032***	-0,0016	-0,0833	0,0785***	74,29%	Europe
87523K	0,0009	0,6666***	0,4900***	0,0734	0,0956***	67,93%	EuroZone
9453WE	-0,0005	0,7656***	-0,1545	-0,0637	0,0755***	67,89%	Global

Annex 3 - Regression outputs for individual funds (5-factor unconditional model).

DS fund code	αp	β1p	β2p	β3p	β4p	β5p	Adj. R^2	Inv. Focus
9299P5	-0,0007***	1,2942***	0,4128***	-0,1091**	0,0408	-0,0094	94,36%	Global
30739P	0,0002	0,8137***	-0,0778	-0,2381***	-0,1201**	-0,0345***	86,11%	Europe
27733H	-0,0008*	0,9902***	0,1381*	-0,0818	-0,1269	0,0194	87,31%	Global
685939	0,0009*	0,8061***	0,1387***	0,0683	0,119	-0,0139	72,59%	Global
8884UC	-0,0001	1,1249***	0,1636***	-0,0555***	-0,0066	-0,0267***	97,16%	Europe
2569XE	-0,0002	0,8642***	0,3827***	0,0018	0,0814	-0,0169	86,97%	Europe
359699	-0,0028**	1,2399***	0,1140	0,04847	0,2016	0,0894**	85,00%	Global
8930N2	-0,0004**	0,9013***	-0,1840***	0,0024	-0,0592*	-0,0004	97,97%	Europe
880029	0,0000	0,7698***	0,2174***	-0,0670	-0,1745*	0,0096	85,94%	Global
880146	0,0004	0,5144***	0,0196	-0,0965**	-0,0083	-0,0265**	70,57%	EuroZone
67077Q	-0,0004	0,9294***	0,0096	-0,0673**	-0,0775	0,0149*	88,89%	EuroZone
92240C	0,0003***	0,9392***	-0,0355	-0,0285	0,0387**	0,0000	97,71%	Europe
725589	0,0000	0,9837***	0,1329***	-0,0932***	-0,0066	-0,0059	96,58%	Global
77814W	-0,0009***	1,1317***	0,0195	-0,1015**	0,0099	-0,0042	96,74%	Global
75543Q	0,0003	0,8649***	0,2014***	0,0762	0,3183***	0,0416***	92,45%	Global
88614Q	0,0005	0,9089***	0,0712	-0,0146	0,0282	-0,0150	87,58%	Europe
880283	0,0000	0,6794***	0,1909**	-0,0956*	-0,1630**	-0,0131	75,89%	Global
41538N	-0,0006	1,0219***	-0,0062	-0,0165	-0,2268*	0,0183	90,39%	EuroZone
74102K	-0,0003**	0,9516***	0,0629***	-0,040	0,0422	0,0082	97,86%	EuroZone
91109L	-0,0004	0,7848***	0,1147	0,0890	-0,0237	0,0527***	75,28%	Europe
26191J	-0,0018***	0,8612***	-0,0855*	-0,0034	0,1103	0,0477***	84,67%	EuroZone
9289WC	-0,0006**	1,0971***	0,1617***	-0,0518	0,0776	-0,0012	95,73%	Europe
87523K	0,0008	0,8845***	0,5498***	0,0774	0,3319**	0,0627**	72,25%	EuroZone
9453WE	-0,0006	1,2248***	0,0471	-0,0172	-0,0190	-0,0134	92,22%	Global

Annex 4 – Regression outputs for individual funds (conditional model).

