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## THE SIN INDEX VS. THE SOCIALLY RESPONSIBLE INDEX

**Abstract:** The article compares the profitability and risk factor of the SINdex (from the so called sin stocks group) with the socially responsible index (SRI) from the Dow Jones (DJSI.US) group. The results were confronted with the results obtained by such conventional indices as the NASDAQ-100 and DJIA. The analysis was conducted for the entire research period, i.e. 16 years (1999–2015) and for separated three-year-long superperiods. The goal of the undertaking was to assess investments in unique passive portfolios pursuant to the profit and risk criteria. It may be assumed that if the ROI in sin stocks portfolios continuously record much higher values than ROI in socially responsible and conventional portfolios, the former ones will constantly enjoy a much greater interest.

**Keywords:** sustainable investments, “sin stocks”, SR indices, SIN index, DJSI Index.

**JEL classification:** G11, M14.

### PORÓWNANIE INDEKSU SIN I INDEKSU SPÓŁEK SPOŁECZNIE ODPOWIEDZIALNYCH

**Streszczenie:** Celem artykułu jest porównanie zyskowności i ryzyka indeksu SINdex i indeksu spółek społecznie odpowiedzialnych. SINdex składa się z akcji podmiotów zaliczanych do tak zwanych „grzesznych” spółek, czyli prowadzących dzia-

łałość w branży tytoniowej, alkoholowej i hazardowej. Uzyskane wyniki zostały porównane z wynikami klasycznych indeksów giełdowych NASDAQ-100 i DJIA. Analizę przeprowadzono dla okresu 1999–2015. Badanie wykazało niższą rentowność portfela inwestycji społecznie odpowiedzialnych niż portfela „grzesznych” akcji, przy porównywalnym poziomie ryzyka.

**Słowa kluczowe:** zrównoważone inwestowanie, grzeszne spółki, indeksy społecznie odpowiedzialne, indeks SIN, indeks DJSI.

## Introduction

In recent years more and more importance for the development of the economy is attributed to sustainable development. It is well reflected in bottom-up social movements, and the functioning of commercial institutions or countries. One such activity in this area may be exemplified by financial investments made in accordance with the concept of sustainable development. For more than two decades the interest in this type of investment has been significantly higher [Budde 2008].

According to the research made by the Eurosif and Social Investment Forum, the market of socially responsible investments may be valued at the level of 14 bln EUR<sup>1</sup> [Eurosif Report 2012; US SIF Trends 2012]. The reasons lying behind this phenomenon are numerous. They constitute both normative and non-normative factors. Supposedly, the opposite ideological pole of financial investments made in accordance with the concept of sustainable development is inhabited by investments in so called sin stocks. Until the moment when the concept of socially responsible investment in the wide area of investments appeared on financial markets, the idea of sin stocks was not so stigmatized. However, the development of social responsibility in investment, especially in rich societies, became so visible and commonly accepted that many conventional companies introduced such changes so that they could meet new requirements. Undoubtedly, this change could be partially an element of their marketing campaign but, on the other hand, some crucial changes were introduced as well as being aimed at strengthening the social economy. It could lead to the conclusion that investments in sin stocks should be marginalized. Nevertheless, it should be absolutely

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<sup>1</sup> These are only estimated values calculated for different reference periods: 2008 – Canada, 2009 – Australia/New Zealand, Japan, 2011 – Europe, 2012 – US. In 2013 only in Europe could this market be valued at the level of – 21 bln EUR.

expected that such changes may appear only when these companies will not meet investors' expectations as for generating a higher rate of return. So, what may motivate this kind of conviction? Actually, the answer is only one and results from human nature; therefore such businesses as tobacco, alcohol or gambling have and will have a significant share in the economy. The conviction that people may drink, smoke and gamble more in harder times leads to the better performance of sin stock companies in comparison to SRI [Brush 2003]. Socially responsible investors avoid them even if they result in higher rates of return [Statman 2006]. It is connected with the consistent action of avoiding 'sinful undertakings'. Heinkel, Kraus and Zechner [2001] prepared a balance model in which socially responsible investors restrain from investing in sin stocks (which keeps the prices of these stocks at a low level), and consequently it leads to higher rates of return resulting from investment underestimates. It works more or less as the effect of neglected stocks described by Merton [1987]. In his research Merton, while examining tobacco companies, proved that higher litigation risk is the reason for higher expectations towards rates of return. H. Hong and M. Kacperczyk also confirm the effect of higher ROI in sin stocks because they exhibit less institutional ownership and less analyst coverage compared to non "sin stocks" with similar characteristics. [Hong and Kacperczyk 2007]. Kim and Venkatachalam [2006] also confirm the higher profitability of non-ethical investments and prove in their research that such investments have lower book-to-market ratios and higher annual earnings per share. So, as the rapid increase in socially responsible assets indicates, investors are willing to accept lower returns in order to comply with societal norms.

