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Financial Performance of Socially Responsible Indices

Abstract

This article analyzes rate-of-return and risk related to investments in socially responsible and conventional country indices. The socially responsible indices are the DJSI Korea, DJSI US and Respect Index, and the corresponding conventional country indices are the Korea Stock Exchange Composite KOSPI, Dow Jones Industrial Average and WIG20TR. We conclude that investing in the analyzed SRI indices do not yield systematically better results than investing in the respective conventional indices, both in terms of neoclassical risk and return rate.

This finding suggest that socially responsible investing should be assessed in terms of behavioral economics related to the psycho-social features of investors, rather than to simplified rational choices (based only on the risk and return rate analysis) that neoclassical economics assumes.

Keywords: socially responsible investments (SRI), socially responsible indices, investment performance
JEL: G02, G11

Introduction

Many companies have introduced Corporate Social Responsibility (CSR) policies to address the challenges related to social responsibility. At the same time, many investors, when making investment decisions, consider nonfinancial factors regarding social, environmental, corporate governance or ethical factors. According to Utz and Wimmer [2014], when socially responsible investment (SRI) emerged in the 1960 s, it was considered a small niche market for philanthropists and do-gooders. SRI has, however, evolved into an important and influential investment class with $ 6.57 trillion assets under management in the United States and $ 21.4 trillion worldwide as of the beginning of 2014.[3] Since SRI began, various academics who have analyzed and monitored the financial performance of it have come to different conclusions.

In this article we analyze selected SRI indices[4] in terms of risk and rate-of-return and compare the obtained results with those from respective conventional country indices. The hypothesis is that investing in socially responsible stocks (indices) can be characterized by better risk-return parameters than in case of respective conventional indices in specific periods of time. However, we cannot conclude that this is a rule – though whether, and under which specific circumstances (if any) SRI indices deliver better results relative to their respective investment indices is a more particularized inquiry that is outside the scope of this article.

Literature Review on Socially Responsible Funds and Indices

Research on the relative performance of SRI has been developing since SRI's introduction. That research rests on portfolio investment theories (Markowitz portfolio theory, Capital Asset Pricing Model). Although SRI indices are often a subset of broader conventional indices, a comparison of their performance can be justified.

First, even though neoclassical theory states that SRI should outperform a market portfolio due to additional investment criterion, the Markowitz mean-variance optimized market portfolio is not the same as a market index. Market indices like the DJIA index usually contain the largest and most influential companies on a given market and are not built on optimization criteria. Similarly, because the CAPM model market portfolio represents a theoretical bundle of many kinds of investments (weighted in proportion to its total value) that is often estimated by the main market index, one cannot say this index represents an optimal portfolio, which is situated on the efficient frontier. Selection criteria for optimal portfolios are based on the optimal behavior of investors, and not on the criteria formed by stock exchange authorities.

Second, investors use practical experience when choosing investments, they are guided by potential rates of return and risk (and other non-financial reasons), and "vote with their feet" by investing in funds that could generate higher profits. They do not reject funds that are indices subsets but analyze them separately when allocating their capital. That is why, for instance, it is a normal practice to invest in the technology index, which is part of a broader market index.

Academic studies generally show three alternatives related to a performance comparison of ethically responsible indices versus conventional stocks. First, the performance of conventional investments and SRIs are not statistically different. Garz, Volk and Gilles [2002] when analyzing socially responsible investment in different industry sectors and countries consider arithmetical risk and return rates. They conclude that these measures are not very different from those for traditional investments. Goldreyer and Diltz [1999] show, based on a sample of 49 ethical funds in the USA, that there is no under/over performance of ethical funds in comparison to traditional funds. Dupré and Girerd-Potin [2003] reached a similar conclusion regarding the performance of ethical and traditional investments. Their research was based on data from 50 American funds from 1997 to 2002. Clark, Deshmukh and Belghitar [2013] compared the performance of socially responsible UK funds with traditional funds, matching the analyzed funds by age, size, investment universe and fund management company. They state that the effectiveness of conventional investment and SRI do not differ significantly.

Other researchers have concluded that the expected performance of SRI can be lower from that of traditional investments. Entine [2003] found that SRI does not generally produce superior financial or stock performance, and also criticized the criteria utilized to include funds in socially responsible indices. According to Lee, Humphrey, Benson and Ahn [2010] increased screening decreases total fund risk but influences fund performance, depressing the adjusted return of funds. Fernández-Sánchez and Luna-Sotorrío [2014] evaluated the financial performance of European socially responsible funds for the period 1993–2012. They compared 184 SRI equity funds to conventional funds from 14 European countries, and concluded that applying social criteria to investment decisions is an investor cost that lowers financial effectiveness. The same results were obtained by Kiymaz [2012], Clark, Deshmukh and Belghitar [2014] and Wallis and Klein [2014] who confirmed that there is a cost associated with SRI, and that socially responsible investors tend to accept lower performance in favor of moral profit in their investment choices.

Finally, some research has suggested that risk adjusted performance is improved for SRI funds over traditional investments. Earle [2000] provides evidence for the positive relationship between environmental and financial performance, and concludes that companies which develop environmental behavior generate greater shareholder returns. Konar and Cohen [2001] support this finding with their research, which indicates that sustainability and financial performance are positively correlated. Moreover, Weber, Mansfeld and Schirrmann's [2009] conclusions regarding SRI performance in bearish and bullish

market phases (2002–2009) highlight the overperformance of SRIs independent from market situations, based on a comparison of 151 SRI funds with the MSCI conventional index. According to their analysis, the coefficient of variation was higher for SRI funds in bull markets, and lower in bear markets. That means investment in SRIs during bearish periods might have resulted in better financial returns than that of the MSCI world index. Nofsinger and Varma [2014] also observed significant performance patterns in socially responsible funds, which they found outperformed conventional ones in moments of crisis and underperformed them in moments of non-crisis.

