Journal of Business Economics and Management
ISSN 1611-1699 / eISSN 2029-4433
2014 Volume 15(5): 1034–1053
doi:10.3846/16111699.2012.745818

SEARCHING FOR THE MOST PROFITABLE AND SUSTAINABLE INVESTMENT STRATEGY: EVIDENCE FROM SOVEREIGN BOND FUNDS

Maria VARGAS[1], Ruth VICENTE[2], Fernando MUÑOZ[3]

Department of Accountancy and Finance, Faculty of Economics and Business Studies, University of Zaragoza, Gran Via 2, 50005 Zaragoza, Spain
E-mails: [1]mvargas@unizar.es; [2]rvicente@unizar.es (corresponding author); [3]fmunoz@unizar.es

Received 07 August 2012; accepted 30 October 2012

Abstract. The aim of this study is to provide the sovereign bond fund investor with a guide to finding the most profitable and sustainable investment strategy. For this purpose, a Global Sustainable Competitiveness Index is applied to a sample of 48 funds.

We have conducted a best-in-class analysis, and our evidence supports the idea that the best strategy consists of investing in funds representing high GDP-per-capita countries, and registering the best-in-class sustainable performance scores.

Additionally, other useful findings are that the screening of the funds is beneficial with respect to sustainable performance, and that there is no strong relationship between sustainability and GDP per capita.

Keywords: best-in-class analysis, financial performance, GDP per capita, Global Sustainable Competitiveness Index, sovereign bond funds, sustainable competitiveness.

JEL Classification: G11, G23, H63, Q01.

Introduction

Socially Responsible Investment (SRI), defined by Renneboog *et al*. (2008a) as an investment process that integrates social, environmental, and ethical considerations into investment decision-making, is gaining momentum. Conflicting theories about the impact of SRI on financial performance have fuelled empirical research during the last decades. Remarkably, almost all studies in this field have involved stock mutual funds; some have focused on the performance differences between ethical and conventional mutual funds (see, among others, Bauer *et al*. (2005), Renneboog *et al*. (2008b) or Nofsinger and Varma (2013)). On the other hand, other studies have analysed the influence of the type and the intensity of SR screening on financial performance and risk (see, among others, Barnett and Salomon (2006) and Lee *et al*. (2010)).

Nevertheless, limited research has been undertaken with respect to non-equity investments. Derwall and Koedijk (2009), Drut (2010a, 2010b), Scholtens (2010) or Bilbao

et al. (2014) are notable examples addressing this issue. Thus, the first work focuses on bond and balanced funds; Drut (2010a, 2010b) analyses sovereign bonds, while Scholtens (2010) and Bilbao *et al.* (2014) study government bond funds.

Another concept connected to SRI is Corporate Social Responsibility (CSR), which is defined by the European Commission (2001) as "*a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with stakeholders on a voluntary basis*". In short, CSR suggests that firms take account of their employees, customers, and other stakeholders, the planet, and the future prospects of the firm. It appears that only a small number of studies pay attention to the relationship between SRI and CSR. Some examples are Brammer *et al*. (2006) or Scholtens (2006, 2007). The first paper examines the relationship between corporate social performance and stock returns in the UK; Scholtens (2006) discusses the transmission mechanisms between finance and sustainability, and lastly, in a subsequent study, Scholtens (2007) constructs a proxy for mutual fund CSR policies.

Furthermore, numerous approaches have been suggested to measure sustainable development, in an attempt to reduce the multidimensional aspects of sustainability to one single unit. The majority of these studies have focused on environmental performance, consisting of gauging, at a national government scale, or at a company scale, how close countries/companies are to established environmental policy goals. Thus, Derwall *et al*. (2005), using Innovest's corporate ecoefficiency scores to compose two equity portfolios, find that the high-ranked portfolio provides higher average return than its low-ranked counterpart; Chatterji *et al*. (2007) examine how well the most widely used ratings (KLD) provide transparency about past and likely future environmental performance; Esty *et al*. (2008) build an environmental performance index (EPI) to measure and rank countries, finding that wealth is highly correlated with EPI scores. However, some countries achieve results that exceed their income-group peers, while others fail to keep up; Fiala (2008) uses the "ecological footprint" as a measure of sustainability, measuring the resources necessary to produce the goods that the population consumes. This author stresses the necessity of using better measures of sustainability because of the limitations of the "ecological footprint"; Pillarisetti and Van den Bergh (2010) also use the ecological footprint, but they employ two further indicators of sustainability: the World Bank's "Genuine Savings" measure, and the "Environmental Sustainability Index", concluding that the rankings of sustainable nations vary among these indicators. Finally, Scholtens (2010) also uses these three indicators to assess the sustainable performance of investment funds, and, in addition, he applies the EPI. In line with the results found by Pillarisetti and Van den Bergh, he concludes that it matters very much which particular indicator is used. All of these papers are only a representative sample of the works addressing this topic.

In contrast, other studies have investigated other indicators of social responsibility; thus, Diltz (1995) examines a sample of common stocks issued by firms rated on eleven different social criteria by the Council on Economic Priorities; Brammer *et al*. (2006) use a set of disaggregated social performance indicators for environment, employment and community activities, in order to evaluate the interactions between social and financial performance. They find that the poor financial reward offered by firms is attributable to

their good social performance on employment and, to a lesser extent, the environmental aspects; Hill *et al*. (2006) use composites containing firms that meet several externally-recognized ethical standards; Fischer and Khoury (2007) use ethical ratings, published by specialized research organizations to screen securities, with the purpose of measuring their impact on the risk-adjusted returns of a sample of Canadian securities. Another example is the paper by Kempf and Osthoff (2007), who implement a simple trading strategy based on socially responsible ratings from KLD Research & Analytics. Specifically, the strategy consists of buying high-ranked stocks and selling low-ranked ones, which leads to high abnormal returns. A further study is that by Cox *et al*. (2004) who estimate a set of ownership models that distinguish between long-term and short-term investors and their largest components, and which incorporate both aggregated and disaggregated measures of corporate social performance. Moreover, we must also point to the study by Muñoz-Torres *et al*. (2004), who make a proposal for social performance as an approximation for classifying and evaluating the CSR of SRI funds in Spain. Lastly, Emerson *et al*. (2012) provide quantitative metrics for evaluating a country's environmental performance in different policy categories relative to clearly defined targets.