## **1. Unique indices SINdex, DJSI.US and conventional indices DJIA, NASDAQ-100**

Two indices of dissimilar ideology in terms of their purpose were classified into the unique indices group. The first one is the index of the companies representing tobacco, alcohol and gambling groups whereas the second index includes socially responsible groups.

The SINdex was launched in December 1998. It includes owners and operators of casinos and gaming facilities (16 companies), producers of beer and malt liquors, distillers, vintners and producers of other alcoholic beverages (8 companies), and manufacturers of cigarettes and other tobacco products (6 companies). Currently, there are 30 companies in the index

listed in the NYSE(19) and NASDAQ(11). New companies are added to the Index when an existing component is removed. The share of the companies in the index is proportional and amounts on average to 3.33%<sup>2</sup>. Index component selection is mostly based on the industries defined in the Global Industry Classification Standard (GICS). The index includes stocks classified under GICS code 25301010 (Casinos & Gaming), 302010 (Brewerages) and 302030 (Tobacco).

Socially responsible indices are passive portfolios, which include those companies meeting the standards of social responsibility, and constitute a specific benchmark for investors acting pursuant to the concept as such.

The basis for building a portfolio for socially responsible investments is the application of one out of 21 investment approaches commonly available on the market now. The most popular and the oldest approach is the so called negative selection. It means an absolute avoidance of sin stocks in the portfolio of companies. The most commonly used approach is “best-in-class” used by the group RebecoSAM (the creators of indices from the DJ group). It means to select sustainability leaders from across all industries. This means that no industry is excluded from the indices, and only the most sustainable companies in each industry are selected for index membership. However, it should be emphasized that only companies from the DJ group are selected according to the ‘best-in-class’ approach. It means that the index does not exclude companies operating in tobacco, gambling, alcohol or similar industries. It was launched in September 2005<sup>3</sup>. The DJSI.US index currently includes 117 companies from the United States. It is a float-adjusted market capitalization index. Top components (10 companies) constitute more than 38% of the index share.

DJIA and the NASDAQ 100 were selected as conventional portfolios. DJIA was launched in May 1896. There are 30 companies operating on the American market (listed on the NYSE and NASDAQ). It is a price-weighted index. This index represents a selected group of prominent U.S. companies known as Blue Chips. The index universe consists of securities in the S&P 500, excluding stocks classified under the Global Industry Classification Standard (GICS) code 2030 (Transportation) and 55 (Utilities). Top components (10 companies) have an overwhelming share in the index (more than 50%).

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<sup>2</sup> Data available on March 20, 2016.

<sup>3</sup> Available daily data back to December 31,1998.

**Table 1. Summaries**

Factor	N	Weighting	Way of component selection
SINdex	30	equal-weighted methodology	under GICS, including stock with sub-industry code: 25301010, industry code: 302010 and 302030.
DJSI.US	117	float-adjusted market capitalization	under GICS, the top 30% from each industry (55) are selected for inclusion.
DJIA	30	price-weighted	under S&P 500, excluding stocks classified under GICS with industry code: 2030 and 55.
NASDAQ-100	100	modified market capitalization	companies across major industry groups with financial sector exclusion.

Source: The author's own analysis.

The NASDAQ-100 was launched in January 1985. The NASDAQ-100 Index includes 100 of the largest domestic and international non-financial companies listed on The NASDAQ Stock Market based on market capitalization. The security types eligible for the Index include common stocks, ordinary shares, and ADRs. Top components (10 companies) have about a 50% share in the index. The index includes such securities which meet certain qualification criteria. The Index reflects companies across major industry groups such as: computer hardware and software, telecommunications, retail/wholesale trade and biotechnology.

