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# **How Risky Are the Socially Responsible Investment (SRI) Stocks? Evidence from the Central and Eastern European (CEE) Companies.**

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# **How Risky Are the Socially Responsible Investment (SRI) Stocks? Evidence from the Central and Eastern European (CEE) Companies.**

## **ABSTRACT:**

We evaluate the risk of the socially responsible investment (SRI) stocks from the Central and Eastern European (CEE) markets. Our analysis covers the data from the first and oldest national sustainability stock market index introduced in the CEE countries, i.e. the RESPECT index listed at the Warsaw Stock Exchange (WSE) in Poland, which was launched in 2009. The RESPECT index stocks are compared with other CEE stocks belonging to the CECE SRI index from the broader CEE region listed at the Vienna Stock Exchange (VSE).

The beta coefficients and other risk measures evidence that the SRI stocks in Poland, which were constituents of the RESPECT index, have been characterised by relatively lower risk than the broader market and by better risk-adjusted performance. They also exhibited an asymmetric risk behaviour patterns. In comparison, the CECE SRI index stocks were also characterised by lower risk than the market, asymmetric risk effects and superior risk-adjusted performance.

Overall, we conclude that the investigated SRI companies from the CEE countries are less risky relative to the broader market, but their behaviour exhibits clearly asymmetric risk patterns.

**Keywords:** Sustainability; Stock Market Risk; Socially Responsible Investment (SRI); CEE Markets; Asymmetric Risk Behaviour.

**JEL codes:** G15, G11, G12, C20, M14

## 1. Introduction

The existing literature in the area of sustainability on stock markets has been focused so far predominantly on the performance of the socially responsible investment (SRI) companies, i.e. mainly on the returns which they deliver, and not so much on their risk. In particular, little attention has been devoted yet to the issue of the asymmetric effects in the risk patterns among the SRI stocks.

We contribute to this line of literature specifically for the Central and Eastern European (CEE) countries, which offer the features that make it particularly interesting to analyse how the corporate business strategies relying on sustainability policies work as well as what impact they have on the companies' performance and, more specifically, on their risk on the stock market.

The aim of this paper is to analyse the risk of stocks from the first ever national sustainability stock market index introduced in the CEE countries: the RESPECT index,<sup>1</sup> listed at the Warsaw Stock Exchange (WSE), which was launched on November 19<sup>th</sup>, 2009. RESPECT is one of the first SRI indices launched in all the emerging markets globally.<sup>2</sup> We compare the RESPECT stocks with other SRI stocks from four other CEE countries, Czech Republic, Hungary, Croatia and Slovenia, which belong to the broader index CECE SRI quoted at the Vienna Stock Exchange (VSE).

In particular, we focus on the verification of the hypothesis about asymmetric effects in the risk patterns of the SRI companies from these markets.

The existing literature presents evidence showing that higher corporate social performance (CSP) is associated with lower risk (see e.g. Orlitzky and Benjamin (2001), Lee and Faff (2009) or Sassen, Hinze and Hardeck (2016), among others). Theoretical justification behind such relationship was presented e.g by Clark, Feiner and Viehs (2015), who argue that if companies neglect sustainability issues, they are then exposed to higher risks, such as environmental accidents, reputational risks linked to labour conditions or gender inequality or other types of risk linked to corporate governance, in particular fraud, socially unacceptable compensation schemes and also lack of risk control. Such approach may be more broadly attributed to the stakeholder theory. One of the most common risk measures used by investor is the beta coefficient. Its popularity is derived from the premise that it is a simple, one number, risk measure that each investor, even unexperienced one, can understand and can easily apply.

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<sup>1</sup> RESPECT acronym in the name of the index stands for: **R**esponsibility, **E**cology, **S**ustainability, **P**articipation, **E**nvironment, **C**ommunity and **T**ransparency.

<sup>2</sup> RESPECT is not only the first sustainability index in the CEE region but also one of the first such stock market measures among all emerging markets worldwide. In fact, Poland has been so far the only country in the CEE, which introduced the SRI index. Only a few other CEE markets have adopted some other selected sustainability practices, such as e.g. reporting on sustainability or offering guidance to companies on sustainability reporting etc. This group includes: Latvia, Lithuania and Estonia, however they do not have yet any formal SRI indices listed on their stock exchanges (see more details in: 2018 Report on Progress, Sustainable Stock Exchanges Initiative (2018)).

The finance theory states that high beta implies higher risk with higher reward, while low beta implies lower risk with lower reward, so the upside and downside risks are assumed to be symmetrical. However, in practice such symmetry does not have to be the case. The existence of such asymmetric effects can be analysed by using the dual beta parameters, which are estimated separately for the periods characterised by positive and negative market returns. Hence, dual betas capture the asymmetric risk effects in the stocks' systematic risk in bull and bear markets and they reveal the risk patterns, which are not possible to observe by focusing only on classical beta coefficients.

To the best of our knowledge, such analysis has not been conducted for the SRI companies yet neither using the CEE markets data nor any other SRI stocks data from other countries. Therefore, the examination of the RESPECT index and CCE SRI index firms data allows for making a new contribution through unique and novel analysis of the ethical and socially responsible investments in important emerging markets in Europe.

The paper is organised as follows. Section 2 provides a concise summary of the relevant literature. Section 3 presents a description of data and methodology. Section 4 discusses empirical results. Last section 5 summarises and concludes.

## **2. Related Literature**

Analysis of the data from the SRI indices is a fairly new stream of literature due to the fact that sustainability and ethical indices have been launched relatively recently in the developed markets and even later in the emerging markets.