In this article we focus on sustainable competitiveness, one of the fields within the broad concept of social responsibility. Sustainable competitiveness can be defined as the long-term competitiveness, given the long-term perspective of sustainable development. At the same time, sustainable development is "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*". This definition was formulated by the Brundtland Commission for the Rio Conference in 1992. In the 20 years since then, many businesses have realized that there are economic opportunities and benefits to sustainability – in the form of cost savings and new business opportunities.

Thus, we attempt to develop a method to assess the sustainability of bond portfolios. Specifically, we study 48 funds that invest in sovereign bonds from a global range of countries. These funds are registered for sale in Europe. We assume it is primarily the government that is held responsible for the sustainable competitiveness of a country. Some papers examining the link between Government or sovereign bond funds and SRI are those conducted by Scholtens (2010), who focuses on the environmental performance of Dutch Government bond funds, and Drut (2010a), who uses the Vigeo Sustainability Country Ratings in order to analyze how the mean-variance efficient frontier defined by the sovereign bond funds of twenty developed countries is affected by the consideration of these indicators in the investment decision. However, despite the production of country ratings according to ESG (environmental, social, and governance) factors for several years, no academic research has yet assessed the link between financial performance and the sustainable competitiveness of sovereign bond investments. We therefore consider the Global Sustainable Competitiveness Index (GSCI) produced by SolAbility[1], which is an index representing the future outlook of nation-economies

[1]SolAbility is a sustainability service provider based in Korea, providing sustainable management services to corporate clients and advanced sustainable investment research covering Pan-Asian equities for institutional investors.

from the perspective of sustainable development. This index is based on key sustainability factors that determine long-term competitiveness. Specifically, it is based on four pillars: Natural Capital (NC), Resource Intensity (RI), Sustainable Innovation & Competitiveness (SI&C), and Social Cohesion (SC)[2].

A primary focus of our research is to discover the most profitable and sustainable investment strategy that can be followed by a sovereign bond fund investor. In order to achieve this objective, we first analyze the financial performance differential among the funds, taking into account their position in the ranking of sustainable competitiveness. Second, we conduct an in-depth, best-in-class analysis in order to find such a strategy. We relate the financial performance of the sovereign funds, not only to their sustainable scores, but also to a third component, the Gross Domestic Product (GDP) that each fund represents. GDP is an indicator of the economy's well-being and development, referenced to a moment in time, but it does not allow us to make judgments on the long-term potential and future outlook of countries, from the perspective of sustainable development.

On the other hand, while pursuing this objective, we will simultaneously be attaining other intermediate goals, taking into account that, prior to analysis of the performance of the sovereign funds, we need to also consider the performance of the countries in which the funds are invested. Thus, we will attempt to determine whether the screening of the funds is beneficial to their sustainable performance, or, on the contrary, the countries obtain better scores. Moreover, we will analyze the possible benefits of diversification on sustainable performance by checking whether the funds investing in bonds from a larger number of countries obtain better results. Finally, the comparison between GDP and sustainable performance for a given country will allow us to reach relevant conclusions. Thus, a country with current high income and comparable low sustainable competitiveness may be facing potential decline; on the other hand, a lower income country with low sustainable competitiveness may be facing serious obstacles to improvement of its current status and the livelihood of its population.

Our contribution is two-fold. First, little attention has been paid to the link between sovereign bond financial performance and the performance of states, in terms of ESG issues. This is striking, considering the significant share that the sovereign bond market maintains in global capital markets. This is all the more striking, in that governments have the power to improve regulations related to ESG criteria. Second, we explore an original topic within the ESG framework, since, to our knowledge, the sustainable

[2]The Natural Capital score is composed of indicators measuring the availability and level of degradation of natural resources; the Resource Intensity sub-index reflects the absolute consumption of resources, as well as the economic productivity of resource consumption; the Sustainable Innovation & Competitiveness score aims to evaluate a country's competitiveness in a knowledge-driven and high-tech world, today and in the foreseeable future, and finally, the Social Cohesion sub-index incorporates a variety of indicators related to health care systems, equal opportunity factors, demographic balance, crime levels, public services, freedom indicators, and qualitative life satisfaction. More information about the GSCI calculation, and on the four sub-indices, can be found in the SolAbility report.

competitiveness rating is used for the first time from a financial perspective. This analysis is of great interest; note that, given the long-term perspective of sustainable development, country sustainability is equal to long-term competitiveness ("sustainable competitiveness"). It is widely recognized that natural resources are finite, and that the impact of human activities on the natural environment do influence the future prospects of societies and economies. There is also increasing evidence that managing companies/countries by incorporating sustainability in decision-making, and investing with sustainability principles, yields significant long-term sustainable growth potential of corporations/countries.

The remainder of the paper is structured as follows. Section 1 describes the data and the methodology. Section 2 discusses the results of the analysis. The last section presents our conclusions.

1. Data and methodology

In this section we introduce the data regarding the portfolios and we explain the methodology.

As for the investment funds, we focus on funds that invest in government and sovereign bonds, for several reasons. First, bond investments have been neglected by financial research. Second, sustainability data are not freely available at the level of individual firms or households, but only at the aggregate country level. We investigate the portfolios of government and sovereign bond investment funds registered for sale in the following European countries: United Kingdom, Italy, Spain, Belgium, Portugal, France, Germany and Ireland. These funds invest in Europe but also in the rest of the world (the funds taken together invest in 41 countries). However, only one fund (the GLOBAL INVESTORS high-yield Government Bond) invests in the bonds of developing countries; specifically, it invests all its resources in bonds from 19 developing countries.

We selected all reports of investment funds with the major portion of their investments in bonds, and ended up with a sample of 48[3] funds that provided information about the composition of their investment portfolio at the individual country level. These 48 funds also provided information about their financial performance during the period for which we had data on their sustainable performance. Of the 48 funds, only one fund (Dexia Sustainable Euro Government Bonds Cap) is specifically marketed as an SRI fund. The fund's holdings of government bonds were rescaled to 100%; however, as shown in Table 1, our funds present a high percentage of investment in these.