DS fund code	α0p	A'1p	A'2p	β1p	TSβ1p	IRWβ1p	β2p	TSβ2p	IRWβ2p	β3p	TSβ3p	IRWβ3p	β4p	TSβ4p	IRWβ4p	β5p	TSβ5p	IRWβ5p	Adj. R^2	Inv. Focus
9299P5	-0,0004	-0,0004	-0,0037	1,2069***	-0,2198	1,4733	0,3115***	0,0735	1,1704	-0,1720***	-0,3096	1,9806	0,1105	0,6695	-1,9391	-0,0161	0,0416	0,0989	93,99%	Global
30739P	0,0003	-0,0017	0,0025	0,8509***	0,1955	-1,2426	-0,0397	-0,165	0,3591	-0,1541**	0,1165	-1,8138***	-0,0936	-0,1739	-2,7654*	-0,0257***	0,0366	-0,3124	87,69%	Europe
27733H	-0,0010***	-0,0030**	-0,0136**	0,9471***	0,1925**	0,3956	0,2376***	-0,0406	-0,6131**	-0,1778***	-0,0128	0,1064	0,0439	0,3885**	-1,7015**	-0,0051	0,0024	0,0959	92,70%	Global
685939	0,0002	-0,0023	0,0074	0,9235***	0,0540	-1,8972***	0,0548	-0,0451	1,5225***	0,0884	-0,0067	-0,3999	0,1257	-0,0733	-0,1209	0,0086	-0,0079	-0,4480***	76,34%	Global
8884UC	-0,0003	0,0029*	-0,0082	1,1327***	0,3458	2,4151**	0,1444**	0,2273	-1,0887	-0,0859**	-0,5751**	-0,0746	-0,0416	-0,2550	0,4028	-0,0261**	-0,0286	0,4791	97,41%	Europe
2569XE	0,0002	0,0017	-0,0712***	0,7174***	-0,7939	2,7939	0,1862*	-0,5069	12,4042*	-0,1354*	-0,8698**	-1,8745	0,1353*	-0,1853	-6,3349*	-0,0074	-0,1427**	0,1046	90,78%	Europe
359699	-0,0019***	-0,0038**	-0,0374***	1,1771***	0,2468***	0,7485	0,1133**	-0,1592**	0,1782	-0,0803*	0,0744	0,1484	0,2373**	0,0983	-0,4849	0,0348***	0,0299	0,5536***	93,07%	Global
8930N2	-0,0006**	-0,0005	-0,0103	0,9460***	0,3300	1,0555	-0,1913***	0,1736	-0,2475	-0,0090	-0,3255	-1,2810	-0,1082*	-0,5009	-0,3388	-0,0030	0,0143	0,5608*	97,64%	Europe
880029	-0,0002	0,0008	0,0131***	0,8291***	0,0430	-0,7008*	0,2487***	-0,2114***	-0,3618	-0,0281	-0,0139	-0,6987**	-0,1599**	-0,1911	-1,2557*	0,0251	-0,0248	-0,1384	89,05%	Global
880146	0.0000	-0,0005	0,0037	0,5493***	0,0658	-0,3003	-0,0198	-0,0181	0,5394	-0,0741	-0,6269	-0,0355	0,0042	0,1295	-0,0137	-0,0137	-0,0318**	-0,1843***	71,76%	EuroZone
67077Q	-0,0005**	-0,0004	-0,0059	0,9976***	-0,0333	-0,2515	0,0542	-0,1121	0,3479	-0,0567**	-0,1429	-0,9156***	-0,0180	-0,2092**	-2,0784***	0,0234***	-0,0550**	-0,1887**	96,61%	EuroZone
92240C	0,0005***	0,0008*	-0,0032	0,8946***	-0,2510*	0,4323	-0,0915***	-0,2802**	0,8387*	-0,0276*	0,1409*	0,1157	0,0342	-0,0082	-0,0084	0,0054	0,0122	-0,0370	97,90%	Europe
725589	-0,0003	-0,0007	-0,0038	0,9969***	-0,2043*	-0,2013	0,1494***	-0,0429	-0,8869*	-0,0844***	-0,0337	0,1749	-0,0109	-0,0094	1,1145	-0,0056	0,0284	0,1308	96,72%	Global
77814W	-0,0009***	0,0003	0,0016	1,1364***	-0,0246	0,4355	0,0370	0,2072	0,5331	-0,1348***	-0,2578*	0,6395	0,0389	0,0767	-0,0391	-0,0106	-0,0440	-0,0135	96,65%	Global
75543Q	0,0003	0,0002	-0,0062	0,8823***	0,1837	-0,3474	0,2307***	0,2778	0,6907	0,0558	0,2477	1,2515	0,2921***	0,2069	1,5436	0,0257***	-0,0882**	0,0981	93,78%	Global
88614Q	0,0005*	-0,0024**	-0,0070	0,9478***	0,2061*	-1,2540***	0,0368	-0,1606***	0,6794**	-0,0864**	0,0314	-0,0188	0,1436***	0,0440	-1,7001***	-0,0137	-0,0162	-0,0367	94,09%	Europe
880283	0,0004	0,0010	0,0020	0,7732***	-0,2094*	-0,6332	0,2525***	-0,2481**	-0,5264	-0,0370	-0,1696	-0,2375	-0,1201*	-0,5349***	-1,7733***	-0,0106	0,0258	-0,1392	84,25%	Global
41538N	-0,0008***	-0,0025***	0,0028	1,0223***	0,2621***	0,0998	0,1013**	-0,1495***	-0,8717***	-0,0451	0,0231	0,1084	-0,1174**	-0,2731**	-2,2605***	-0,0045	0,0274*	0,0529	95,45%	EuroZone
74102K	0,0000	0,0006	-0,0055*	0,9381***	-0,1009	-0,6563	0,0472***	0,0567	0,5418*	-0,0180	-0,0258	0,1994	-0,0234	-0,2685***	0,4517	0,0048	0,0020	0,1198	98,20%	EuroZone
91109L	0,0002	0,0066**	-0,0342*	0,4422***	-1,2703*	6,3949***	-0,2261	-1,2226*	3,1638	-0,0858	0,0918	4,3595***	0,1475	-1,2205	-5,5234	0,1189***	-0,1516	-0,7995	81,73%	Europe
26191J	-0,0016***	-0,0001	-0,0132**	0,9018***	-0,1029	-0,6059*	-0,1140***	-0,0106	0,2428	0,0024	-0,2767***	-0,7939**	0,1365**	0,0003	-0,1673	0,0428***	-0,0204	0,1609	89,77%	EuroZone
9289WC	-0,0002	-0,0003	-0,0126**	1,0427***	-0,2394	-0,1333	0,0434	-0,3195	1,6701*	-0,1216***	-0,2756*	1,9467**	0,1609***	0,2675	-2,0002	-0,0087	0,0025	0,2838	96,86%	Europe
87523K	0,0006	-0,0003	-0,0267*	0,8917***	0,23045	2,3135	0,5466***	0,3756	2,3227	0,0312	0,1831	-0,4532	0,2854***	0,0946	3,8008*	0,0386	-0,1176**	0,2559	72,67%	EuroZone
9453WE	0,0000	0,0045	0,0147	1,1301***	-0,4865	-0,6718	0,0224	0,2531	0,9727	-0,0460	0,0681	2,6448	0,0511	-0,2458	-1,3990	-0,0142	0,0451	0,0703	92,27%	Global