## 2. Methodology

The research analysis covers 16 years from 1999–2015. In order to establish profitability, some calculations were made to define the so called cumulative return, annualized return and daily average log-return for each index. The same analysis was made for the five sub-periods. For the daily rate of return a standard deviation was established as well as minimal and maximum values of rates of return were calculated for particular sub-periods.

To measure the effectiveness, classical equations were used such as the Sharpe ratio and the modified Sharpe ratio. The Sharpe ratio was defined as:

$$SR = \frac{\mu - r_f}{\sigma},$$

where:

- $\mu$  – average logarithmic rate of return,
- $\sigma$  – standard deviation of logarithmic rate of return,
- $r_f$  – average logarithmic risk free rate of return, defined as follows:

$$r_f = \frac{\sum_{i=1}^n \ln(1 + r_{free}^i)}{k},$$

where  $r_{free}^i$  is the risk free rate of return in  $i$ -th period, and  $k$  stands for the number of base periods in a year. The modified Sharpe ratio was calculated by replacing the standard deviation with a standard semi-deviation.

Apart from the classical measures of effectiveness alternative measures were also used which apply lower partial moments – LPM – to measure risk or the Value at Risk – *Var*.

The lower partial moment was derived from the equation:

$$LPM^n = \frac{1}{n} \sum_{i=1}^n \max(MAR - r_i, 0)^n,$$

where  $n$  is the order determining the type of a lower partial moment,  $r_i$  is the rate of return on investment in  $i$ -th period, and *MAR* is the *minimum acceptable return*, which may equal 0 or may be equal to the risk free rate of return or may have any average rate of return on a standard investment. In the paper, *MAR* is the risk free rate of return. The order  $n$  is interpreted as the level of the investor's aversion to loss, and the higher the loss is; the higher the order is [Perez 2012].

The value at risk (*Var*) is a defined number in such a way that the possibility of a loss higher than *Var*, in a given time horizon, is equal to the given in advance number  $\alpha$ . Assuming that the rate of return on a given investment has a normal distribution with a mean  $\mu$  and standard deviation  $\sigma$  in a given time, it can be calculated as follows:

$$VaR = \mu - c \cdot \sigma,$$

where  $c$  is the constant whose value depends on the adjusted level of  $\alpha$  significance and is equal to:

- $c = 1.645$  for  $\alpha = 0.05$ ,
- $c = 2.326$  for  $\alpha = 0.01$ .

The use of *VaR* to measure effectiveness was proposed by Dowd, who created the rate of return on *VaR* (*RoVaR*, *return on VaR*) [Perez 2012]:

$$RoVaR = \frac{\mu - r_{free}}{VaR}.$$

In order to examine the interdependence between the rates of return of the analysed coefficients, the following correlation indices were calculated: Pearson's, Kendall's and Spearman's.

Pearson's correlation coefficient is a measure of the linear correlation between two variables. Kendall's and Spearman's coefficient are rank correlation statistics and they measure the degree of similarity between two rankings. When the relationship between the variables is not linear, it may be more appropriate to use the Spearman's or Kendall's rank correlation method. Additionally, Pearson's coefficient is very sensitive to outliers.

The correlations coefficients above are static concepts. Thus the possible dynamic changes in the correlation between asset returns were examined. One of the most widely used models of a conditional correlation is BEKK [Engel and Kroner 1995]. The model ensures positive definiteness; however, it still suffers from a high dimensionality problem. In this paper the simplest BEKK specification with all orders set to 1 is used:

$$H_t = CC' + A\varepsilon_{t-1}\varepsilon'_{t-1}A' + GH_{t-1}G',$$

where:

- $H_t$  – conditional variance matrix,
- $A, G$  –  $k \times k$  parameter matrices (not necessarily symmetric),
- $C$  – a lower triangular parameter matrix.

The fully parameterized model includes  $\frac{k(5k+1)}{2}$  parameters. In order to make the model feasible, two restricted parametrizations have been proposed namely the scalar and diagonal specifications.

In the scalar BEKK model, the parameter matrices  $A$  and  $G$  are replaced by  $A = a \cdot U$  and  $G = g \cdot U$ , where  $a$  and  $b$  are scalars and  $U$  is a matrix of ones.

In the diagonal specification the parameter matrices  $A$  and  $G$  are set to be diagonal as  $A = \text{diag}(a)$ , and  $G = \text{diag}(g)$ . In this paper diagonal BEKK were used.

