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CORPORATE SOCIAL RESPONSIBILITY AT THE GLOBAL LEVEL: AN INVESTIGATION OF PERFORMANCES AND INTEGRATION OF SOCIALLY RESPONSIBLE INVESTMENTS

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ABSTRACT. Our paper analyses the performance of socially responsible investments (SRI) as evidenced by a number of global and regional indices. We investigate the degree of price co-movements among global SRI markets by using vector-autoregressive models, Granger-causality and innovation accounting techniques, in order to detect their interdependence in terms of level and structure. The results of our research indicate that SRI markets, both at national and regional level, are interdependent, although less than expected given the crisis period under analysis. However, since these markets are somehow segmented, managers of SRI funds may still benefit from the virtues of international diversification when deciding to extend their holdings of SRI assets abroad. At the same time, since these markets are integrated to some extent, the perils of shocks propagating from one country to the other cannot be ignored, which requires a consistent policy in the area of SRI markets regulation, so that contagion risks may be better mitigated.

***JEL Classification**: G01, G11, G30, M14*

Keywords: corporate social responsibility, socially responsible investing, portfolio performance, capital market integration, international diversification

Introduction

Corporate social responsibility (CSR) may be considered nowadays an issue that is fully integrated in companies and organizations' operational management practices, and the positive link between companies' social involvement and financial performance is evidenced by the literature. The most important directions that observe the positive effects of companies' involvement in various activities, projects, programs or strategies in the area of CSR and that have the potential of supporting their competitive advantages at the global level are reputation risk management, conflict management, access to capital and investors' relations, learning and innovation, competitiveness and market positioning, and operational efficiency. Annually, various surveys conducted at national or global level (for example: State of Corporate Social Responsibility Review conducted by the Australian Centre for Corporate Social Responsibility,

Corporate Social Responsibility Survey of Hang Seng Index Constituent Companies, The Corporate Social Responsibility Index published by Boston College and Reputation Institute etc.) investigate the perception on companies' reputation and the propensity towards being employed by such companies. More recently, they gave way to a new investment strategy that acknowledges companies' CSR activities and integrates them in stock market investments: socially responsible investing (SRI).

Socially responsible investments have grown considerably in recent years, as evidenced by statistics on assets under management by various investment funds around the world. According to the 2010 Report on Socially Responsible Investing Trends published by the Social Investment Forum in the United States, the value of total assets under management that used at least one of the sustainable and responsible investing strategies in 2010 was 3.07 trillion USD (or 2.31 trillion Euro) , on a growing trend with a rate of more than 13% since 2007. Moreover, the report evidenced that approximately one out of eight dollars under professional management in the United States is somehow involved in such type of investing. The Canadian Socially Responsible Investment Review 2010 conducted by the Canadian Social Investment Organisation reported that total Canadian assets invested according to SRI guidelines had a value of 530.9 billion Canadian dollars (or 432.64 billion Euro) as of June 2010, with a share of 19.1% of the total assets under management in Canada. The Responsible Investment Annual Report 2011 published by Responsible Investment Association Australasia also evidenced increased activity and value of assets under management for investments that comply with SRI guidelines in Australia and New Zealand: between 2010 and 2011, core responsible investment rose by 8%, from 18.12 billion Australian dollars (or 12.56 billion Euro) to 19.55 billion Australian dollars (or 14.0 billion Euro).Also, the increase in responsible investment portfolios (1.8%) was higher compared to all assets under management in the two countries. Japan is the leading market in Asia, with a total assets value of Publicly Offered SRI Investment Trusts of 267,356 JPY million (or 2,575.93 million Euro) in September 2011, as indicated by the 2011 Review of Socially Responsible Investment in Japan conducted by the Social Investment Forum Japan. The Euros if SRI 2010 Study shows that the European Sustainable and Responsible investments have significantly grown since 2008, with total assets under management reaching almost 5 trillion Euro at the end of 2009 from 2.7 trillion Euro in 2007, which indicates a compound annual growth rate (CAGR) of 37%. At the same time, the report substantiates significant differences between national markets in terms of size, growth, market share and strategies of SRI investors. These figures show that socially responsible investments have matured in recent years and have changed from an activity undertaken by a few investment funds to an investing approach adopted by large institutional investors. It is worth mentioning that traditional and SRI equity funds have experienced negative growth between 2007 and2009, although assets' value in SRI equity funds has decreased less than for assets in traditional equity funds. In terms of market share of SRI funds compared to the overall European asset management market, an EFAMA (European Fund and Asset Management Association) report from 2010 estimates the overall value of European asset management industry at 10.7 trillion Euro for both investment funds and discretionary mandates by the end of 2008, which leads to a share of SRI assets in Europe at around 10% in 2009, based upon a average growth rate of 8.4% between 2008 and 2009.

In this framework, it is expected from SRI to represent a form of influence over companies to more consistently address and implement CSR policies (Sparkes and Cowton, 2004).