Table 1 lists the investment funds and the percentage of their investments in government or sovereign bonds. On average, 97.43% of the investments of the funds in our sample

[3]For 9 funds we only have information about their top ten investments. However, we have not removed them from our database since, taking into account only the top ten holding, they still present a major percentage of investment in government or sovereign bonds (the smallest percentage is 24%).

Table 1. Descriptive statistics for the sovereign funds

Investment fund	Percentage of the fund invested in government bonds	Top ten	Investment fund	Percentage of the fund invested in government bonds	Top ten
BlackRock Euro Government Bond Index Fund	100		iShares iBoxx € Liquid Sovergns Cap 1.5–2.5 (DE)	95.47	
BlackRock Euro Government Enhanced Index Fund	97.8		iShares iBoxx € Liquid Sovergns Cap 10.5+ (DE)	100	
BlackRock US Government Mortgage Fund	100		iShares iBoxx € Liquid Sovergns Cap 2.5–5.5 (DE)	100	
BNY Mellon Euro Government Bond	95.34		iShares iBoxx € Liquid Sovergns Cap 5.5–10.5 (DE)	100	
Dexia Bonds Euro Government C Cap		36.81	Julius Baer BF Euro Government-EUR	91.2	
Dexia Bonds Euro Government Plus C Cap		47.8	L&G Royal London UK Government Bond-Pen	78.7	
Dexia Bonds USD Government C Cap	85.86		M&G International Sovereign Bond A Inc	98.2	58.68
Dexia Sustainable Euro Government Bonds Cap		42.1	MFS Meridian Funds US Government Bond A1	92.75	
EasyETF iBoxx Liquid Sovereigns Global	100	44.34	Parvest Euro Government Bond	95.77	23.92
EasyETF iBoxx Liquid Sovereigns Long	100		Pictet F (LUX)-EUR Government Bonds-HI-CHF	94.88	
Edmond de Rothschild Euro Govt Bonds Mid	97.88		Pictet F (LUX)-USD Government Bonds-P Cap	98.32	
Fondaco Euro Gov Beta	100		Pictet F (LUX)-World Government Bonds-I-USD	93.45	
Franklin US Government A MDis USD	98		Pioneer Funds Austria - Euro Government Bond A		34.77

(*End of Table 1*)

GLOBAL INVESTORS high-yield Government Bond	93.1	Robeco Euro Government Bond D EUR	99.41	58.41
HSBC French Government Bonds I Cap	100	Royal London UK Government Bond		70
iShares eb.rexx« Government Germany (DE)	99.99	Scottish Equitable SC UK Government Bond-Pen	99.8	
iShares eb.rexx« Government Germany 1.5–2.5 (DE)	100	SSgA FI EMU Government Bond Index (EGBI)	99.86	
iShares eb.rexx« Government Germany 10.5+ (DE)	100	SSgA FI UK Government Bond Index	99.8	
iShares eb.rexx« Government Germany 2.5–5.5 (DE)	100	Standard Life IG üCAV Euro Government Bond	100	
iShares eb.rexx« Government Germany 5.5–10.5 (DE)	100	Standard Life IG üCAV Euro Govt All Stocks	99.3	
iShares EUR Government Bond 1–3 EUR	100	UBS (Lux) Medium Term Bond Fund - US Government	98.05	
iShares EUR Government Bond 15–30 EUR	95.02	Vanguard Euro Government Bd Index Inv EUR	100	
iShares EUR Government Bond 3–5 EUR	92.02	Vanguard US Government Bd Index Inst USD	99.6	
iShares EUR Government Bond 7–10 EUR	100	***Average***	97.43	
iShares iBoxx € Liquid Sovergns Cap 1.5–10.5 (DE)	99.99	***Standard Deviation***	4.285	

Notes: Table 1 reports the portfolio composition of the sovereign funds, measured at the end of 2011. The average and the standard deviation are also shown. Funds are ordered alphabetically. In the third column, the percentage of investments in government or sovereign bonds is shown for the funds for which only information about their top ten investments is available.
Source: Annual and Quarterly Reports of the funds.

are in such bonds[4]. The remainder is mainly invested in corporate bonds, stock, real estate, or liquid assets.

Regarding the methodology, we first calculate the distribution of the investments among the various countries whose bonds are included in the fund's portfolio. Second, we compute the sustainable performance of each mutual fund, for both the composite index and the four sub-indexes. Thus, for a particular fund, the score on an index is calculated by multiplying the weight of its investment in the bonds of a particular country's government with the score of that country in the index[5]. This was done for all sovereign or government bond investments and for all indices. We also calculate the GDP and the GDP per capita of each of the sovereign funds; thus, for a particular fund, we multiply the weight of its investment in the bonds of a particular country's government with the GDP/GDP per capita of that country. It is important to point out that both the portfolio composition and the GDP/GDP per capita date from 2011.

Next, we rank the investment funds with respect to both their performance on the five indicators and their GDP/GDP per capita. Thus, the fund with the highest score on an index or on the GDP ranking is in position 1. Some funds are in the same position with respect to an index or the GDP, because they have the same portfolio.

In order to further analyze the relationship between each of the sustainability indicators and that between an indicator and the wealth of the country or countries where the fund is invested, we examine the correlation between the different rankings. Since our variables are ordinal, we compute the Spearman's rank-order correlation, which is the non-parametric version of the Pearson product-moment correlation. This correlation coefficient assumes a monotonic relationship between the variables. The Spearman correlation coefficient, r_s, can take values from +1 to –1. An r_s of +1 indicates a perfect association of ranks, an r_s of zero indicates no association between ranks, and an r_s of –1 indicates a perfect negative association of ranks. The closer r_s is to zero, the weaker the association between the ranks.

Then, we run a statistical significance test in order to check the robustness of our results. Specifically, we test the following null hypothesis, which is supposed to be normally distributed: H_0: there is no association between the two rankings ($r_s = 0$).