Some results from the international markets have been presented by Sauer (1997) and Statman (2000) for the Domini Social Index (DSI), Consolandi et al. (2009), who analysed the Dow Jones Sustainability Stoxx Index (DJSSI), Managi et al. (2012), who used the data for the SRI indices from the US, the UK and Japan, Belghitar et al. (2014), who compared the four socially responsible FTSE4GOOD indices with similar conventional indices, and Śliwiński and Łobza (2017), who analyzed returns and risk related to investments in different international SRI and conventional indices (i.e. the socially responsible indices: the DJSI Korea, DJSI US and RESPECT Index and the corresponding conventional indices: the Korea Stock Exchange Composite KOSPI, Dow Jones Industrial Average and WIG20 index).

Among other papers focused specifically on emerging markets, Ortas, Moneva and Salvador (2012) examined the Brazilian Corporate Sustainability Index, while Janik and Bartkowiak (2015) investigated socially responsible indices in selected Central and Eastern European countries. More recently, Zou et al. (2020) analyzed the component stocks from the SRI indices in Brazil, China and South Africa. Yilmaz, Aksoy and Tatoglu (2020) investigated also the data from the Istanbul stock exchange in Turkey and showed that no strong evidence existed of the effect of inclusion in, or exclusion from, the BIST Sustainability Index on stock returns and on the systematic risk of the Turkish companies.

Regarding, more specifically, the risk of the SRI investments, Sassen, Hinze and Hardeck (2016) report that there exists little available research so far focused on the relationship between the CSP and firms' risk. In the earlier studies, Orlitzky and Benjamin (2001) presented

a review of research on the association between CSP and firms' risk using the US data covering 18 US-based primary studies, where in majority of them it was found that higher CSP leads to lower financial risk. Lee and Faff (2009) argued that leading corporate social performance firms exhibit significantly lower idiosyncratic risk and that idiosyncratic risk might be priced by the broader equity market. Sassen, Hinze and Hardeck (2016) further found that social performance has a negative effect on all three risk measures, i.e. total risk, idiosyncratic risk and systematic risk. The environmental performance generally decreased idiosyncratic risk, whereas total risk and systematic risk were only affected in the environmentally sensitive industries. However, Jin (2018) argues that other research concerning SRI risk provides mixed results depending on the exploited samples, databases, CSP measures and risk metrics.

Overall, the existing evidence in the literature relying on the SRI indices data and the relationship between SRI and stock market risk, in particular from emerging markets, is still scarce, which constitutes a gap which we aim to fill in by reporting new results from the stock markets in the CEE countries.<sup>3</sup>

### **3. Data and Methodology**

The database used in this study covers exactly 100 months since the RESPECT index stocks data is available at the Warsaw Stock Exchange, i.e. from November, 19<sup>th</sup> 2009 until February, 28<sup>th</sup> 2018. However, the dataset employed in all our empirical work spans across the period starting from the first full calendar month, i.e. December 1<sup>st</sup>, 2009 - February 28<sup>th</sup>, 2018, and it contains a total of 14 stocks.

The RESPECT index project, initiated by the Warsaw Stock Exchange (WSE) in 2009, aims at the identification of companies managed in a responsible and sustainable manner, but it additionally strongly emphasizes investment attractiveness of companies that are characterized, among other criteria, by reporting quality, level of investor relations or information governance. The issue of liquidity is also incorporated into the eligibility requirements of the RESPECT index, so it tends to be composed of mainly large and liquid stocks. The audit of WSE listed companies is carried out cyclically and it targets firms operating in compliance with best corporate governance, information governance and investors relations standards and also in adherence to environmental, social and personnel criteria (see: [www.gpw.pl](http://www.gpw.pl)).

We also use data for the companies from the sustainability index CECE SRI (CECE Socially Responsible Investment index) listed at the Vienna Stock Exchange, which can be treated as a control sample. CECE SRI is a capitalization-weighted price index which is composed of the leading firms in reference to social and ecological quality that are traded on stock exchanges in the CEE region. It includes 10 companies from Hungary, Czech Republic,

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<sup>3</sup> Other related papers using international markets data include: Hamilton et al. (1993), Guerard (1997), Goldreyer and Diltz (1999), Orlitzky et al. (2003), Bauer et al. (2005), Derwall et al. (2005), Scholtens (2005), Kempf and Osthoff (2007), Escrig-Olmedo et al. (2013), Charlo et al. (2015), Brzeszczyński and McIntosh (2014), Lean et al. (2015), Auer (2016), Auer and Schuhmacher (2016), Miralles-Quiros et al. (2017), Syed (2017), Riedl and Smeets (2017) and Chang et al. (2018).

Croatia and Slovenia. The data sample for the CECE SRI stocks is the same as in case of the RESPECT index companies and it covers the period from November, 19<sup>th</sup> 2009 to February, 28<sup>th</sup> 2018.

Since the main aim of this study is the analysis of the SRI stocks risk, as the main methodology we apply first the Sharpe single index model to estimate the beta coefficients for the individual RESPECT index and CECE SRI index companies as the measures capturing the stock market risk:

$$R_{it} = \alpha_i + \beta_i \cdot R_{mt} + \varepsilon_{it} \quad (1)$$

where:  $R_{it}$  are stock  $i$  returns and  $R_{mt}$  is the market index return.

We further analyse the asymmetric effects in RESPECT index and CECE SRI index stocks risk by employing the semi variance and semi standard deviation as the basic risk measures.

Subsequently, we verify the hypothesis that there are no asymmetric effects in the risk of RESPECT index and CECE SRI index stocks by estimating the dual betas (see Chong et al. (2011)). The dual betas estimations were performed using the following version of the Sharpe single index model:

$$R_{it} = \alpha_i + \beta_i^{POS} \cdot D \cdot R_{mt} + \beta_i^{NEG} \cdot (1 - D) \cdot R_{mt} + \varepsilon_{it} \quad (2)$$

where:  $D$  is the dummy variable (which takes on the value of 1 when the market index return is non-negative and 0 otherwise when it is negative),  $\beta_i^{POS}$  is the positive dual beta and  $\beta_i^{NEG}$  is the negative dual beta.