Only a few academic papers analyze the behavior of the Polish SRI index (RESPECT Index) versus its non-SRI counterpart. Lulewicz-Sas [2014] presented the Polish SRI market in its initial phase, but was unable to draw clear conclusions about SRI effectiveness, due to differing investment time horizon, the prevailing market atmosphere during the analyzed period, and the variety of sectors considered (which may have affected the author's results). However, a comparative analysis of the Respect Index and WIG20 showed that during previous five years the Respect Index outperformed the WIG20 index (although one must remember that the Respect Index is total return index, whereas the WIG20 is a price index; thus, the returns of these indices are not fully comparable[5]). Janik and Bartkowiak [2015] analyzed all three socially responsible indices existing currently in the CEE countries: the RESPECT, CEERIUS and VONIX indices[6] by calculating different measures related to risk-return. In the period 2010–2013 the RESPECT Index outperformed WIG20TR index in terms of daily and weekly returns (with similar standard deviations). During the same period, the CEERIUS and the VONIX underperformed other indices used as benchmarks (ATX, ATX prime, ATX five, WBI, CECExt and NTX), However, the standard deviation of the CEERIUS index was slightly lower compared to conventional benchmarks.

Selected SRI Country Indices vs. Their Non-SRI Conventional Counterparts Chosen for Analyses

In this article we focus on three sustainable indices – namely, DJSI Korea, DJSI US and Respect Index – and compare them with the conventional the Korea Stock Exchange Composite KOSPI, Dow Jones Industrial Average and WIG20TR indices, respectively. These sustainable indices were chosen because they are associated with countries, not regions. Therefore, we can easily compare them with other appropriate conventional country indices. In the case of US and Polish indices we use their total return (TR) versions. Because the South Korean KOSPI is a price return index, we use the DJSI Korea PR as its counterpart (Korean TR indices were only introduced to Korean exchange in 2016). Below we present a brief characteristics of analyzed indices. Figures [1–3] show indices quotes and tables [1–3] their top-ten components.

The Dow Jones Sustainability™ Indices and the Regional Counterparts

The Dow Jones Sustainability™ Indices (DJSI) are a group of indices that follow a best-in-class approach. Companies trading on the Dow Jones Global Total Stock Market Index are evaluated comprehensively based on economic, social and environmental criteria including their focus on long-term shareholder value. This allows industry leaders in sustainability to be selected, and those indices became the global benchmark for sustainability. The whole family of Dow Jones sustainable indices is comprised of global and regional broad or blue-chip market indices that exclude alcohol, gambling, tobacco, armaments and firearms and/or adult entertainment. Both price and total-return versions of all DJSI indices are available and disseminated daily[7].

DJSI Korea vs. KOSPI

DJSI Korea includes currently 52 components and is weighted by free-float market capitalization. The selection process is as follows. First, the 200 largest Korean companies of the S&P Global Broad Market Index are considered. Second, the top 30% of those companies are selected based on their sustainability in each industry. Third, a 45% target buffer selection is performed in each Industry[8]. DJSI Korea represents the top 30% of the biggest 200 companies from South Korea in the S&P Global BMI, based on long-term economic, environmental and social criteria. The index was calculated for the first time on October 20, 2009. Its base value was 1000 as of 30th of December 2005. Full and float-adjusted market capitalization of its components was 503.3 and 352 billion USD (or 596,572.7 and 417,208.3 billion KRW) respectively as of September 30, 2015[9].

The Korea Composite Stock Price Index (KOSPI) is a capitalization-weighted index of all common stocks on the Korean Stock Exchanges. However, it has excluded preferred stocks since June 14, 2002[10]. KOSPI is a price index. It was introduced in 1983 with a base value of 100 as of January 4, 1980. We have chosen this index because it is representative of the stock market index for the Republic of South Korea. There were 756 companies included in this index with a total capitalization of some 1,004 billion USD (1,190,000 billion KRW) as of September 30, 2015[11].

DJSI US vs. DJIA

DJSI US currently includes 125 components and is weighted by free-float market capitalization. This index is basically a sub-index of the DJSI North America that currently excludes 20 companies from Canada. The selection process has four stages. First, the 600 largest North American companies of the S&P Global Broad Market Index (58 RobecoSAM Industries and two Countries) are selected. Second, the top 20% companies in each industry are chosen based on their sustainability. Third, a 30% target buffer selection is performed in each Industry. Finally, 145 components were selected in 51 RobecoSAM Industries and two Countries Review 2015; 14 companies were added and 19 were deleted[12]. Thus, the DJSI US represents the top 20% of the largest 600 companies from the USA in the Dow Jones Sustainability North America Index, based on long-term economic, environmental and social criteria. It was calculated for the first time on September 23, 2005. Its base value was 100 as of December 31, 1998. Full and float-adjusted market capitalization of its components was 5,500 and 5,342.3 billion USD respectively as of September 30, 2015[13].

TABLE 1. Top ten components of DJSI Korea and KOSPI indices by market capitalization as of September 30, 2015