Next, to compare the social and financial performance of our sample of sovereign bond funds, we compute the 1-year returns for quintile portfolios, formed on the basis of the ranked social performance scores. Thus, quintile 1 contains 20%[6] of the funds with the lowest scores, and so on, while quintile 5 contains the highest scoring funds under each measure (both the composite and the sub-indices). Returns and social performance measures are both computed for the year 2011. The returns are calculated for both an

[4]For the calculation of this average holding, we have not considered the funds for which we have no information about the total percentage of their investment in government or sovereign bonds.

[5]The scores of the countries in the sub-indices and in the index are obtained from the SolAbility report.

[6]Given that some funds have the same social performance score, as they invest in sovereign bonds of the same country, sometimes the quartiles contain more (or less) than 20% of the funds. However, the deviation is minimal.

equal-weighted portfolio and a GDP-per-capita-weighted portfolio, with the purpose of checking the wealth effect on the returns.

Finally, to go further, we construct a sustainable portfolio based on a "best-in-class" analysis, an approach that is commonly applied in the SRI industry (see, for instance, Kempf and Osthoff 2007). Thus, we first place our 48 sovereign bond funds into three groups of 16 funds, depending on their GDP per capita, so we have one group of low GDP per capita funds, another group with medium GDP per capita, and the third group is composed of funds with a high GDP per capita. Within each group, we then construct an equal-weighted portfolio of high-ranked funds and another of low-ranked funds. GDP per capita-weighted best-in-class and worst-in-class portfolios are also constructed. As a general rule, the two portfolios (best-in-class and worst-in-class) are equal in size – namely, 5 or 6 funds – and mutually exclusive. The best-in-class (worst-in-class) portfolio comprises funds having the highest (lowest) sustainable performance score in each GDP per capita group. The sustainable performance is measured by means of the composite and also with the sub-indices.

We then compute the 1-year returns for the best-in-class and worst-in-class portfolios, and also for the difference portfolio, which is calculated as the best-in-class portfolio return, minus the worst-in-class portfolio return.

2. Results

First, when comparing the funds' average performance on the five indicators with the country averages, we observe that the fund performance with respect to all the measures is significantly better. This suggests that the screening of the funds has been beneficial with respect to sustainable performance. This result is remarkable as, apart from the *Dexia Sustainable Euro Government Bonds Cap* fund, screening was not motivated by sustainable performance[7].

Next, in Table 2, we rank the investment funds with respect to both their performance on the five indicators and their GDP/ GDP per capita. Cells shaded in dark grey indicate top-5 performers, and cells shaded in light grey correspond to positions 6th to 10th.

Here, the funds are ordered, not alphabetically, but according to their score on the composite (GSCI). Table 2 shows that the *iShares eb.rexx« Government Germany* funds group ranks highest. The second position is occupied by a fund of the same fund family, the *iShares EUR Government Bond 7–10 EUR* fund. This fund invests in sovereign bonds of Germany (75%), France (23%) and Spain (2%). It performs significantly better with respect to the NC sub-index.

Our unique fund that positions itself as sustainable, the *Dexia Sustainable Euro Government Bonds Cap* fund, ranks fourth on the composite (a good position). This fund invests in the sovereign bonds of Germany, France, Italy and Netherlands.

[7]For the sake of brevity, we do not report these results; however they are available from the authors upon request.

Table 2. Fund ranks on sustainability indexes and on GDP

	GDP	GDP per capita	GSCI	NC	RI	SI&C	SC
iShares eb.rexx« Government Germany (DE)	5	5	1	33	27	1	1
iShares eb.rexx« Government Germany 1.5–2.5 (DE)	5	5	1	33	27	1	1
iShares eb.rexx« Government Germany 10.5+ (DE)	5	5	1	33	27	1	1
iShares eb.rexx« Government Germany 2.5–5.5 (DE)	5	5	1	33	27	1	1
iShares eb.rexx« Government Germany 5.5–10.5 (DE)	5	5	1	33	27	1	1
iShares EUR Government Bond 7–10 EUR	6	6	2	12	28	2	2
Edmond de Rothschild Euro Govt Bonds Mid Term	27	8	3	7	8	3	3
Dexia Sustainable Euro Government Bonds Cap	10	9	4	8	15	8	5
HSBC French Government Bonds I Cap	12	16	5	3	29	29	25
iShares iBoxx € Liquid Sovergns Cap 1.5–10.5 (DE)	26	23	6	11	14	7	8
iShares iBoxx € Liquid Sovergns Cap 1.5–2.5 (DE)	30	29	7	9	26	10	9
Dexia Bonds Euro Government Plus C Cap	7	14	8	10	17	12	6
M&G International Sovereign Bond A Inc	4	3	9	4	34	4	17
BlackRock Euro Government Enhanced Index Fund	33	7	10	27	6	6	10
iShares iBoxx € Liquid Sovergns Cap 10.5+ (DE)	31	28	11	15	22	11	11
Dexia Bonds Euro Government C Cap	11	11	12	14	25	13	7
Pioneer Funds Austria – Euro Government Bond A	35	22	13	30	10	9	12

(*Continue of Table 2*)

Vanguard Euro Government Bd Index Inv EUR	19	13	14	21	23	14	13
Standard Life IG SICAV Euro Govt All Stocks	32	12	15	13	30	23	4
Parvest Euro Government Bond	17	15	16	22	5	15	23
BlackRock Euro Government Bond Index Fund	23	21	17	19	19	16	15
SSgA FI EMU Government Bond Index (EGBI)	22	18	18	20	20	19	14
Fondaco Euro Gov Beta	24	17	19	18	21	21	16
Standard Life IG SICAV Euro Government Bond	25	19	20	17	18	22	18
BNY Mellon Euro Government Bond	18	20	21	24	12	18	19
iShares EUR Government Bond 15–30 EUR	13	26	22	23	9	25	22
Pictet F (LUX)-EUR Government Bonds-HI-CHF	20	27	23	26	16	24	20
iShares EUR Government Bond 3–5 EUR	8	32	24	28	11	26	21
iShares iBoxx € Liquid Sovergns Cap 2.5–5.5 (DE)	29	25	25	34	4	17	24
EasyETF iBoxx Liquid Sovereigns Global	14	33	26	5	24	31	29
iShares iBoxx € Liquid Sovergns Cap 5.5–10.5 (DE)	28	24	27	32	13	20	26
Julius Baer BF Euro Government-EUR	21	30	28	29	7	28	27
Pictet F (LUX)-World Government Bonds-I-USD	3	4	29	6	32	5	30
iShares EUR Government Bond 1–3 EUR	15	31	30	31	2	30	28
Robeco Euro Government Bond D EUR	34	35	32	35	1	35	33
L&G Royal London UK Government Bond-Pen	9	10	33	36	31	27	32