Next we focus on the investigation of the risk-adjusted performance of the RESPECT index and CECE SRI index stocks based on such measures as the modified Sharpe ratio (see Israelsen (2005)) and also the Certainty Equivalent ( $CEQ$ ) returns (see DeMiguel et al. (2009)).

The modified Sharpe ratio is defined as:

$$MSR = ER / SD^{(ER/absER)} \quad (3)$$

where  $ER$  is the excess return defined as mean monthly difference between the stock (or index) return and the risk-free return and  $SD$  is the sample standard deviation of the monthly differences of returns.

The Certainty Equivalent ( $CEQ$ ) returns are defined as:

$$CEQ = ER - (\gamma/2) \cdot var(ER) \quad (4)$$

where  $ER$  is the excess return, defined as mean monthly difference between the stock (or index) return and the risk-free return and  $var(ER)$  is the variance of  $ER$ . The parameter  $\gamma$  is the risk aversion parameter. This formulation of  $CEQ$  assumes a multi-period investor with quadratic

utility. The ‘normal’ level of risk aversion is  $\gamma=1$ . Higher values of  $\gamma$  mean higher levels of risk aversion and lower values of  $\gamma$  indicate lower levels of risk aversion.

In the next section, we present and discuss the empirical results.

## 4. Results

### 4.1. Risk of the SRI Stocks from the RESPECT Index and the CECE SRI Index

Table 1 below presents the estimates of the beta coefficient for all the constituent stocks from the RESPECT and CEE SRI indices in our sample. Estimation was conducted based on the Sharpe single index model (rather than the excess return model) using monthly data frequency.

Among all 14 stocks from the RESPECT index there are only 5 companies which have the betas higher than 1, while the betas for the remaining 9 companies are lower than 1. The average beta is also lower than 1 and it equals 0.94. Hence, we can conclude that most of the stocks from the RESPECT index in Poland were characterized by lower systematic risk than the market represented by the broad market index WIG.

Similar result is evident in case of the CECE SRI stocks: there are also more stocks with betas smaller than 1 than those with betas greater than 1, i.e. 6 *versus* 4 companies. The average beta is lower than 1 too and it is equal to 0.91.

The results in Table 1, therefore, clearly demonstrate the existence of the asymmetry in favour of the less risky SRI companies in case of both indices RESPECT and CECE SRI.

Further illustration of the pattern of the beta estimates relative to the neutral level of 1 for all the RESPECT and CECE indices companies is shown in Figures 1 and 2.

We tested for heteroscedasticity and autocorrelation of the error term. Heteroscedasticity was not detected in any of the models, so it was not necessary to employ e.g. ARCH class models and the parameters’ estimates were obtained using simple ordinary least squares (OLS) method. However, in some cases, autocorrelation was present, so the appropriate AR terms were added in the relevant equations.

In the next step, we explored further another type of asymmetric effects and we focused our attention on the analysis of semi variances and semi standard deviations for all the constituent stocks from the RESPECT and CECE SRI indices.

Table 2 reports that among RESPECT companies there are 11 stocks for which the positive semi variance is higher than the negative semi variance and only 3 stocks showing the opposite relation. The same pattern is evident for the semi standard deviations. The respective average values at the bottom row of Table 2 confirm this type of asymmetry.

Table 1. Estimates of beta coefficients for constituent stocks from the RESPECT index and CECE SRI index.

| <b>Country</b>  | <b>RESPECT index stocks</b>  | <b>Beta estimate</b> | <b>p-value</b> |
|-----------------|------------------------------|----------------------|----------------|
| Poland          | Grupa Apator                 | 0.67                 | 0.00           |
| Poland          | Grupa Azoty                  | 0.58                 | 0.01           |
| Poland          | Budimex                      | 0.81                 | 0.00           |
| Poland          | Bank Handlowy                | 1.08                 | 0.00           |
| Poland          | Elektrobudowa                | 0.73                 | 0.00           |
| Poland          | ING Bank Śląski              | 0.82                 | 0.00           |
| Poland          | KGHM                         | 1.68                 | 0.00           |
| Poland          | ZEW Kogeneracja              | 0.69                 | 0.00           |
| Poland          | Grupa Lotos                  | 1.57                 | 0.00           |
| Poland          | Bank Millennium              | 1.12                 | 0.00           |
| Poland          | Orange Polska                | 0.65                 | 0.00           |
| Poland          | PGE                          | 0.89                 | 0.00           |
| Poland          | PGNiG                        | 0.80                 | 0.00           |
| Poland          | PZU                          | 1.01                 | 0.00           |
| <b>Average:</b> |                              | <b>0.94</b>          | -              |
| <b>Country</b>  | <b>CECE SRI index stocks</b> | <b>Beta estimate</b> | <b>p-value</b> |
| Hungary         | OTP Bank                     | 1.44                 | 0.00           |
| Hungary         | Richter Gedeon               | 0.75                 | 0.00           |
| Hungary         | Magyar Telecom               | 0.37                 | 0.00           |
| Slovenia        | Krka                         | 0.75                 | 0.00           |
| Slovenia        | Zavarovalnica Triglav        | 1.28                 | 0.00           |
| Slovenia        | Telekom Slovenije            | 1.27                 | 0.00           |
| Slovenia        | Luka Koper Port              | 1.45                 | 0.00           |
| Croatia         | Hrvatski Telekom             | 0.57                 | 0.00           |
| Croatia         | Ericsson Nikola Tesla        | 0.87                 | 0.00           |
| Czech Republic  | O2 CR                        | 0.31                 | 0.00           |
| <b>Average:</b> |                              | <b>0.91</b>          | -              |

Note: The estimations of betas were performed using the following Sharpe single index model:  $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$ , where:  $R_{it}$  are stock  $i$  returns and  $R_{mt}$  is the market index return.