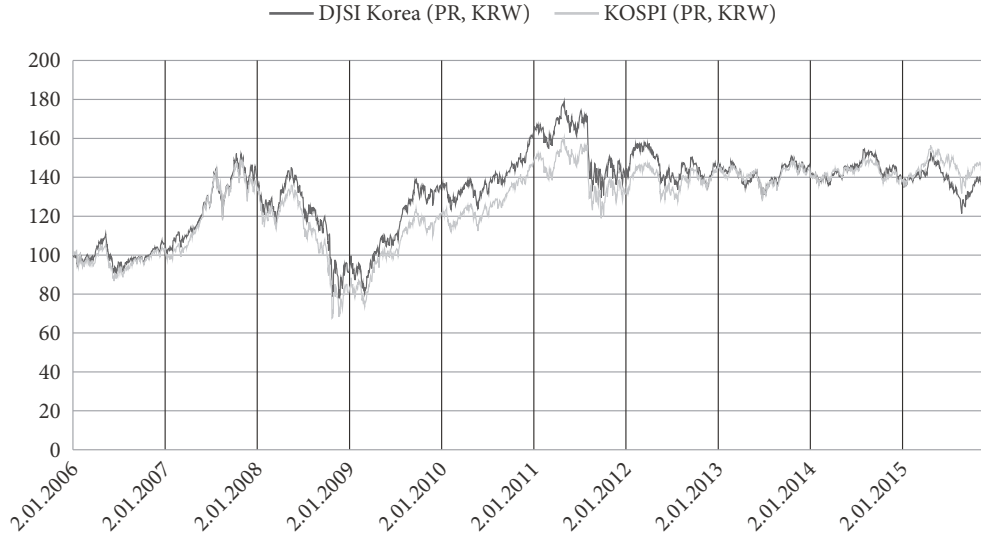
DJSI KOREA			KOSPI		
Industry	Company	Weight	Industry	Company	Weight
MTBA	Samsung Electronics Co.	9.61%	MTBA	Samsung Electronics Co.	4.01%
OFI	Shinhan Financial Group	6.29%	MMVEMV	Hyundai Motor Co.	3.03%
MS	SK Hynix Inc.	6.27%	PCDE	Korea Elec Power Corporation (KEPCO)	3.64%
MMVEMV	Hyundai Motor Co.	5.06%	OSW	Samsung C&T	2.33%
MTP	KT&G Corp.	4.91%	MS	SK Hynix Inc.	2.05%
MMVEMV	Kia Motors Corp.	4.60%	MMVEMV	Hyundai Mobis	1.89%
OFI	KB Financial Group Inc.	4.37%	MOCP	Amorepacific	1.89%
MBIS	POSCO	4.33%	CPSIMS	Samsung SDS	1.87%
PCDE	Korea Elec Power Corporation (KEPCO)	4.03%	Transport Equipment	Kia Motors Corp.	1.82%
MBC	LG Chem Ltd.	4.00%	Telecommunications	SKTelecom	1.78%

Notes: MTBA – Manufacture of Telecommunication and Broadcasting Apparatuses, OFI – Other Financial Intermediation, MS – Manufacture of Semiconductor, MMVEMV–Manufacture of Motor Vehicles and Engines for Motor Vehicles, MOCP – Manufacture of Other Chemical Products, PCDE – Production, Collection and Distribution of Electricity, OSW – Other Specialized Wholesale, MTP – Manufacture of Tobacco Products, MBIS – Manufacture of Basic Iron and Steel, MBC–Manufacture of Basic Chemicals, CPSIMS – Computer programming, System Integration and Management Services.

Source: own elaboration.

The Dow Jones Industrial Average™ is one of the oldest stock exchange indices in the world. When first calculated in 1896, it had only 12 components. Currently it is a price-weighted index of 30 blue-chip USA based companies. Stock selection is not ruled by quantitative principles. A stock is usually added only if the company has an excellent reputation, shows sustained growth and is of interest to a large group of investors. Maintaining adequate sector representation is also considered in the selection process, which excludes transportation and utilities companies. Full and float-adjusted market capitalization of its components was 4,950.8 and 4,774.4 billion USD respectively as of September 30, 2015[14]. The DJITR is the total return version of the index.

FIGURE 1. Relative growth of DJSI Korea and KOSPI from 2.01.2006 to 31.12.2015



Source: own elaboration.

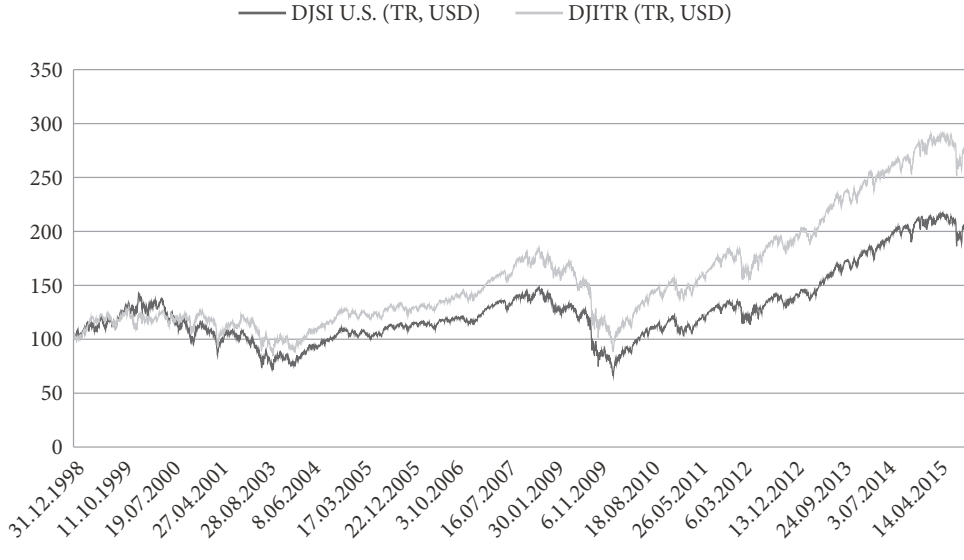
TABLE 2. Top ten DJSI US and DJIA indices components by market capitalization as of September 30, 2015

DJSI US			DJIA		
Industry	Company	Weight	Sector	Company	Weight
Technology	Microsoft Corp.	6.63%	Financials	Goldman Sachs Group Inc.	7.13%
Oil & Gas	Exxon Mobil Corp.	5.80%	Technology	Intl Business Machines Corp.	5.95%
Health Care	Johnson & Johnson	4.84%	Industrials	3M Co.	5.82%

DJSI US			DJIA		
Industry	Company	Weight	Sector	Company	Weight
Consumer Goods	Procter & Gamble	3.65%	Industrials	Boeing Co.	5.37%
Financials	Bank of America Corp.	3.05%	Consumer Goods	NIKE Inc. B	5.05%
Consumer Services	Walt Disney Co.	2.97%	Health Care	Unitedhealth Group Inc.	4.76%
Financials	Citigroup Inc.	2.80%	Consumer Services	Home Depot Inc.	4.74%
Oil & Gas	Chevron Corp.	2.78%	Technology	Apple Inc.	4.53%
Technology	Intel Corp.	2.68%	Consumer Services	Walt Disney Co.	4.19%
Technology	Cisco Systems Inc.	2.50%	Financials	Travelers Cos Inc.	4.08%

Source: own elaboration.