(*End of Table 2*)

Royal London UK Government Bond	9	10	33	36	31	27	32
Scottish Equitable SC UK Government Bond-Pen	9	10	33	36	31	27	32
SSgA FI UK Government Bond Index	9	10	33	36	31	27	32
Pictet F (LUX)-USD Government Bonds-P Cap	2	2	34	2	35	33	34
BlackRock US Government Mortgage Fund	1	1	35	1	36	34	35
Dexia Bonds USD Government C Cap	1	1	35	1	36	34	35
Franklin US Government A MDis USD	1	1	35	1	36	34	35
MFS Meridian Funds US Government Bond A1	1	1	35	1	36	34	35
UBS (Lux) Medium Term Bond Fund – US Government	1	1	35	1	36	34	35
Vanguard US Government Bd Index Inst USD	1	1	35	1	36	34	35
GLOBAL INVESTORS high-yield Government Bond	36	36	36	25	33	36	36

Notes: Table 2 presents the rankings of the sovereign funds with respect to their performance on the five sustainability indicators and with respect to the GDP and GDP per capita. A fund with the highest score on an indicator for its portfolio is in position 1. The funds are ordered according to their rank on the GSCI. Cells shaded in dark grey indicate the top 5 performers, while cells shaded in light grey correspond to positions 6^{th} to 10^{th}.
GSCI stands for Global Sustainable Competitiveness Index; NC stands for Natural Capital; RI stands for Resource Intensity; SI&C stands for Sustainable Innovation & Competitiveness; SC stands for Social Cohesion. GDP and GDP per capita data are based on purchasing-power-parity (PPP).

We also observe that funds investing only in USA sovereign bonds perform poorly on the composite, and also on the RI, SI&C and SC sub-indexes. However, they perform best with respect to the NC sub-index. Additionally, the fund performing the worst on the composite index invests in sovereign bonds of the poorest countries (Turkey, Colombia, Russia, Philippines, …); in fact, this fund, the *GLOBAL INVESTORS high-yield Government Bond* fund, ranks last on the GDP and GDP per capita. This fund also performs poorly on all the sub-indices. We therefore observe no correlation between sustainable competitiveness and income measured by GDP or the GDP per capita; nor can we draw a conclusion about the benefits of diversification on sustainable

competitiveness, as for example funds investing only in German sovereign bonds perform best, but funds investing only in USA sovereign bonds perform poorly.

Later, Table 3 reports the Spearman correlation coefficients between each of the rankings of the sovereign funds with respect to their performance on the five sustainability measures, and with respect to the economic indicators (GDP and GDP per capita). The p-values for the Z-scores are also reported below the coefficient estimates (in parenthesis).

First, we observe a very high correlation between the fund rankings on the composite index (GSCI) and those on the SI&C and the SC sub-indices (0.88 and 0.946, respectively). Taking into account that the weightings of the four sub-indexes in the GSCI are 25% for the NC, 20% for the RI, 32.5% for the SI&C and 22.5% for the SC, we

Table 3. Correlations between fund rankings on sustainability indicators and on GDP

	GSCI	NC	RI	SI&C	SC	GDP	GDP per capita
GSCI	1*	–0.089	0.168	0.88*	0.946*	–0.124	0.114
	(0.000)	(0.272)	(0.125)	(0.000)	(0.000)	(0.197)	(0.218)
NC	–0.089	1*	–0.4*	–0.202	–0.173	0.29*	0.32*
	(0.272)	(0.000)	(0.003)	(0.083)	(0.117)	(0.023)	(0.014)
RI	0.168	–0.4*	1*	0.14	0.194	–0.591*	–0.656*
	(0.125)	(0.003)	(0.000)	(0.168)	(0.092)	(0.000)	(0.000)
SI&C	0.88*	–0.202	0.14	1*	0.877*	–0.071	0.226
	(0.000)	(0.083)	(0.168)	(0.000)	(0.000)	(0.313)	(0.060)
SC	0.946*	–0.173	0.194	0.877*	1*	–0.181	0.098
	(0.000)	(0.117)	(0.092)	(0.000)	(0.000)	(0.107)	(0.252)
GDP	–0.124	0.29*	–0.591*	–0.071	–0.181	1*	0.681*
	(0.197)	(0.023)	(0.000)	(0.313)	(0.107)	(0.000)	(0.000)
GDP per capita	0.114	0.32*	–0.656*	0.226	0.098	0.681*	1*
	(0.218)	(0.014)	(0.000)	(0.060)	(0.252)	(0.000)	(0.000)

Notes: Table 3 shows the Spearman correlation coefficients between each of the rankings of the sovereign funds with respect to their performance on the five sustainability measures and with respect to the economic indicators (GDP and GDP per capita). The p-values for the Z-scores are also reported below the coefficient estimates (in parenthesis) and allow us to test the null hypothesis that the coefficient is equal to zero.
GSCI stands for Global Sustainable Competitiveness Index; NC stands for Natural Capital; RI stands for Resource Intensity; SI&C stands for Sustainable Innovation & Competitiveness; SC stands for Social Cohesion; * indicates significance at the 5% level. GDP per capita data are based on purchasing-power-parity (PPP).

would expect a higher correlation between the rankings on the NC and the GSCI than that between those on the SC and the GSCI; however the reason could be found in the different scores registered by the countries invested in by our funds, on each of the sub-indexes. The rankings of the other components of the GSCI have negligible correlations with the ranking on the composite measure.