The conditional covariance matrix is estimated by the quasi maximum likelihood method. One needs to notice its assumption that the time series treated should be stationary.

### 3. Results

The tables and figures below present the research results. Table 2 shows the results of cumulative rate of return and annualized rate of return for the whole research period. Table 3 presents the results for the average daily rates of return for the same periods. Additionally, the risk was analysed and measured by a standard deviation as well as minimal and maximum value of the rate of return in a given period. Table 4 lists the correlation coefficients. Figure 1 shows the 12-month rolling correlations between the returns on indices. Table 5 presents the results from the diagonal BEKK model estimation. Figure 2 shows patterns of dynamic conditional correlations. Table 6 estimates the investment effectiveness by presenting the Sharpe coefficient and the values at risk  $VaR$  and  $RoVaR$  were calculated.

**Table 2. Rates of return, January 1999 – December 2015**

Factor	Cumulative RoR	Annualized RoR
SINdex	783.04%	12.81%
DJSI.US	39.15%	1.94%
DJIA	89.78%	3.76%
NASDAQ-100	131.78%	4.94%

Source: The author's own analysis.

The profit and risk analysis indicates the advantage of the sin stocks portfolio over other portfolios. It is especially visible in the analysis of the cumulative rate of return and annualized rate of return (Table 2). The worst results were recorded in the socially responsible index.

The conducted analysis on daily rates of return (Table 3) indicates the advantage of sin stocks over the remaining indices; however, the risk measured by the standard deviation for particular indices was very similar apart

from the NASDAQ-100, for which the risk in the entire research period and the first three sub-periods was significantly higher.

The correlation coefficients confirm a strong linear (Pearson) and non-linear interdependence (Kendall, Spearman) between the rates of return of the following indices DJIA, DJSI.US, the NASDAQ-100. The correlation between classical indices as well as DJSI.US and the SINDEX is at an average level. The correlation coefficients increase clearly between 2007–2009 and 2010–2012. This was the time of the financial crisis and the subsequent recession, so it may be assumed that systematic risk might have had a strong influence on the increased correlation coefficient. The weakest linear interdependence, on the contrary, is visible from 2001–2003.

Nevertheless the correlation coefficients are not constant over time. The 12-month rolling correlations between the returns on indices were computed. The rolling correlations are illustrated in Figure 1. The correlations between DJIA and DJSI.US as well as DJIA and the NASDAQ-100 is very high during the whole analysed period (panel 4–5), they vary between 0.8–1. The correlation between the SINDEX and other indices exhibits greater variability (panel 1–3). At the beginning of the sample, these coefficients are about 0.4 and increase steadily, hits a high of about 0.9, then stabilizes at the value of 0.8 through the end of the sample. The correlations between DJIA and the NASDAQ-100 behave similarly to the latter.

**Table 3. Factor Returns, January 1999 – December 2015**

Factor	N	Mean Return (daily average)	Std. Dev.	Minimum	Maximum
<b>Overall period: January 1999 – December 2015</b>					
SINDEX	4277	0.00051	0.01369	-0.09708	0.09932
DJSI.US		0.00009	0.01263	-0.08828	0.10229
DJIA		0.00048	0.01160	-0.08201	0.10508
NASDAQ-100		0.00021	0.01895	-0.11115	0.17203
<b>Subperiod 1: January 2001 – December 2003</b>					
SINDEX	752	0.00041	0.00908	-0.05993	0.04444
DJSI.US		-0.00008	0.01237	-0.05876	0.05780
DJIA		-0.00004	0.01352	-0.07396	0.06155
NASDAQ-100		-0.00049	0.02699	-0.09533	0.17203
<b>Subperiod 2: January 2004 – December 2006</b>					
SINDEX		0.00056	0.00656	-0.02663	0.03364
DJSI.US		0.00016	0.00550	-0.02198	0.02061

Table 3 – cont.