FIGURE 2. Relative growth of DJSI U.S. and DJITR from 31.12.1998 to 31.12.2015



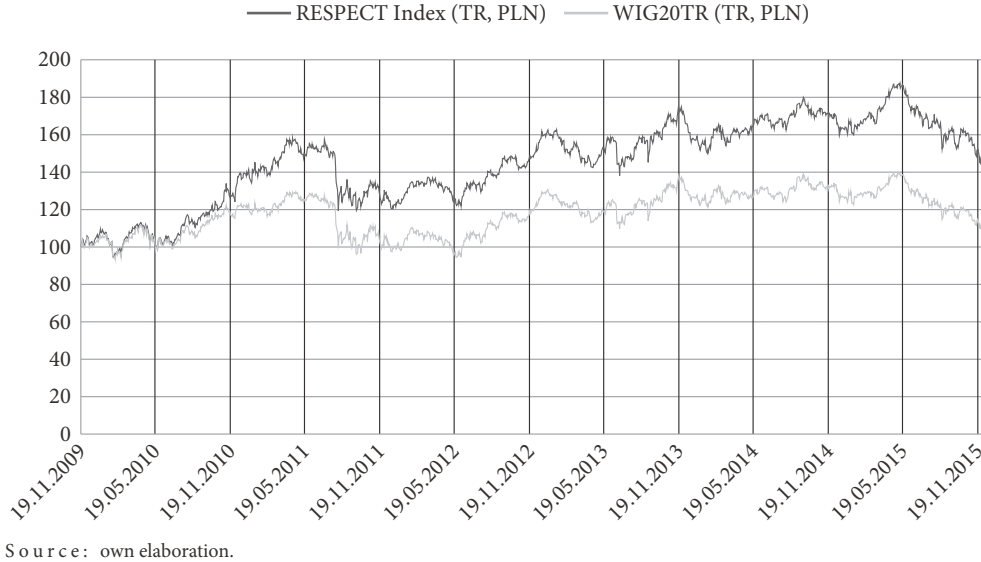
Source: own elaboration.

TABLE 3. Top ten RESPECT and WIG20TR indices components by market capitalization as of September 30, 2015

RESPECT Index			WIG20 TR		
Sector	Company	Weight	Sector	Company	Weight
Basic materials	KGHM	12.10%	Financial	PKOBP	14.50%
Financial	BZWBK	10.20%	Financial	PZU	12.12%
Oil and gas	PGNIG	10.13%	Oil and gas	PKNORLEN	10.85%
Financial	PZU	9.26%	Financial	PEKAO	10.83%
Utilities	PGE	9.12%	Basic materials	KGHM	7.04%
Oil and gas	PKNORLEN	8.73%	Oil and gas	PGNIG	6.08%
Telecommunications	ORANGEPL	5.18%	Utilities	PGE	6.01%
Financial	INGBSK	4.42%	Retail	LPP	5.19%
Financial	MILLENNIUM	4.10%	Financial	BZWBK	5.17%
Basic materials	GRUPAAZOTY	3.95%	Media	CYFRPLSAT	2.84%

Source: own elaboration.

FIGURE 3. Relative growth of RESPECT Index and WIG20TR from 19.11.2009 to 31.12.2015



Source: own elaboration.

RESPECT Index vs. WIG20TR

The name of Poland's socially responsible RESPECT Index stands for Responsibility, Ecology, Sustainability, Participation, Environment, Community and Transparency. The first calculation of this index on the WSE (Warsaw Stock Exchange) was performed on November 19, 2009, and included 16 companies (now 24). The main objective of the RESPECT Index is to provide investors with a synthetic, reliable tool based on international GRI (the Global Reporting Initiative) guidelines [Janik, Bartkowiak, 2015]. In other words, the goal of this project is to identify companies that traded on the WSE that are managed in sustainable and responsible way. A strong emphasis is also put on the investment attractiveness of companies, which is characterized by, among other indicia, by reporting quality, level of investor relations and information governance[15]. Its base value was 1000 as of December 31, 2008. Market capitalization of its components was 93.8 billion PLN (25.2 billion USD at the average exchange rate published by the National Bank of Poland) as of October 9, 2015[16]. The RESPECT Index, as a total return index considers dividend income and preemptive rights.

The WIG20TR is a capitalization-weighted stock market index composed of the 20 largest companies traded on the Warsaw Stock Exchange. It is a total return version of the WIG20 index that includes the same companies as price-weighted WIG20 index. No more than five companies from any one sector of the stock exchange may participate in WIG20 index; this rule also applies for the WIG20TR. The WIG20TR was first calculated on December 3,2012. Its base value was 1,960.57 points as of December 31, 2004. Market capitalization of its components was 185.2 billion PLN (49.7 billion USD at the average exchange rate published by the National Bank of Poland) as of October 9, 2015[17].

Methodology

Portfolio and asset pricing theories widely applied by sophisticated investors and broadly accepted in modern finance schools demonstrate that research on the financial performance of SRI indices versus conventional indices is worth focusing on.

In our multi-step analysis of rate of returns and risk, we used average daily price changes from the reference point of index base value calculation (December 30, 2005 for the DJSI Korea PR/KOSPI, December 31, 1998 for the DJSI US TR/DJITR and December 31, 2008 for the RESPECT Index/WIG20TR, respectively) to December 31, 2015. We used the Dow Jones Sustainability website and Stooq.pl as source of data for these indices. The data series for the Korean and Polish indices were reduced by about 3%, when needed to tailor them to global market index series which included less data used for calculation of beta, Treynor and MM ratios, Jensen's alpha, and regression analysis.

Our first step was to examine average daily price changes for each year for each index separately. Then, for the same annual periods, we calculated standard deviations (SD) of daily changes in the analyzed indices. Simple risk and return measures, such as SD and mean, are often used as an introduction to more advanced analysis. They were applied to the evaluation of SRI performance by, for example by Le Maux and Le Saout [2004], Lee, Humphrey, Benson and Ahn [2010], and Barwick-Barrett [2015]. Additionally, we calculated the coefficients of variation (also known as relative standard deviation, RSD), applied in such analysis by, for example, Abdullah, Hassan and Mohamad [2007].

$$RSD = \frac{SD}{|\bar{x}|}$$

where:
SD – standard deviation,
$|\bar{x}|$ – absolute value of the mean.