We also found a high degree of association between the fund rankings on the SI&C and the SC sub-indices (0.877), which is not striking, taking into account the high correlation between both indices with the composite.

In relation to GDP and GDP per capita, a relatively high but negative correlation is observed between the rankings on both economic measures and the RI sub-index, which is not surprising taking into account that some world economic powerhouses score below the average mark on the RI sub-index.

Furthermore, although the Spearman coefficients are not as high as those mentioned in the three preceding paragraphs, we can also reject the null hypothesis of no association between the rankings on the NC and the RI sub-indexes, on the NC and the GDP, on the NC and the GDP per capita, and, obviously, on the GDP and the GDP per capita. The first is negative, indicating that the greater the availability of natural resources in a country, the lower the efficient use of those resources. The second and third coefficients are positive, indicating that the more natural resources in a country, the richer it is. The fourth coefficient is obviously positive.

Table 4 reports the 1-year returns for the quintile portfolios, formed on the basis of the ranked sustainable performance scores. In panel A, equal-weighted portfolio returns are shown, while panel B reports GDP per capita-weighted portfolio returns.

We observe that the differences between the equal-weighted portfolio returns and the GDP per capita-weighted ones are negligible.

Whichever sustainability measure is used, the financial dominance of the worst performing funds on social grounds is evident, except for the SI&C sub-index, where the best performing funds register the highest returns, although they are quite similar to those on the worst performing funds. This result is in line with that found by Brammer *et al*. (2006) for stock portfolios, but contrary to the finding of Derwall *et al*. (2005).

We also observe, in general terms, a modest and almost monotonic decline in returns as the sustainability score increases from quintiles 1 to 4. However, funds in quintile 5 register a similar average return to those in quintile 1, except for the RI sub-index where the highest returns are registered for funds in the second quintile, while funds in quintile 5 present the lowest returns.

Table 5 reports the results of the best-in-class strategy.

We observe that the portfolios with the highest 1-year returns are those including funds that invest in high GDP per capita countries, and those comprising funds that invest in medium GDP per capita countries, and ranked lowest with respect to sustainable performance. Another surprising result is that related to the difference portfolio (the worst-in-class portfolio returns subtracted from the best-in-class returns); thus, this

Table 4. 1-year returns for portfolios based on quintiles of sustainability scores (%)

Panel A: 1-YEAR RETURN (Equally weighted)					
	GSCI	NC	RI	SI&C	SC
Quintile 1 (low score)	7.48	9.27	7.39	6.43	7.19
Quintile 2	6.86	3.43	8.35	6.37	6.53
Quintile 3	2.98	2.48	5.94	2.66	2.98
Quintile 4	2.74	3.33	3.05	2.88	3.01
Quintile 5 (high score)	6.3	6.77	2.31	7.57	6.53
Panel B: 1-YEAR RETURN (GDP per capita-weighted)					
	GSCI	NC	RI	SI&C	SC
Quintile 1 (low score)	7.54	9.33	7.44	6.72	7.32
Quintile 2	7	3.17	8.37	6.46	6.68
Quintile 3	2.98	2.49	6.08	2.65	3.07
Quintile 4	2.85	3.39	3.04	2.88	3.01
Quintile 5 (high score)	6.37	6.95	2.29	7.58	6.59

Notes: Table 4 presents the 1-year returns for quintile portfolios formed on the basis of the ranked sustainable performance scores. Quintile 1 contains the 20% of funds with the lowest scores, and so on, while quintile 5 contains the highest scoring funds under each measure. In panel A, the equally-weighted portfolio returns are reported, and in panel B, the GDP per capita-weighted portfolio returns are shown.
GSCI stands for Global Sustainable Competitiveness Index; NC stands for Natural Capital; RI stands for Resource Intensity; SI&C stands for Sustainable Innovation & Competitiveness; SC stands for Social Cohesion. GDP per capita data are based on purchasing-power-parity (PPP).

difference is economically large for the medium GDP per capita group, where the worst-in-class portfolio return is about 800 basis points higher than that of the best-in-class portfolio. In the case of the high GDP per capita group, this difference is about 200 basis points, but with the opposite sign (the best-in-class portfolio return is higher, except for the NC measure). In relation to the low GDP per capita group, the difference is only around 100 basis points, and it is positive, except for the NC and the RI sub-indices.

The highest differential return for the medium GDP per capita group cannot be explained for the different sustainability scores among funds included in each of the three GDP per capita groups, since there are no significant differences.

Additionally, the differences between the equal-weighted portfolio returns and the GDP per capita weighted ones are negligible, except for the low GDP per capita group where the differential return is notably higher for the GDP per capita weighted portfolios.

In short, the difference in returns between the best-in-class portfolio and the worst-in-class is notable for funds investing in medium GDP per capita countries; here the

Table 5. 1-Year return for best-in-class and worst-in-class portfolios

Low GDP per capita					
Panel A: 1-YEAR RETURN (Equally weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	3.34	2.66	2.42	3.34	3.34
Worst-in-Class Portfolio	3.14	3.34	3.86	2.92	2.92
Difference	***0.2***	***–0.68***	***–1.44***	***0.42***	***0.42***
Panel B: 1-YEAR RETURN (GDP per capita-weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	3.34	2.71	2.42	3.34	3.34
Worst-in-Class Portfolio	2.57	3.32	3.41	2.32	2.32
Difference	***0.77***	***–0.61***	***–0.99***	***1.02***	***1.02***
Medium GDP per capita					
Panel A: 1-YEAR RETURN (Equally weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	1.16	1.19	1.11	1.32	1.24
Worst-in-Class Portfolio	9.92	9.92	9.79	9.71	9.71
Difference	***–8.76***	***–8.73***	***–8.68***	***–8.39***	***–8.47***
Panel B: 1-YEAR RETURN (GDP per capita-weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	1.14	1.17	1.1	1.31	1.22
Worst-in-Class Portfolio	9.97	9.97	9.81	9.75	9.75
Difference	***–8.83***	***–8.8***	***–8.71***	***–8.44***	***–8.53***
High GDP per capita					
Panel A: 1-YEAR RETURN (Equally weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	9.32	7.42	8.46	9.32	9.32
Worst-in-Class Portfolio	7.42	9.32	7.42	7.42	7.42
Difference	***1.9***	***–1.9***	***1.04***	***1.9***	***1.9***
Panel B: 1-YEAR RETURN (GDP per capita-weighted) (%)					
	GSCI	NC	RI	SI&C	SC
Best-in-Class Portfolio	9.32	7.42	8.48	9.32	9.32
Worst-in-Class Portfolio	7.42	9.32	7.42	7.42	7.42
Difference	***1.9***	***–1.9***	***1.06***	***1.9***	***1.9***