Factor	N	Mean Return (daily average)	Std. Dev.	Minimum	Maximum
DJIA	755	0.00023	0.00651	-0.01980	0.02036
NASDAQ-100		0.00024	0.01015	-0.03144	0.03135
<b>Subperiod 3: January 2007 – December 2009</b>					
SINdex	756	-0.00009	0.01840	-0.09708	0.09933
DJSI.US		-0.00032	0.01732	-0.08828	0.10229
DJIA		-0.00024	0.01718	-0.08201	0.10508
NASDAQ-100		0.00007	0.01941	-0.11115	0.11849
<b>Subperiod 4: January 2010 – December 2012</b>					
SINdex	754	0.00035	0.01213	-0.08180	0.05672
DJSI.US		0.00021	0.01064	-0.05997	0.04394
DJIA		0.00030	0.01056	-0.05706	0.04153
NASDAQ-100		0.00046	0.01253	-0.06305	0.04915
<b>Superperiod 5: January 2013 – December 2015</b>					
SINdex	756	0.00039	0.00851	-0.03899	0.03258
DJSI.US		0.00040	0.00808	-0.04190	0.03723
DJIA		0.00038	0.00780	-0.03640	0.03876
NASDAQ-100		0.00068	0.00937	-0.04172	0.04937

N – number of observations.

Source: Own author's analysis.