The second step was to calculate auxiliary ratios: beta, Sharpe ratio (Sharpe), Treynor ratio (Treynor), Jensen ratio (alpha) and Modigliani-Modigliani ratio (MM), and to examine average daily price changes for each individual year of the global market used as a market benchmark for all indices. Daily global market rates of return and risk free rates for the USA were taken from Kenneth R. French – Data Library, and daily risk free rates for Poland and South Korea from Investing.com. Despite the fact that K. French, provided only an approximation of global market performance, it allows us to better compare all chosen indices in our analysis. We took South Korea and Poland 1-year Bond yields as representative measures of risk free rates for these countries. In SRI performance analysis, Sharpe and Treynor ratios, and Jensen's alpha are standard measures widely applied in the literature by, for example, Mueller [1991], Le Maux and Le Saout [2004], Abdullah, Hassan and Mohamad [2007] and Barwick-Barrett [2015]. Modigliani-Modigliani's [1997] ratio was used in this context by Burlacu, Girerd-Potin and Dupré [2004], Abdullah, Hassan and Mohamad [2007] and Lee, Humphrey, Benson and Ahn [2010]. The formulas for these ratios are presented below:

$$\beta = \frac{Cov(Ri, Rm)}{Var(Rm)}$$

where:
β – beta coefficient,
$Cov(Ri, Rm)$ – covariance of series of index and market rates of returns,
$Var(Rm)$ – variance of market rates of returns.

$$Sh = \frac{R_i - R_f}{SD_i}$$

where:
Sh – Sharpe ratio,
R_i – mean daily index rate of return for given period,
R_f – mean daily risk free rate for given period,
SD_i – standard deviation of daily index rates of returns for given period.

$$Tr = \frac{\left(R_i - R_f\right)}{\beta_i}$$

where:
Tr – Treynor ratio,
β_i – index beta against global market.

$$\alpha_i = \left(R_i - R_f\right) - \beta_i\left(R_m - R_f\right)$$

where:
α_i – Jensen's alpha,
R_m – mean daily market rate of return for a given period.

$$MM = R_f + \frac{R_i - R_f}{SD_i} SD_m - R_m$$

where:
MM – Modigliani-Modigliani's ratio,
SD_m – standard deviation of daily market rates of return for a given period.

The last step included statistical tests and an extended regression analysis. The *f–test* was used to compare variance of sustainable index rates of return to conventional index rates of return and their means. We performed regressions for the three SR indices and their respective conventional benchmarks, using the Analysis ToolPak, an Excel add-in program. The objective was to confirm earlier calculations of beta and Jensen's alpha, and to check their statistical relevance. Standard errors were also obtained. Finally, the evaluation of adjusted R^2 was used to assess the model-data fit. Similar statistical tests are widely used in the analysis of SRI, inter alia by Le Maux and Le Saout [2004], Abdullah, Hassan and Mohamad [2007] and Barwick-Barrett [2015].

Some scholars use more advanced neoclassical models in SRI performance analysis, such as Fama-French [1993] and its extensions (for example Carhart [1997], Jin-Mitchell-Piggot [2006], Amenc-Le Sourd [2010] or Giroud-Mueller [2011]). Because of limited data for many countries, they focused mostly on the USA, Canada, Australia, Japan and Western European countries. Since we included Poland and South Korea in our analysis we decided to analyze the performance of our chosen indices with an extended methodological toolset omitting, however, multifactor asset pricing models.

The Results of the Comparative Study on the Financial Performance of SR Indices

The summary of the results is presented in this section. Detailed results are included in the appendix. In the Table 4, we present daily means, standard deviations and relative standard deviations for the analyzed indices.

TABLE 4. Daily means, standard deviations and relative standard deviations of SRI vs. usual indices

INDEX (TYPE, CURRENCY)	DAILY RATE OF RETURN (MEAN)	SD OF DAILY RATES OF RETURN	RSD
DJSI U.S. (TR, USD)	0.025% (0.0548%*)	1.26% (1.08%*)	50.20 (19.66*)
DJITR (TR, USD)	0.031% (0.0550%*)	1.18% (1.04%*)	37.76 (18.86*)
DJSI Korea (PR, KRW)	0.021% (0.029%*)	1.39% (1.19%*)	64.93 (40.75*)
KOSPI (PR, KRW)	0.023% (0.038%*)	1.35% (1.11%*)	58.53 (29.14*)
RESPECT index (TR, PLN)	0.028%	1.17%	40.99
WIG20TR (TR, PLN)	0.010%	1.19%	114.19

* for the limited period from 2009 to 2015

Source: own elaboration.

This simple risk and return analysis provides mixed results. Both the DJSI U.S. and DJSI Korea show slightly lower performance than their conventional counterparts for the examined period. The RESPECT Index instead demonstrates better performance for that period.

In Table 5, we present auxiliary ratios: beta, Sharpe, Treynor, Jensen (alpha) and Modigliani-Modigliani for the analyzed indices.

TABLE 5. Betas, Sharpe Treynor ratios, Jensen's alphas and MM ratios of SRI vs. usual indices

INDEX (TYPE, CURRENCY)	BETA	SHARPE	TREYNOR	JENSEN'S ALPHA	MM
DJSI U.S. (TR, USD)	1.07	0.014	0.00017	–0.0009%	–0.003%
DJITR (TR, USD)	0.98	0.020	0.00024	0.0065%	0.003%
DJSI Korea (PR, KRW)	0.51	0.009	0.00024	0.0034%	–0.01%
KOSPI (PR, KRW)	0.52	0.010	0.00027	0.0050%	–0.01%
RESPECT index (TR, PLN)	0.75	0.017	0.00027	0.0003%	–0.01%
WIG20TR (TR, PLN)	0.80	0.002	–0.00019	–0.0191%	–0.02%

Source: own elaboration.