Source: Authors' own calculations.

Figure 1. Beta coefficients of constituent stocks from the RESPECT index.

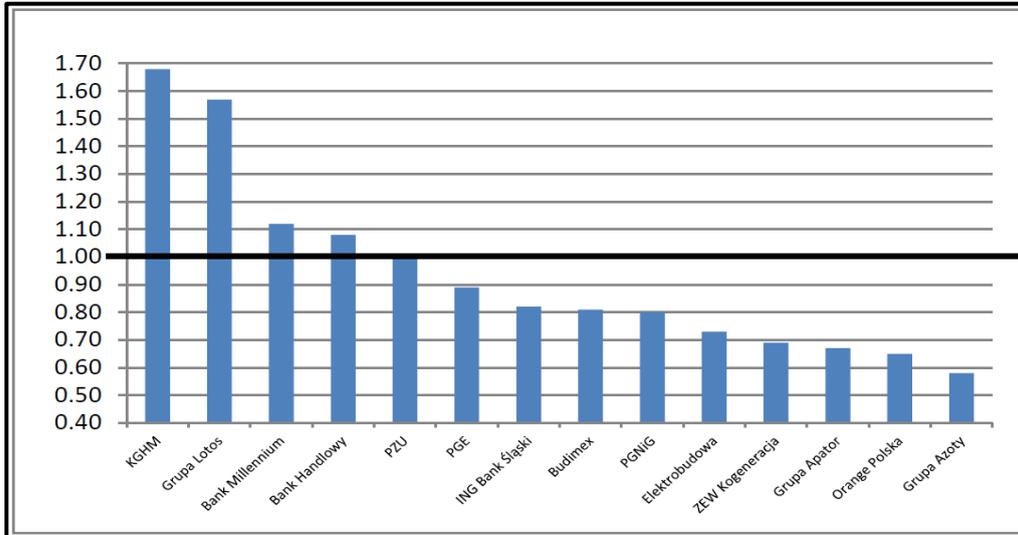
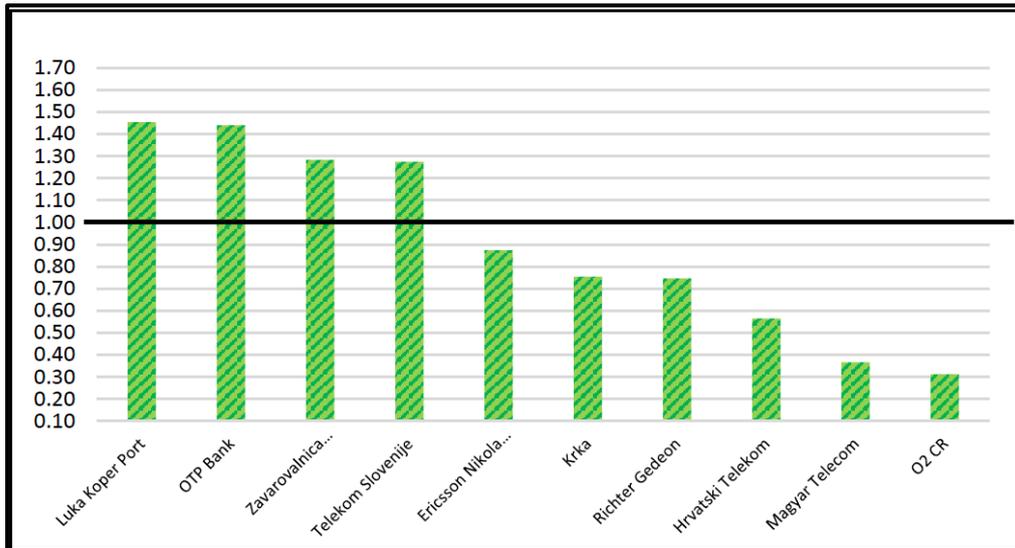


Figure 2. Beta coefficients of constituent stocks from the CECE SRI index index.



Source: Authors' own calculations.

Therefore, the results Table 2 provide further evidence of the asymmetric effects for the SRI stocks from the RESPECT index, which appear to be more resilient during the bear market sub-periods than during the bull market sub-periods. This finding can be interpreted as the evidence of a relatively lower risk of the SRI companies during the stock market downturns.

Similar pattern is visible in case of the CECE SRI companies, which can be treated as a control sample: there is also very clear dominance of stocks for which positive semi variance is higher than the negative semi variance, i.e. 7 *versus* 3 instances, which is further supported by the differences in respective average values of those measures.

After having identified asymmetric risk effects in Table 2, we now focus on the estimation of the dual betas from the Sharpe single index model, which are presented in Table 3 below.

Among all the analysed 14 SRI stocks from the RESPECT index, there are 5 companies, which have higher upside systematic risk than the downside systematic risk. These are obviously the most attractive components of SRI portfolio in terms of its diversification benefits, because on average they gain more during the upside market swings than what they lose during the downside market swings. In Table 3 there is also an asymmetric effect clearly evident. The average dual beta for the bull market (0.81) is substantially lower than the average dual beta for the bear market (1.08).

This asymmetric pattern in dual beta results may appear to be somewhat inconsistent with the semi variance results. However, because beta coefficient measures only the systematic (or non-diversifiable) risk, i.e. the risk which cannot be eliminated by portfolio diversification, it does not inform about the total risk of the stock, which is in turn measured by variance (or standard deviation) of returns. In fact, there is no inconsistency between the semi variance results and the dual betas estimates. In any market, it is possible to identify stocks, which are more risky than average, when we take into consideration the beta coefficient, and less risky than average, when we take into consideration the variance or standard deviation of returns. Variance is more important to the investor, who is not going to build a portfolio of stocks, but who is interested in picking a single stock and making a non-diversifiable investment. This is, obviously, a situation that is less likely to occur in practice. Therefore, from the point of view of portfolio performance, the dual betas are more relevant and more practically important than semi variances or semi standard deviations.