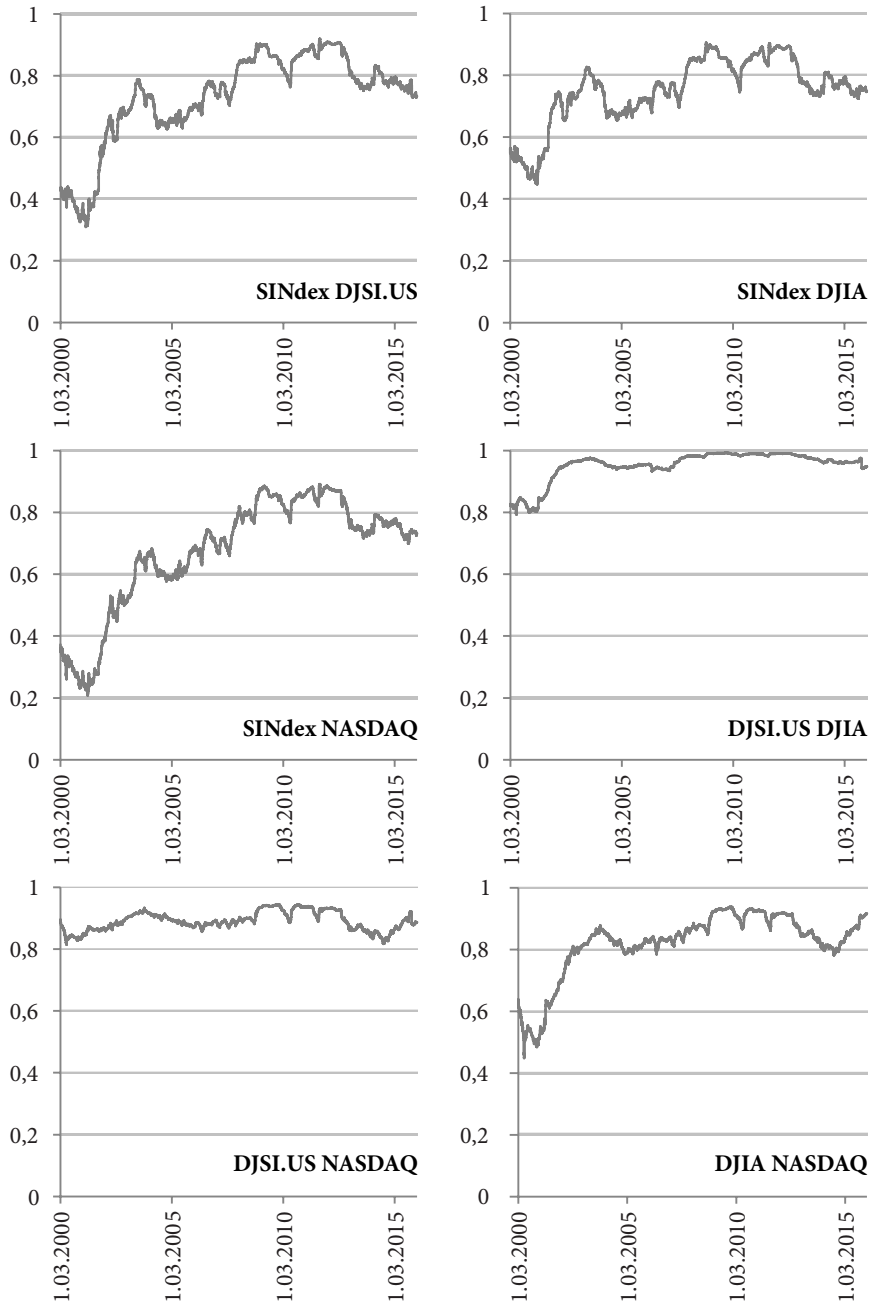
Table 4. Correlation coefficients

Factor	SINdex	DJSI.US	DJIA	NASDAQ-100
<b>Overall period: January 1999 – December 2015 [Pearson]</b>				
SINdex	1	0.73251	0.76950	0.56832
DJSI.US		1	0.94893	0.85737
DJIA			1	0.74758
NASDAQ-100				1
<b>Overall period: January 1999 – December 2015 [Kendall]</b>				
SINdex	1	0.51249	0.53250	0.44827
DJSI.US		1	0.79664	0.68722
DJIA			1	0.58241
NASDAQ-100				1

Table 4 – cont.

Factor	SINdex	DJSI.US	DJIA	NASDAQ-100
<b>Overall period: January 1999 – December 2015 [Spearman]</b>				
SINdex	1	0.68573	0.71022	0.61290
DJSI.US		1	0.92813	0.85772
DJIA			1	0.75269
NASDAQ-100				1
<b>Superperiod 1: January 2001 – December 2003 [Pearson]</b>				
SINdex	1	0.655023	0.73056	0.47632
DJSI.US		1	0.95032	0.87005
DJIA			1	0.75099
NASDAQ-100				1
<b>Superperiod 2: January 2004 – December 2006 [Pearson]</b>				
SINdex	1	0.68924	0.70888	0.63792
DJSI.US		1	0.94556	0.88477
DJIA			1	0.81077
NASDAQ-100				1
<b>Superperiod 3: January 2007 – December 2009 [Pearson]</b>				
SINdex	1	0.85269	0.84570	0.83064
DJSI.US		1	0.98869	0.92641
DJIA			1	0.91324
NASDAQ-100				1
<b>Superperiod 4: January 2010 – December 2012 [Pearson]</b>				
SINdex	1	0.88126	0.86635	0.85113
DJSI.US		1	0.98854	0.91988
DJIA			1	0.90552
NASDAQ-100				1
<b>Superperiod 5: January 2013 – December 2015 [Pearson]</b>				
SINdex	1	0.7600045	0.760531	0.74735
DJSI.US		1	0.95492	0.86926
DJIA			1	0.86844
NASDAQ-100				1

Source: Own author's analysis



**Figure 1. The 12-month rolling correlations between the returns on indices (2000–2015)**

Source: Own author's analysis

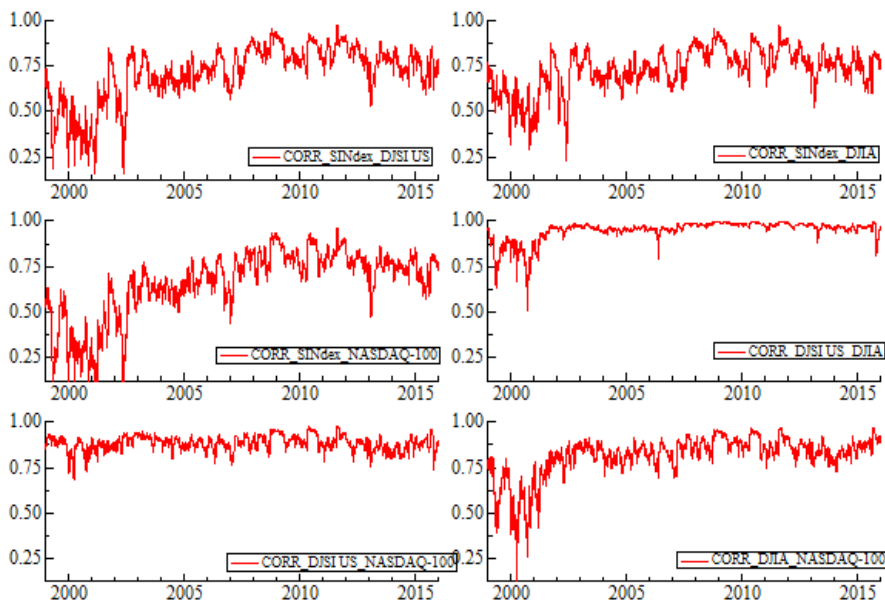
**Table 5. Result from the diagonal BEKK (1,1) model estimation (with a multivariate normal distribution)**