Sharpe, Treynor and Jensen's alpha confirm the relative underperformance of the DJSI U.S. and DJSI Korea, and relative stronger performance of the RESPECT index versus their conventional benchmarks. The DJSI US also shows higher risk than the DJITR in relation to the approximated global market, the DJSI Korea demonstrates a slightly lower risk than the KOSPI and the RESPECT Index exhibits a somewhat lower risk than the WIG20TR. MM ratios show relative performance to the approximated global market that we used as market portfolio benchmark. The DJSI U.S. also underperforms the DJITR. Korean indices show the same performance. The RESPECT Index slightly overperforms WIG20TR Detailed data are presented in Appendix (Tables 8–13).

We present detailed yearly evaluations of the above measures in the appendix. The performance of indices changes from one year to another. For instance, the DJSI US TR achieved the largest daily mean in 1999 (0.117%) and the lowest in 2008 (–0.153%). Its beta fell from 1.44 in 2009 to 0.7 in 2006. The DJITR achieved the largest daily mean in 2013 (0.105%) and the lowest in 2008 (–0.124%). Its beta fluctuated between 0.69 and 1.21 for the period. The DJSI Korea performed best in terms of daily mean in 2009 (0.170%) and the worst in 2008 (–0.150%). Its beta fluctuated between 0.2 and 0.87. In turn, the KOSPI delivered the largest daily mean in 2009 (0.171%) and the lowest in 2008 (–0.181%). Its beta ranged from 0.25 to 0.83. Finally, the RESPECT Index achieved the highest daily mean in 2009 (0.177%) and the lowest in 2015 (–0.059%). Its beta fell from 0.95 in 2009 to 0.65 in 2013 and then grew to 0.78 in 2015. The WIG20TR showed the largest daily mean in 2012 (0.110%) and the smallest in 2015 (0.068%). Its beta fluctuated between 0,72 and 1,01.

In Tables 6 and 7 the results of *f-test* and *t-test* for variances in daily rates of returns are shown.

TABLE 6. F-tests for variances

INDICES (TYPE, CURRENCY)	F STAT	F CRITICAL ONE-TAIL	P(F<=F) ONE-TAIL	SAMPLE SIZE
DJSI U.S. (TR, USD) vs. DJITR (TR, USD)	1.1516	1.0516	0.0002%	4273
DJSI Korea (PR, KRW) vs. KOSPI (PR, KRW)	1.0593	1.0683	7.5824%	2480
RESPECT index (TR, PLN) vs. WIG20TR (TR, PLN)	0.9635	0.9192	23.3943%	1528

Source: own elaboration.

Statistical tests confirm the risk difference between the DJSI U.S. and the DJITR and between the RESPECT Index and the WIG20TR for the analyzed periods, respectively. They do not allow us to confirm statistical difference between variances of the DJSI Korea and the KOSPI or between means of all three compared pairs of indices for the USA, South Korea and Poland, respectively.

TABLE 7. T-tests for means

INDICES (TYPE, CURRENCY)	T STAT	T CRITICAL TWO-TAIL	P (T<=T) TWO-TAIL	SAMPLE SIZE
DJSI U.S. (TR, USD) vs. DJITR (TR, USD)	–0.2276	1.9602	82.0%	4273
DJSI Korea (PR, KRW) vs. KOSPI (PR, KRW)	–0.0451	1.9604	96.4%	2480
RESPECT index (TR, PLN) vs. WIG20TR (TR, PLN)	0.4238	1.9607	67.2%	1528

Source: own elaboration.

The results of our regression analysis are presented in the Appendix (Table 14). They confirm the statistical relevance of our earlier beta evaluations and fully refute the statistical relevance of the respective alpha calculations. The overall fit of the regression model is similar for each country. It is the highest for the USA (Adjusted R^2 is about 70%). However, the overall fit of this model for Korea and Poland is very weak, with an adjusted R^2 of about 35% and 15%, respectively. Standard errors in all three categories – that is for beta, alpha and regression – are very low, below 2.5%.

Conclusions

Based on the empirical results, it appears that that the examined SRIs do not deliver systematically better results in comparison to their respective conventional indices, both in terms of rates of return and risk. It cannot be concluded, however, that investing in SRI indices diminishes investment returns or increases investment risk.

During the entire period of analysis, both the DJSI Korea, in comparison with the KOSPI, and the DJSI US versus the DJITR, presented lower average rates of return and higher risk, what was also connected with higher relative risk (see table 4). By contrast, the RESPECT Index achieved better results than its corresponding conventional index, the WIG20TR, in terms of risk and return. As a result, the relative risk of the RESPECT Index was lower than that of the WIG20TR. Similar conclusions can be drawn based on auxiliary ratios. Statistical tests confirmed a risk difference only in the American and Polish indices. Our regression analysis confirmed the statistical relevance of our beta calculations.

These results may be affected by the fact that they do not refer to the same time frames. The risk and return analysis of these pairs of indices for one identical period (January 2, 2009[18] to December 31, 2015) shows that general conclusions change when comparing the South Korean indices. The DJSI US TR is still more risky than the DJITR (standard deviation of 1.08% vs. 1.04%), and also has a slightly lower average daily rate of return (0.0548% vs. 0.0550%). The relative risk for this SR index is therefore higher for a given period (relative standard deviation of 19.66 vs. 18.86). In turn, in the case of the Korean

indices, the conventional index is better than the SR index in terms of risk, rate of return and relative risk (standard deviation of 1.11% vs. 1.19%, average daily rate of return of 0.038% vs 0.029% and relative standard deviation of 29.14 vs. 4075).

Moreover, the analysis of risk and return for individual years (see appendix) confirms our research hypothesis that investing in socially responsible stocks (indices) can be characterized in specific periods by better risk-return yields. However, that does not describe a rule. The analysis shows that a general lack of superiority (or inferiority) of SR indices in terms of neoclassical return and risk over the conventional ones, so it cannot be stated that SRI indices are always better or worse than their conventional counterparts.