Notes: Table 5 reports the 1-year returns for best-in-class and worst-in-class portfolios. The best-in-class (worst-in-class) portfolios comprise funds having the highest (lowest) sustainability score in each GDP per capita group (low, medium and high). The difference portfolio is computed as the best-in-class portfolio return, minus the worst-in-class portfolio return. In panel A, the equally-weighted portfolio returns are reported, and in panel B, the GDP per capita-weighted portfolio returns are shown.
GSCI stands for Global Sustainable Competitiveness Index; NC stands for Natural Capital; RI stands for Resource Intensity; SI&C stands for Sustainable Innovation & Competitiveness; SC stands for Social Cohesion. GDP per capita data are based on purchasing-power-parity (PPP).

investor can gain an 8% extra return by investing in funds with the worst sustainable performance scores. However, if the investor chooses funds investing in high GDP per capita countries, he/she will gain an extra return of around 2% if he/she chooses funds with the best sustainable performance scores, except for the NC measure. Finally, if the investor selects funds investing in low GDP per capita countries, he/she must invest in funds having the best social performance scores, provided that the sustainable performance measure is not the NC or the RI. The most profitable strategies would be, therefore, to select the funds investing in medium GDP per capita countries, with the worst sustainable performance scores, or to select the funds representing high GDP per capita countries, and ranked best with respect to sustainable performance.

Concluding remarks

Much academic interest has been shown in the performance of socially responsible equity mutual funds. However, to the best of our knowledge, little evidence exists in the investment literature regarding the performance of SRI fixed-income funds, and no evidence exists in relation to the sustainable competitiveness of portfolios representing countries. We attempt to bridge this gap by developing a method to assess the sustainable competitiveness of sovereign bond portfolios. Furthermore, this paper assesses the link between financial performance and the sustainable competitiveness of these portfolios, and the GDP per capita that each fund represents is the third related variable in our analysis.

The importance of the study is evident, taking into account that country sustainability is related to long-term competitiveness.

The average sustainable performance is higher for the funds than for the countries, regardless of the sostenibility measure. This suggests that the screening of the funds has been beneficial with respect to sustainable performance. However, we cannot draw a conclusion about the benefits of diversification on the sustainable competitiveness, since the investment in sovereign bonds of a unique country occasionally allows for the achievement of a high sustainable performance.

With regard to the correlation between the fund rankings on the sustainability indicators and those on GDP per capita, we observe no significant correlation between sustainable competitiveness and the wealth measured by GDP per capita. This implies that, just because a country is rich, it cannot necessarily be assumed to be more competitive in the long-term. However, we find a high association between the rankings on the SI&C and the SC sub-indexes – this could be a sign that a social welfare state is also a high-tech society – and also a high correlation between the rankings on the composite measure and both indicators, which is not surprising, considering that both indices are components of the composite. On the other hand, a negative correlation with the RI sub-index is found for both GDP and GDP per capita rankings, which could be an indication that the richest countries are less efficient in the use of resources, or, in other words, the richest countries could be considered spendthrift.

Finally, taking into account financial performance, the dominance of the worst performing funds on social grounds is evident in general terms. However, the best performing funds register a similar average 1-year return, suggesting that funds with medium social scores are the worst in financial terms. Furthermore, a best-in-class analysis reveals that, for the high GDP per capita fund group, the investment in the best social performing funds leads to the gain of an extra return of 200 basis points; for the medium GDP per capita group, the investment in the worst social performing funds leads to an extra 8% return; and for the low GDP per capita group, the investment in the best social performing funds leads an extra return of 1%.

In short, the most profitable strategies are to invest in the funds representing medium GDP per capita countries that obtain the worst sustainable performance scores, and also to invest in funds representing high GDP per capita countries that register the best scores with respect to sustainability.

At the very last, our evidence shows that funds obtaining medium sustainable scores register the poorest 1-year returns, and also supports the idea that, even though there is no strong relationship between sustainable competitiveness and the GDP per capita represented by the fund, this economic indicator matters when deciding the most profitable strategy. Thus, the best strategy in both economic and sustainable terms would be to invest in funds that represent high GDP per capita countries and that are best-in-class sustainable performers.

Further research may allow us to reach more relevant conclusions by overcoming our data limitations; as pointed out above, sustainability data is not currently available for a longer time period.

References

Barnett, M. L.; Salomon, R. M. 2006. Beyond dichotomy: the curvilinear relationship between social responsibility and financial performance, *Strategy Management Journal* 27: 1101–1122. http://dx.doi.org/10.1002/smj.557

Bauer, R.; Koedijk, K.; Otten, R. 2005. International evidence on ethical mutual fund performance and investment style, *Journal of Banking and Finance* 29: 1751–1767. http://dx.doi.org/10.1016/j.jbankfin.2004.06.035

Bilbao, A.; Arenas, M.; Cañal, V.; Antomil, J. 2014. Using TOPSIS for assessing the sustainability of government bond funds, *Omega* 49: 1–17.

Brammer, S.; Chris, B.; Pavelin, S. 2006. Corporate social performance and stock returns: UK evidence from disaggregate measures, *Financial Management* 35: 97–116. http://dx.doi.org/10.1111/j.1755-053X.2006.tb00149.x

Brundtland Commission. 1992. *Rio Declaration on Environment and Development*.