In comparison with the RESPECT companies, the CECE SRI stocks exhibit the opposite asymmetric effect: the average dual beta for the bull market (0.99) is higher than the average dual beta for the bear market (0.82) and both of them are lower than 1.

Table 2. Semi variances and semi standard deviations for constituent stocks from the RESPECT index and the CECE SRI index.

| RESPECT index stocks  |                       | Semi Variance (-) | Semi Variance (+) | Semi Standard Deviation (-) | Semi Standard Deviation (+) |
|-----------------------|-----------------------|-------------------|-------------------|-----------------------------|-----------------------------|
| Poland                | Grupa Apator          | 0.002430          | <b>0.002541</b>   | 0.049296                    | <b>0.050409</b>             |
| Poland                | Grupa Azoty           | 0.004226          | <b>0.005548</b>   | 0.065010                    | <b>0.074484</b>             |
| Poland                | Budimex               | 0.003478          | <b>0.003981</b>   | 0.058976                    | <b>0.063094</b>             |
| Poland                | Bank Handlowy         | <b>0.002348</b>   | 0.002029          | <b>0.048454</b>             | 0.045046                    |
| Poland                | Elektrobudowa         | 0.004150          | <b>0.005749</b>   | 0.064423                    | <b>0.075820</b>             |
| Poland                | ING Bank Śląski       | <b>0.001419</b>   | 0.001257          | <b>0.037665</b>             | 0.035456                    |
| Poland                | KGHM                  | 0.005419          | <b>0.006357</b>   | 0.073616                    | <b>0.079729</b>             |
| Poland                | ZEW Kogeneracja       | 0.003265          | <b>0.003710</b>   | 0.057137                    | <b>0.060913</b>             |
| Poland                | Grupa Lotos           | 0.004393          | <b>0.005085</b>   | 0.066277                    | <b>0.071307</b>             |
| Poland                | Bank Millennium       | 0.003055          | <b>0.003427</b>   | 0.055275                    | <b>0.058543</b>             |
| Poland                | Orange Polska         | <b>0.004334</b>   | 0.002407          | <b>0.065833</b>             | 0.049060                    |
| Poland                | PGE                   | 0.002123          | <b>0.002140</b>   | 0.046074                    | <b>0.046258</b>             |
| Poland                | PGNiG                 | 0.002211          | <b>0.002748</b>   | 0.047019                    | <b>0.052419</b>             |
| Poland                | PZU                   | 0.001584          | <b>0.002104</b>   | 0.039803                    | <b>0.045869</b>             |
| Average:              |                       | 0.003174          | <b>0.003506</b>   | 0.055347                    | <b>0.057744</b>             |
| CECE SRI index stocks |                       | Semi Variance (-) | Semi Variance (+) | Semi Standard Deviation (-) | Semi Standard Deviation (+) |
| Hungary               | OTP Bank              | 0.003113          | <b>0.003683</b>   | 0.055800                    | <b>0.060693</b>             |
| Hungary               | Richter Gedeon        | 0.001572          | <b>0.001819</b>   | 0.039654                    | <b>0.042647</b>             |
| Hungary               | Magyar Telecom        | <b>0.001739</b>   | 0.000857          | <b>0.041709</b>             | 0.029283                    |
| Slovenia              | Krka                  | 0.000960          | <b>0.001228</b>   | 0.030993                    | <b>0.035044</b>             |
| Slovenia              | Zavarovalnica Triglav | 0.001714          | <b>0.004042</b>   | 0.041408                    | <b>0.063580</b>             |
| Slovenia              | Telekom Slovenije     | 0.002140          | <b>0.003159</b>   | 0.046269                    | <b>0.056210</b>             |
| Slovenia              | Luka Koper Port       | 0.002237          | <b>0.008971</b>   | 0.047307                    | <b>0.094716</b>             |
| Croatia               | Hrvatski Telekom      | <b>0.000988</b>   | 0.000905          | <b>0.031443</b>             | 0.030083                    |
| Croatia               | Ericsson Nikola Tesla | <b>0.002207</b>   | 0.002116          | <b>0.046979</b>             | 0.046007                    |
| Czech Republic        | O2 CR                 | 0.001397          | <b>0.022175</b>   | 0.037379                    | <b>0.148913</b>             |
| Average:              |                       | 0.001807          | <b>0.004896</b>   | 0.041894                    | <b>0.060718</b>             |

Note: Results indicated by bold font indicate higher positive / negative semi variances and higher positive / negative standard deviations, respectively.

Source: Authors' own calculations.

Table 3. Estimates of dual beta coefficients for constituent stocks from the RESPECT index and the CECE SRI index in bull market and bear market periods.