In this article, we analyzed three pairs of indices, which is too small of a sample to draw general conclusions. Broadened research that includes other SR indices analyzed in terms of geographical scope and subject matter, as well as faith-based indices (e.g. Christian and Islamic ones), may verify the hypothesis that conventional and socially responsible indices do not differ from each other statistically in terms of risk and return. If this hypothesis is correct, it would suggest that socially responsible investments should be analyzed more in terms of behavioral economics and psycho-social investor features, rather than rational choices based only on the risk and return analysis that neoclassical economics assumes. According to Melé [2012], fully rational decisions apply three forms of human reason simultaneously: economic or instrumental rationality, theoretical, and practical reason. We should, therefore, be prepared to go beyond the limiting assumptions of neoclassical theory to better understand the phenomenon of growing socially responsible investing.

Notes

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[3] Global Sustainable Investment Review 2014, Appendix 3, p. 30, www.gsi-alliance.org; accessed: November 2, 2015.

[4] Our study is in line with Rocchia and Bechet [2011] who investigate SRI performances by taking an index perspective to avoid fund management bias.

[5] In this article we therefore compare the Respect Index with the WIG20TR, because both of them are total return indices.

[6] The RESPECT Index is composed of companies traded on the Warsaw Stock Exchange. The VONIX index includes only companies listed on the Vienna Stock Exchange. CEERIUS is a mixed index, including the companies traded on five stock exchanges in the CEE countries.

[7] http://djindexes.com/, accessed: November 10, 2015.

[8] http://www.sustainability-indices.com/, accessed: November 10, 2015.

[9] http://djindexes.com/, accessed: November 10, 2015.

[10] http://www.bloomberg.com/, accessed: November 10, 2015.
[11] http://eindex.krx.co.kr/, accessed: November 10, 2015.
[12] http://www.sustainability-indices.com/, accessed: November 10, 2015.
[13] http://djindexes.com/, accessed: November 10, 2015.
[14] http://www.djindexes.com/, accessed: November 10, 2015.
[15] http://www.odpowiedzialni.gpw.pl/, accessed: October 11, 2015.
[16] http://www.gpw.pl/, accessed: October 11, 2015.
[17] http://www.gpw.pl, accessed: October 11, 2015.
[18] January 2, 2009 was chosen as the starting point for this research as the time series for the RESPECT index (the youngest index in the analyzed group) are available beginning from this date.

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Appendix. Detailed results of the study

TABLE 8. Performance of DJSI U.S. (total return, USD)

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
1999	0.117%	1.33%	11.42	0.0739	1.44	0.00068	–0.000163	–0.026%
2000	–0.052%	1.60%	30.62	–0.0469	1.20	–0.00063	0.000160	0.028%
2001	–0.008%	1.54%	187.34	–0.0152	1.30	–0.00018	0.000632	0.051%
2002	–0.092%	1.76%	19.09	–0.0561	1.32	–0.00075	–0.000071	0.004%
2003	0.116%	1.11%	9.61	0.1003	1.19	0.00094	–0.000286	–0.040%
2004	0.029%	0.73%	25.09	0.0335	0.90	0.00027	–0.000290	–0.038%
2005	0.009%	0.62%	66.08	–0.0038	0.89	–0.00003	–0.000306	–0.034%
2006	0.059%	0.61%	10.47	0.0652	0.70	0.00058	–0.000005	–0.016%
2007	0.021%	0.94%	44.04	0.0035	0.96	0.00003	–0.000121	–0.013%
2008	–0.153%	2.41%	15.77	–0.0660	1.03	–0.00153	0.000269	0.050%
2009	0.108%	1.62%	15.04	0.0663	1.05	0.00102	–0.000248	–0.033%
2010	0.053%	1.05%	19.91	0.0495	0.91	0.00057	0.000026	–0.002%
2011	0.020%	1.36%	68.62	0.0145	0.94	0.00021	0.000282	0.029%
2012	0.041%	0.75%	18.21	0.0548	0.86	0.00048	–0.000084	–0.014%
2013	0.108%	0.67%	6.22	0.1607	0.96	0.00112	0.000149	–0.001%
2014	0.053%	0.71%	13.53	0.0739	1.08	0.00049	0.000389	0.030%
2015	0.000%	1.02%	2157.75	0.0005	1.13	0.00000	0.000160	0.014%
Whole period	**0.025%**	**1.26%**	**50.20**	**0.0140**	**1.07**	**0.00017**	**–0.000009**	**–0.003%**

Source: own elaboration.

TABLE 9. Performance of DJITR (total return, USD)

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
1999	0.101%	1.02%	10.11	0.0811	1.08	0.00077	–0.000033	–0.021%
2000	–0.011%	1.31%	116.53	–0.0260	0.81	–0.00042	0.000275	0.049%
2001	–0.013%	1.35%	99.74	–0.0213	1.11	–0.00026	0.000453	0.044%
2002	–0.052%	1.61%	31.16	–0.0361	1.21	–0.00048	0.000256	0.027%
2003	0.104%	1.04%	10.02	0.0959	1.13	0.00089	–0.000328	–0.043%

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2004	0.023%	0.68%	29.94	0.0267	0.86	0.00021	–0.000324	–0.042%
2005	0.009%	0.65%	73.20	–0.0043	0.95	–0.00003	–0.000332	–0.034%
2006	0.071%	0.62%	8.71	0.0849	0.69	0.00076	0.000124	–0.003%
2007	0.038%	0.92%	24.06	0.0218	0.94	0.00021	0.000050	0.001%
2008	–0.124%	2.39%	19.29	–0.0545	1.02	–0.00128	0.000526	0.073%
2009	0.093%	1.53%	16.46	0.0605	0.98	0.00094	–0.000313	–0.041%
2010	0.057%	1.02%	17.73	0.0556	0.88	0.00065	0.000091	0.005%
2011	0.041%	1.32%	32.52	0.0307	0.91	0.00044	0.000488	0.051%
2012	0.042%	0.74%	17.77	0.0562	0.83	0.00050	–0.000062	–0.013%
2013	0.105%	0.64%	6.08	0.1644	0.88	0.00119	0.000195	0.001%
2014	0.040%	0.69%	17.02	0.0587	1.03	0.00039	0.000273	0.021%
2015	0.006%	0.99%	172.49	0.0058	1.09	0.00005	0.000207	0.018%
Whole period	**0.031%**	**1.18%**	**37.76**	**0.0201**	**0.98**	**0.00024**	**0.000065**	**0.003%**

Source: own elaboration.