C				A	G
0.00105 (0.00021)	0.00066 (0.00014)	0.00068 (0.00015)	0.00077 (0.00015)	0.18606 (0.01656)	0.97914 (0.00448)
	0.00057 (0.00017)	0.00054 (0.00016)	0.00051 (0.00015)	0.21525 (0.01837)	0.97359 (0.00555)
		0.00023 (0.00007)	0.00003 (0.00004)	0.21691 (0.01941)	0.97288 (0.00599)
			0.00051 (0.00010)	0.20338 (0.01660)	0.97647 (0.00435)

Part C presents parameters of the triangular matrix C. Column A and G shows the diagonals of diagonal matrices A and G respectively.

Source: Own author’s analysis.

Table 5 reports the estimates of the diagonal BEKK (1,1) parameters. Here, A and G are the corresponding ARCH and GARCH parameters associated with the appropriate index. All diagonal elements A and G are sta-



**Figure 2. Dynamic conditional correlations**

Source: Own author’s analysis

tistically significant. It suggests that each conditional variance depends on its own squared lagged innovations as well as on their own history.

The dynamic correlations (Figure 2) exhibit high and stable conditional correlations between DJIA and DJSI.US as well as between DJSI.US and the NASDAQ-100. There are a few sharp drops in the dynamic, but these drops are small compared to the value of correlations. The correlations between DJIA and the NASDAQ-100 witnessed a sharp slump in 2000 during “the dot-com bubble”, become stable and high. The correlations between the SINdex and the other indices fluctuate sharply during the whole sample.

The ratio of the profit against the value of value at risk expressed by the RoVaR is the highest for the DJIA index. SINdex is ranked second. The lowest (negative) value of this index is present for the socially responsible DJSI.US. This results from the negative rate of return for the DJSI.US index.

The lowest value for the Sharpe ratio has the socially responsible DJSI.US index. The obtained rate of return in the analysed period was lower than the risk-free rate which is indicated by its negative value. The Sharpe ratio is also very low for the NASAQ-100 which also has the lowest value at risk. The factor influencing such results has the value of a standard deviation and is absolutely the highest for this index.

**Table 6. Effectiveness index and endangered value**

Factor	Sharpe ratio	VaR	RoVaR
SINdex	0.0227	0.0184	0.0141
DJSI.US	-0.0028	0.0186	-0.0017
DJIA	0.0331	0.0185	0.0207
NASDAQ-100	0.0056	0.0309	0.0035

Source: The author's own analysis.

## Conclusions

The development of socially responsible investment is visible by, for example, continuously increasing socially responsible assets. The spectrum of offers dedicated to investors includes single investments as well as active portfolios managed by institutions specializing in group investments. Also passive portfolios are being created, i.e. stock market indices which group companies performing their business activity pursuant to the concept of social responsibility. Although the conducted analysis proved the

lower profitability of the socially responsible investments portfolio than the portfolio of the sin stocks, still the positive effect is a lack or a considerable limitation of sin stock companies in the main indices of conventional companies (the NASDAQ-100 does not include any company recorded in the SINDEX). The value of the correlation coefficient between the SINDEX and DJSI.US, DJIA and the NASDAQ-100 is maintained at an average or low level. Although the tendency confirmed by the increase of socially responsible assets is positive, still it is the higher profitability of investments in the 'sin' companies that arouses anxiety, which undoubtedly will attract investors aimed at high profits only. It is worth quoting here the opinion of Z. Bauman who in *Does Ethics have Chance in a World of Consumers?* stated that a complete change of the world through the development of an ethical economy is impossible due to consumerism and so called market expansion [Bauman 2009], whereas A. Arvidsson and N. Peitersen estimated the potential effects of an ethical economy and said that "... a practical implementation of the rules governing ethical economy may probably redefine the notion of an economic growth (by the change of the value), which may result in opening to new markets, e.g. markets of ecological energy, connecting new actors (like social ventures and entrepreneurs) to financial capital or enabling productive publics to monetize their efforts in more rational and transparent ways" [Arvidsson and Peitersen 2013]. Summing up, there is a need of a profound change in social mentality to make profitability not the only reason lying behind investment decisions.

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