| RESPECT index stocks  |                       | Dual beta estimate<br>(bull market) | p-value | Dual beta estimate<br>(bear market) | p-value |
|-----------------------|-----------------------|-------------------------------------|---------|-------------------------------------|---------|
| Poland                | Grupa Apator          | 0.32                                | 0.27    | 1.03                                | 0.00    |
| Poland                | Grupa Azoty           | 0.55                                | 0.21    | 0.61                                | 0.25    |
| Poland                | Budimex               | 1.18                                | 0.00    | 0.39                                | 0.40    |
| Poland                | Bank Handlowy         | 1.16                                | 0.00    | 0.97                                | 0.00    |
| Poland                | Elektrobudowa         | 0.03                                | 0.96    | 2.05                                | 0.00    |
| Poland                | ING Bank Śląski       | 0.90                                | 0.00    | 0.73                                | 0.00    |
| Poland                | KGHM                  | 1.49                                | 0.00    | 1.95                                | 0.00    |
| Poland                | ZEW Kogeneracja       | 0.13                                | 0.69    | 1.19                                | 0.00    |
| Poland                | Grupa Lotos           | 1.14                                | 0.00    | 2.14                                | 0.00    |
| Poland                | Bank Millennium       | 0.83                                | 0.00    | 1.16                                | 0.00    |
| Poland                | Orange Polska         | 0.90                                | 0.01    | 0.33                                | 0.44    |
| Poland                | PGE                   | 0.82                                | 0.00    | 0.99                                | 0.00    |
| Poland                | PGNiG                 | 0.63                                | 0.03    | 1.03                                | 0.00    |
| Poland                | PZU                   | 1.33                                | 0.00    | 0.60                                | 0.02    |
| <b>Average:</b>       |                       | <b>0.81</b>                         | -       | <b>1.08</b>                         | -       |
| CECE SRI index stocks |                       | Dual beta estimate<br>(bull market) | p-value | Dual beta estimate<br>(bear market) | p-value |
| Hungary               | OTP Bank              | 1.43                                | 0.0000  | 1.45                                | 0.0000  |
| Hungary               | Richter Gedeon        | 0.77                                | 0.0000  | 0.72                                | 0.0000  |
| Hungary               | Magyar Telecom        | 0.42                                | 0.0094  | 0.29                                | 0.0552  |
| Slovenia              | Krka                  | 0.71                                | 0.0000  | 0.80                                | 0.0000  |
| Slovenia              | Zavarovalnica Triglav | 1.47                                | 0.0000  | 1.07                                | 0.0000  |
| Slovenia              | Telekom Slovenije     | 1.65                                | 0.0000  | 0.85                                | 0.0006  |
| Slovenia              | Luka Koper Port       | 1.90                                | 0.0000  | 0.95                                | 0.0082  |
| Croatia               | Hrvatski Telekom      | 0.65                                | 0.0001  | 0.45                                | 0.0188  |
| Croatia               | Ericsson Nikola Tesla | 0.49                                | 0.0400  | 1.38                                | 0.0000  |
| Czech Republic        | O2 CR                 | 0.46                                | 0.5972  | 0.23                                | 0.7911  |
| <b>Average:</b>       |                       | <b>0.99</b>                         | -       | <b>0.82</b>                         | -       |

Note: The dual betas estimations were performed using the following version of the Sharpe single index model:  $R_{it} = \alpha_i + \beta_i^{POS} \cdot D \cdot R_{mt} + \beta_i^{NEG} \cdot (1 - D) \cdot R_{mt} + \varepsilon_{it}$ , where:  $D$  is the dummy variable (which takes on the value of 1 when the market index return is non-negative and 0 otherwise when it is negative),  $\beta_i^{POS}$  is the positive dual beta and  $\beta_i^{NEG}$  is the negative dual beta.

Source: Authors' own calculations.

## 4.2. Risk-adjusted Performance of the SRI Stocks from the RESPECT Index and the CECE SRI Index

Below we present the analysis of the performance of the RESPECT index and the CECE SRI index stocks, as well as their benchmark market indices, by using such risk-adjusted measures as the modified Sharpe ratio and also the Certainty Equivalent (*CEQ*) returns.

Table 4 illustrates average monthly returns of WIG and RESPECT indices as well as individual companies from the RESPECT index in the entire period between December 2009 and February 2018. It demonstrates that the investments in the SRI stocks from the RESPECT index group have delivered better excess returns than the broad market index WIG. The average monthly excess return of the WIG index was 0.07%, while for the RESPECT index stocks the average monthly excess return is substantially higher at the 0.43% level.

Out of all 14 stocks from the RESPECT index in our sample, 11 had positive average excess returns and only 3 had negative average excess returns. Moreover, for the stocks with positive returns, the average was +0.71%, while for those with negative returns, the corresponding average was -0.61%, which indicates also an asymmetric effect in favour of stocks which had positive performance.

The dominance of the RESPECT index companies over the broad market index WIG should not be attributed to the size effect, because on average the value of companies in the RESPECT index is much higher. For instance, at the end of 2018 the average market value of the block of stocks of companies from the RESPECT index was PLN 4,486 millions, whereas for the companies from the WIG index it was only PLN 835 millions (own calculations based on the GPW official data from Roczni Giełdowy 2019 (2019)). It also needs to be emphasized that the RESPECT index constituents are mainly large, stable and liquid firms. Because liquidity is used as one of the criteria for identification and inclusion of stocks into the RESPECT index, the RESPECT return higher than the WIG index return can not be a result of the liquidity premium. WIG index portfolio is characterised by lower liquidity and lower capitalization and, therefore, it should yield better results than RESPECT index portfolio (which is more liquid and has higher capitalization).

The values of risk-adjusted measures are also higher for the RESPECT index and most of the individual stocks than for the WIG. The modified Sharpe ratio (*MSR*) for RESPECT is positive at the 0.04 level while for WIG it equals 0.02. For individual stocks it ranges from 0 to 0.17 and its arithmetic average is 0.07.

A similar picture for the RESPECT index stocks as in Table 4 is revealed in Table 5, which reports the *CEQ* measure values for three different variants representing normal risk aversion of investors ( $\gamma=1$ ), lower risk aversion ( $\gamma=0.5$ , i.e. half of normal risk aversion level) and higher risk aversion ( $\gamma=2$ , i.e. double the normal risk aversion level). They also show dominance of the SRI stocks. The average *CEQ* values are always higher for the RESPECT index companies in comparison with the WIG index for all three  $\gamma$  parameters.