TABLE 10. Performance of DJSI Korea (price return, KRW)

Year	daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2006	0.029%	1.10%	38.15	0.01	0.68	0.00024	–0.000274	–0.05%
2007	0.131%	1.47%	11.22	0.08	0.87	0.00135	0.000999	0.04%
2008	–0.150%	2.44%	16.30	–0.07	0.56	–0.00290	–0.000580	0.06%
2009	0.170%	1.64%	9.66	0.0984	0.46	0.00349	0.001070	0.02%
2010	0.078%	1.03%	13.22	0.0679	0.38	0.00182	0.000519	0.02%
2011	–0.044%	1.74%	39.78	–0.0305	0.48	–0.00112	–0.000445	–0.02%
2012	0.019%	1.04%	53.85	0.0104	0.51	0.00021	–0.000146	–0.04%
2013	0.007%	0.80%	114.50	–0.0004	0.43	–0.00001	–0.000387	–0.09%
2014	–0.025%	0.72%	29.32	–0.0433	0.20	–0.00160	–0.000325	–0.03%
2015	–0.006%	0.87%	143.22	–0.0123	0.42	–0.00026	–0.000030	0.01%
Whole period	**0.021%**	**1.39%**	**64.93**	**0.0089**	**0.51**	**0.00024**	**0.000034**	**–0.01%**

Source: own elaboration.

TABLE 11. Performance of KOSPI (price return, KRW)

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2006	0.020%	1.15%	58.61	0.0059	0.75	0.00009	–0.000410	–0.06%
2007	0.124%	1.45%	11.66	0.0759	0.83	0.00132	0.000935	0.04%
2008	–0.181%	2.45%	13.59	–0.0793	0.61	–0.00319	–0.000804	0.03%
2009	0.171%	1.55%	9.04	0.1051	0.44	0.00371	0.001113	0.03%
2010	0.083%	0.95%	11.36	0.0797	0.38	0.00197	0.000574	0.04%
2011	–0.033%	1.65%	49.78	–0.0258	0.45	–0.00095	–0.000344	–0.02%
2012	0.041%	0.97%	23.76	0.0333	0.49	0.00066	0.000082	–0.02%
2013	0.006%	0.78%	131.95	–0.0018	0.44	–0.00003	–0.000407	–0.09%
2014	–0.018%	0.64%	35.77	–0.0384	0.25	–0.00099	–0.000260	–0.03%
2015	0.013%	0.80%	62.98	0.0100	0.39	0.00021	0.000151	0.03%
Whole period	**0.023%**	**1.35%**	**58.53**	**0.0104**	**0.52**	**0.00027**	**0.000050**	**–0.01%**

Source: own elaboration.

TABLE 12. Performance of Respect index (total return, PLN)

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2009	0.177%	1.20%	6.79	0.1375	0.95	0.00174	0.000729	0.01%
2010	0.119%	1.30%	10.93	0.0831	0.80	0.00135	0.000726	0.04%
2011	–0.036%	1.52%	42.21	–0.0319	0.75	–0.00064	–0.000323	–0.02%
2012	0.107%	0.88%	8.21	0.1083	0.68	0.00139	0.000635	0.04%
2013	0.002%	1.15%	732.89	–0.0055	0.65	–0.00010	–0.000639	–0.09%
2014	0.022%	0.93%	42.48	0.0166	0.68	0.00023	0.000113	0.00%
2015	–0.059%	1.10%	18.46	–0.0583	0.78	–0.00082	–0.000497	–0.03%
Whole period	**0.028%**	**1.17%**	**40.99**	**0.0171**	**0.75**	**0.00027**	**0.000003**	**–0.01%**

Source: own elaboration.

TABLE 13. Performance of WIG20TR (total return, PLN)

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2009	0.099%	1.26%	12.74	0.0693	1.01	0.00086	–0.000113	–0.04%
2010	0.074%	1.27%	17.27	0.0493	0.77	0.00082	0.000289	0.01%
2011	–0.067%	1.56%	23.17	–0.0511	0.82	–0.00097	–0.000622	–0.05%

Year	Daily mean	SD	RSD	Sharpe	Beta	Treynor	Jensen's alpha	MM
2012	0.110%	1.06%	9.63	0.0926	0.85	0.00115	0.000585	0.03%
2013	–0.001%	1.11%	944.19	–0.0081	0.78	–0.00012	–0.000783	–0.09%
2014	0.007%	0.94%	144.96	0.0000	0.72	0.00000	–0.000044	–0.01%
2015	–0.068%	1.08%	15.76	–0.0677	0.76	–0.00096	–0.000592	–0.03%
Whole period	**0.010%**	**1.19%**	**114.19**	**0.0016**	**0.80**	**0.00002**	**–0.000191**	**–0.02%**

Source: own elaboration.

TABLE 14. Regression results

index (type, currency)	Sample size	beta	T-stat for beta	Standard error for beta	alpha	T-stat for alpha	Standard error for alpha	Adjusted R^2	Standard error of regression
DJSI U.S. (TR, USD)	4273	1.07	103.36	1.032%	–0.001%	–0.09	0.010%	71.432%	0.676%
DJITR (TR, USD)	4273	0.98	99.69	0.986%	0.007%	0.00	0.646%	69.933%	0.646%
DJSI Korea (PR, KRW)	2404	0.51	21.34	2.410%	0.001%	0.05	0.026%	15.905%	1.295%
KOSPI (PR, KRW)	2404	0.52	22.34	2.329%	0.003%	0.11	0.026%	17.173%	1.251%
RESPECT index (TR, PLN)	1484	0.75	26.83	2.792%	0.000%	0.01	0.025%	32.645%	0.972%
WIG20TR (TR, PLN)	1484	0.80	28.78	2.775%	–0.020%	–0.79	0.025%	35.804%	0.966%

Source: own elaboration.