Chatterji, A.; Levine, D. I.; Toffel, M. W. 2007. How well do social ratings actually measure corporate social responsibility?, *Journal of Economics and Management Strategy* 18: 125–169. http://dx.doi.org/10.1111/j.1530-9134.2009.00210.x

Cox, P.; Brammer, S.; Millington, A. 2004. An empirical examination of institutional investor preferences for corporate social performance, *Journal of Business Ethics* 52: 27–43. http://dx.doi.org/10.1023/B:BUSI.0000033105.77051.9d

Derwall, J.; Guenster, N.; Bauer, R.; Koedijk, K. 2005. The eco-efficiency premium puzzle, *Financial Analysts Journal* 61: 51–63. http://dx.doi.org/10.2469/faj.v61.n2.2716

Derwall, J.; Koedijk, K. 2009. Socially responsible fixed-income funds, *Journal of Business Finance and Accounting* 36: 210–229. http://dx.doi.org/10.1111/j.1468-5957.2008.02119.x

Diltz, J. D. 1995. Does social screening affect portfolio performance?, *Journal of Investing* 4: 64–69. http://dx.doi.org/10.3905/joi.4.1.64

Drut, B. 2010a. Sovereign bonds and socially responsible investment, *Journal of Business Ethics* 92: 131–145. http://dx.doi.org/10.1007/s10551-010-0638-3

Drut, B. 2010b. Nice but cautious guys: the cost of responsible investing in the bond markets, *Working Paper* CEB 09-034. Université Libre de Bruxelles, Solvay Brussels School of Economics and Management, Centre Emile Bernheim.

Emerson, J. W.; Hsu, A.; Levy, M. A.; de Sherbinin, A.; Mara, V.; Esty, D. C.; Jaiteh, M. 2012. *2012 environmental performance index and pilot trend environmental performance index.* New Haven: Yale Center for Environmental Law and Policy.

Esty, D. C.; Levy, M.; Kim, C. H.; de Sherbinin, A.; Srebotjnak, T.; Mara, V. 2008. *2008 environmental performance index*. New Haven: Yale Center for Environmental Law and Policy.

European Commission. 2001. Promoting a European framework for corporate social responsibility, *Green Paper* 264, final. Brussels.

Fiala, N. 2008. Measuring sustainability: why the ecological footprint is bad economics and bad environmental science, *Ecological Economics* 67: 519–525.
http://dx.doi.org/10.1016/j.ecolecon.2008.07.023

Fischer, K.; Khoury, N. 2007. The impact of ethical ratings on Canadian security performance: portfolio management and corporate governance implications, *The Quarterly Review of Economics and Finance* 47: 40–54. http://dx.doi.org/10.1016/j.qref.2006.02.001

Hill, R. P.; Ainscough, T.; Shank, T.; Manullang, D. 2006. Corporate social responsibility and socially responsible investing: a global perspective, *Journal of Business Ethics* 70: 165–174. http://dx.doi.org/10.1007/s10551-006-9103-8

Kempf, A.; Osthoff, P. 2007. The effect of socially responsible investing on portfolio performance, *European Financial Management* 13: 908–922.
http://dx.doi.org/10.1111/j.1468-036X.2007.00402.x

Lee, D. D.; Humphrey, J. E.; Benson, K. L.; Ahn, J. Y. K. 2010. Socially responsible investment fund performance: the impact of screening intensity, *Accounting & Finance* 50: 351–370.
http://dx.doi.org/10.1111/j.1467-629X.2009.00336.x

Muñoz-Torres, M. J.; Fernandez-Izquierdo, M. A.; Balaguer-French, M. R. 2004. The social responsibility performance of ethical and solidarity funds: an approach to the case of Spain, *Business Ethics: a European Review* 13: 200–218. http://dx.doi.org/10.1111/j.1467-8608.2004.00363.x

Nofsinger, J.; Varma, A. 2013. Socially responsible funds and market crises, *Journal of Banking & Finance.* http://dx.doi.org/10.1016/j.jbankfin.2013.12.016

Pillarisetti, J. R.; Van den Bergh, J. C. J. M. 2010. Sustainable nations: what do aggregate indicators tell us?, *Environment Development and Sustainability* 12: 49–62.

http://dx.doi.org/10.1007/s10668-008-9179-7

Renneboog, L.; Ter Horst, J.; Zhang, C. 2008a. Socially responsible investments: institutional aspects, performance, and investor behavior, *Journal of Banking and Finance* 32: 1723–1742. http://dx.doi.org/10.1016/j.jbankfin.2007.12.039

Renneboog, L.; Ter Horst, J.; Zhang, C. 2008b. The price of ethics and stakeholder governance: the performance of socially responsible mutual funds, *Journal of Corporate Finance* 14: 302–322. http://dx.doi.org/10.1016/j.jcorpfin.2008.03.009

Scholtens, B. 2006. Finance as a driver of corporate social responsibility, *Journal of Business Ethics* 68: 19–33. http://dx.doi.org/10.1007/s10551-006-9037-1

Scholtens, B. 2007. Financial and social performance of socially responsible investments in the Netherlands, *Corporate Governance: an International Review* 15: 1090–1105. http://dx.doi.org/10.1111/j.1467-8683.2007.00633.x

Scholtens, B. 2010. The environmental performance of Dutch government bond funds, *Journal of Business Ethics* 92: 117–130. http://dx.doi.org/10.1007/s10551-010-0637-4

SolAbility Publications. 2012. *The Global Sustainability Competitiveness Index*.

Fernando MUÑOZ. Professor of Business Administration at "Centro Universitario de la Defensa", in Zaragoza, Spain. He received his PhD in Business Management from the University of Zaragoza. His research interests include the assessment and measurement of mutual funds financial performance, the analysis of socially responsible investments or the study of managerial abilities of mutual funds managers, among others.

Maria VARGAS. Professor of Finance Department at University of Zaragoza, Spain. She received the PhD in finance from the University of Zaragoza. She has supervised three PhD's. Her research interests include the assessment and measurement of mutual funds financial performance, the analysis of socially responsible investments or the study of managerial abilities of mutual funds managers, among others.

Ruth VICENTE is a PhD student in Department of Finance at University of Zaragoza. Her research interests include the assessment and measurement of mutual funds financial performance, the analysis of socially responsible investments or the study of managerial abilities of mutual funds managers, among others.