Table 4. Average monthly returns, standard deviations and modified Sharpe ratios (*MSRs*) of RESPECT index and CECE SRI index constituent stocks and of the stock market indices.

| RESPECT index stocks      |                       | Average monthly excess return | Standard deviation of average monthly excess return | Modified Sharpe Ratio ( <i>MSR</i> ) |
|---------------------------|-----------------------|-------------------------------|---|--------------------------------------|
| Poland                    | Grupa Apator          | 0.45%                         | 0.07  | 0.06                                 |
| Poland                    | Grupa Azoty           | 1.56%                         | 0.10  | 0.16                                 |
| Poland                    | Budimex               | 1.51%                         | 0.09  | 0.17                                 |
| Poland                    | Bank Handlowy         | 0.44%                         | 0.07  | 0.07                                 |
| Poland                    | Elektrobudowa         | -0.41%                        | 0.10  | 0.00                                 |
| Poland                    | ING Bank Śląski       | 0.73%                         | 0.05  | 0.14                                 |
| Poland                    | KGHM                  | 0.61%                         | 0.11  | 0.06                                 |
| Poland                    | ZEW Kogeneracja       | 0.18%                         | 0.08  | 0.02                                 |
| Poland                    | Grupa Lotos           | 0.71%                         | 0.10  | 0.07                                 |
| Poland                    | Bank Millennium       | 0.60%                         | 0.08  | 0.07                                 |
| Poland                    | Orange Polska         | -0.62%                        | 0.08  | 0.00                                 |
| Poland                    | PGE                   | -0.80%                        | 0.07  | 0.00                                 |
| Poland                    | PGNiG                 | 0.46%                         | 0.07  | 0.06                                 |
| Poland                    | PZU                   | 0.53%                         | 0.06  | 0.08                                 |
| WIG index                 |                       | 0.07%                         | 0.04  | 0.02                                 |
| RESPECT index             |                       | 0.20%                         | 0.05  | 0.04                                 |
| CECE SRI index stocks     |                       | Average monthly excess return | Standard deviation of average monthly excess return | Modified Sharpe Ratio ( <i>MSR</i> ) |
| Hungary                   | OTP Bank              | 0.71%                         | 0.09  | 0.08                                 |
| Hungary                   | Richter Gedeon        | 0.04%                         | 0.06  | 0.01                                 |
| Hungary                   | Magyar Telecom        | -0.76%                        | 0.06  | 0.00                                 |
| Slovenia                  | Krka                  | -0.30%                        | 0.05  | 0.00                                 |
| Slovenia                  | Zavarovalnica Triglav | 0.15%                         | 0.07  | 0.02                                 |
| Slovenia                  | Telekom Slovenije     | -0.50%                        | 0.07  | 0.00                                 |
| Slovenia                  | Luka Koper Port       | 0.35%                         | 0.10  | 0.04                                 |
| Croatia                   | Hrvatski Telekom      | -0.80%                        | 0.04  | 0.00                                 |
| Croatia                   | Ericsson Nikola Tesla | -0.29%                        | 0.07  | 0.00                                 |
| Czech Republic            | O2 CR                 | 1.09%                         | 0.12  | 0.09                                 |
| BUX index (Hungary)       |                       | 0.32%                         | 0.06  | 0.06                                 |
| PX index (Czech Republic) |                       | -0.08%                        | 0.04  | 0.00                                 |
| CROBEX index (Croatia)    |                       | -0.43%                        | 0.04  | 0.00                                 |
| SBITOP index (Slovenia)   |                       | -0.42%                        | 0.04  | 0.00                                 |
| CECE SRI index            |                       | -0.31%                        | 0.04  | 0.00                                 |

Notes: The modified Sharpe ratio of Israelsen (2005) is defined as follows:  $MSR = ER/SD^{ER/absER}$ , where *ER* is the excess return defined as mean monthly difference between the stock (or index) return and the risk-free return and *SD* is the sample standard deviation of the monthly differences of returns.

Source: Authors' own calculations.

Table 5. CEQ returns of RESPECT index and CECE SRI index constituent stocks and of the stock market indices.

| RESPECT index stocks      |                       | CEQ for $\gamma = 0.5$ | CEQ for $\gamma = 1$ | CEQ for $\gamma = 2$ |
|---------------------------|-----------------------|------------------------|----------------------|----------------------|
| Poland                    | Grupa Apator          | 0.0032                 | 0.0020               | -0.0005              |
| Poland                    | Grupa Azoty           | 0.0131                 | 0.0107               | 0.0058               |
| Poland                    | Budimex               | 0.0132                 | 0.0113               | 0.0076               |
| Poland                    | Bank Handlowy         | 0.0033                 | 0.0022               | 0.0000               |
| Poland                    | Elektrobudowa         | -0.0066                | -0.0091              | -0.0141              |
| Poland                    | ING Bank Śląski       | 0.0067                 | 0.0060               | 0.0046               |
| Poland                    | KGHM                  | 0.0032                 | 0.0002               | -0.0057              |
| Poland                    | ZEW Kogeneracja       | 0.0000                 | -0.0017              | -0.0052              |
| Poland                    | Grupa Lotos           | 0.0047                 | 0.0023               | -0.0025              |
| Poland                    | Bank Millennium       | 0.0044                 | 0.0027               | -0.0006              |
| Poland                    | Orange Polska         | -0.0079                | -0.0096              | -0.0130              |
| Poland                    | PGE                   | -0.0091                | -0.0101              | -0.0123              |
| Poland                    | PGNiG                 | 0.0033                 | 0.0021               | -0.0004              |
| Poland                    | PZU                   | 0.0043                 | 0.0033               | 0.0013               |
| WIG index                 |                       | 0.0002                 | -0.0002              | -0.0012              |
| RESPECT index             |                       | 0.0014                 | 0.0008               | -0.0004              |
| CECE SRI index stocks     |                       | CEQ for $\gamma = 0.5$ | CEQ for $\gamma = 1$ | CEQ for $\gamma = 2$ |
| Hungary                   | OTP Bank              | 0.0051                 | 0.0030               | -0.0010              |
| Hungary                   | Richter Gedeon        | -0.0006                | -0.0015              | -0.0035              |
| Hungary                   | Magyar Telecom        | -0.0084                | -0.0092              | -0.0108              |
| Slovenia                  | Krka                  | -0.0037                | -0.0043              | -0.0056              |
| Slovenia                  | Zavarovalnica Triglav | 0.0001                 | -0.0013              | -0.0041              |
| Slovenia                  | Telekom Slovenije     | -0.0063                | -0.0077              | -0.0105              |
| Slovenia                  | Luka Koper Port       | 0.0011                 | -0.0012              | -0.0060              |
| Croatia                   | Hrvatski Telekom      | -0.0085                | -0.0090              | -0.0100              |
| Croatia                   | Ericsson Nikola Tesla | -0.0041                | -0.0053              | -0.0077              |
| Czech Republic            | O2 CR                 | 0.0074                 | 0.0039               | -0.0032              |
| BUX index (Hungary)       |                       | 0.0024                 | 0.0016               | 0.0001               |
| PX index (Czech Republic) |                       | -0.0012                | -0.0017              | -0.0026              |
| CROBEX index (Croatia)    |                       | -0.0047                | -0.0052              | -0.0060              |
| SBITOP index (Slovenia)   |                       | -0.0046                | -0.0050              | -0.0059              |
| CECE SRI index            |                       | -0.0036                | -0.0041              | -0.0051              |

Notes: The Certainty Equivalent ( $CEQ$ ) returns are defined as follows:  $CEQ = ER - (\gamma/2) \cdot var(ER)$ , where  $ER$  is the excess return, defined as mean monthly difference between the stock (or index) return and the risk-free return and  $var(ER)$  is the variance of  $ER$ .

Source: Authors' own calculations.

The results in Tables 4 and 5 for the CECE SRI stocks, as our control sample group, show a similar picture, i.e. the performance of the CECE SRI companies proves to be better relative to the respective conventional indices from the markets where they come from. The average monthly excess returns for the 10 CECE SRI stocks is -0.03%, whereas the average excess return for the benchmark indices is -0.15%. The corresponding *MSR* measure values confirm this pattern. The average *MSR* for the CECE SRI stocks is 0.024 and it is substantially higher than the average *MSR* for the respective conventional indices, which is only 0.015.

## 5. Conclusions

We present empirical evidence, which shows risk patterns among the SRI stocks from the RESPECT index from the Warsaw Stock Exchange, as the oldest SRI index in the CEE countries, and the stocks from the CECE SRI index from the broader CEE region. The key conclusions from our study are as follows.

*First*, the estimates of the beta coefficients for the SRI stocks in Poland are on average smaller than 1, which indicates that their risk is lower relative to the wider market. The same effect is also evident in the group of the CECE SRI companies. *Second*, there exists also an asymmetric effect in favour of the less risky SRI stocks among the estimates of the beta coefficients for the stocks from both the RESPECT and the CECE SRI indices. *Third*, we found further asymmetric effects in the total risk of the RESPECT index stocks, which tend to be more resilient during the bear market periods than during the bull market periods. This finding can be interpreted as evidence of a relatively lower risk of the SRI companies during stock market downturns. Moreover, the dual betas estimates further show that among all the 14 analysed SRI stocks from the RESPECT index, there are 5 companies, which have higher upside systematic risk than the downside systematic risk. These are the most attractive components of SRI portfolio in terms of its diversification benefits. There is also another asymmetric effect evident: the average dual beta for the bull market is lower than the average dual beta for the bear market. These results are practically important and directly relevant from the point of view of stock portfolios construction and the evaluation of their performance. In comparison, the CECE SRI stocks also exhibit asymmetric patterns, but they are different than in case of the RESPECT companies. *Fourth*, the investigation of the risk-adjusted measures leads to the conclusion that the SRI stocks risk is not detrimental to their overall performance. On the contrary, the SRI companies from both the RESPECT index and the CECE SRI index achieve the results, which are on average better than the corresponding measures for the benchmark conventional indices.

The methodology which we used is designed mainly to capture asymmetric effects in risk, but it does not allow us conclude whether the results of this research that concern the risk of the analysed stocks (which is on average lower than the broad market's risk) or their performance (which is better than the broad market's performance) are a direct result of socially responsible practices of the SRI companies or the results of the method of stocks inclusion into the SRI indices. However, we are able to state that better performance measures of the analysed SRI stocks are not due to the size effect or liquidity premium, because the RESPECT

constituents are mainly large, stable and liquid firms, which additionally had to go through a strict selection process before they could be included in the RESPECT index. This situation may have contributed to the relatively lower risk, which we report in this study.

In summary, we conclude that the SRI stocks in Poland, which were constituents of the RESPECT sustainability index, as well as the stocks from the CECE SRI index from other CEE countries, were characterised by relatively lower risk than the broader market, better risk-adjusted performance and they also exhibited a clearly asymmetric risk behaviour.

Our findings have also direct implications for the practitioners and the stakeholders, because the knowledge about the asymmetric effects in the SRI stocks risk, which is captured by the dual beta estimates, is very useful for them due to a variety of reasons. For instance, most practitioners use the CAPM beta (i.e. traditional beta) as their primary measure of risk. If this conventional beta misrepresents the actual risk (in particular during the bull and bear market episodes), then the calculations of the cost of equity and all other subsequent assessments of the intrinsic value of companies may be severely inaccurate. This situation has also serious implications for other types of decision-making processes on the broader financial market, such as pricing of the initial public offerings (IPOs) and timing of the IPO offers with respect to the bull and bear market periods. Moreover, the firms for which the upside / downside trade-off is understated by traditional betas constitute attractive long-position opportunities, while in case of companies for which this trade-off is overstated there exist short-selling opportunities (especially in bear market periods). Our results show that due to the existence of the asymmetric risk patterns, which we found and report in our study, this issue should be also taken into consideration by the SRI investors.

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