Besides an analysis of SRI strategies put into practice by institutional investors, an understanding of how international SRI markets behave is crucial from another point of view: the benefits that investors may derive from holding internationally diversified portfolios instead of domestic portfolios. As such, knowing the extent of linkages between national SRI markets

becomes motivating for managers of SRI assets due to the fact that the risk of shocks originating in one country propagating to another market is higher when markets are integrated. The goal of our paper is to address the issue of whether corporate social responsibility actions and policies, embedded in the performance of SRI indices, are evaluated in an international or a national context. In case of a demonstrated high level of integration across SRI markets worldwide, there are reasons to believe that valuation of companies involved in CSR activities is valued in a global framework, while in case of market segmentation such valuation takes place mostly in a national context. Our paper contributes to both the literature on SRI and on capital market integration, as it provides more evidence on the intensity of SRI markets integration around the world based on VAR-related methodologies. Since the period under analysis is represented by the years of the global financial crisis (2008-2012), we investigate market integration in a context that has not been previously addressed in the SRI literature; to our knowledge, the only study that investigated SRI market integration belongs to Roca et al. (2010). The novelty of our study stems from the following: first, we specifically cover only the financial crisis period, when markets are considered to have become more integrated; second, we take into account not only national SRI markets, but also regional markets, with the aim of better understanding the patterns in market interactions at the global level.

The paper is structured as follows: the next section provides information on CSR and SRI practices, and on the performance of socially responsible investments contrasted against the performance of normal investments, as well as on the extent of capital market integration, as evidenced by the existing literature. Section three presents the data used in our analysis and the research methodology. Section four shows and discusses the most important empirical results we obtained, and is followed by the last section of our paper, which presents our conclusions.

Literature review

To a higher extent, CSR strategies employed by global companies became an integral and essential component of the business strategy; there are even companies (Vodafone and AT&T, for example), that make no difference between their normal business and CSR strategy. CSR strategies are viewed as representing protection instruments against potential crises, as tools for improving the company's global performance and, in the end, as a means for value creation for stakeholders. Also, many authors refer to the positive impact of CSR activity on companies' operations, in the form of attracting and retaining high quality employees, generating a positive corporate image, increasing reputation, reducing operational costs and increasing the quality of the products and services offered by the company (Stancu *et al.*, 2011). But besides the theoretical discussion on CSR practices and significance, one needs to address the link between CSR and company's performance. From this perspective, SRIs have emerged as an approach that capitalizes on the so-called "moral" companies being perceived as being able to provide investors with higher benefits as compared to normal investments.

The literature on the correlations between profitability and corporate responsibility is rather vast and, despite the different manners of measuring social responsibility and financial performance, authors generally agree that they are positively correlated. For Greenberg (2010) this comes as no surprise, since companies that are financially successful invest more in social causes given their financial power, while companies that are socially responsible tend to have a good financial performance – the author calls it "the virtuous circle". Pearce (2003) also shows that a company with a more intense CSR activity is more likely to have more success in generating Economic Value Added, for reasons that are present in its business strategy. Corporate social performance is found to be positively associated with prior financial performance (Waddock and Graves, 1997), and also positively related with future financial performance, which supports the theory that good company management and social

performance are positively related. But McWilliams and Siegel (2000) suggest that econometric studies on the link between company's social and financial performance are flawed, as they do not take into account R&D activity as an important determinant of firm performance. By applying a model that controls for this misspecification, the authors find that CSR activities have only a neutral impact on financial performance.

Nevertheless, the emergence of a new paradigm concerning the measurement of company performance is obvious, as the transition from the shareholders-oriented to the stakeholders-oriented company has brought about a changeover from financial reporting to social reporting, so that companies are able to measure and manage their global performance on more than the economic dimension. In this framework, Devinney (2009) studies the interrelations between CSR and company performance and proposes four categories of reasons that should prompt managers to assume CSR initiatives: the impact on demand for their products and consumers, the impact on cost, productivity and efficiency, the impact on tangible assets, innovation and assets' durability, and the impact on risk, specifically on cost of capital. Actually, the interest of financial market investors towards companies that implement CSR policies may be motivated, as suggested by Renneboog *et al.* (2006) and Bollen (2007) by a lower cost of capital that stems from lower company exposure to environmental and/or reputation risks.

Building on the presumed superior performance of companies that are active in the CSR field SRI has developed as an investment approach that attempts to combine the natural pursuit of financial returns by capital market investors and their desire to take into account environmental, social and governance considerations when investing in financial assets. SRI differ from traditional investments by means of a number of screening practices employed that are targeted at identifying companies that adhere to environmental, social and governance (ESG) requirements. Roca *et al.* (2010) review the three types of screening practices applied by fund managers, as follows: (1) negative screening – it excludes the so-called "sin stocks", which belong to companies operating in industries such as alcohol, tobacco, gambling, weapons or pornography; (2) positive screening – it selects, for inclusion in the fund's assets, only those companies that are committed to social and environmental issues; and (3) the best-of-sector approach, which involves identifying the leading companies in an industry that propel it towards a sustainable future. The effective application of these screening practices has different effects on funds' portfolios performance. An important point to be made here is the one advanced by Mill (2006), which argues that the use of screens may result in supplementary costs for the investment fund which, in turn, may result in lower net returns.

In fact, the literature on the performance of SRI funds versus traditional funds seems to indicate that there are no significant differences between the two investment approaches. In a recent paper, Mollet and Ziegler (2012) examine the relationship between SRI and stock performance in the US and Europe using a four-factor model, and find that an investment strategy based on SRI generally leads to insignificant abnormal returns and that SRI does not seem to be either penalized or rewarded by stock markets in both regions. In their study of Australian SRI funds, Benson *et al.* (2006) find that SRI funds exhibit different industry betas depending on a portfolio's position, but also that these risks are not stable over time. Furthermore, they find that SRI fund managers do not benefit from a superior stock-picking ability compared to traditional fund managers, which raises the issue of a true better performance of SRI. Moving closer to our research, Managi *et al.* (2012) investigate whether more socially responsible firms outperform conventional firms, by the use of SRI indexes and conventional stock indexes in US, UK and Japan. After applying a Markow switching model, they find no statistical difference in means and volatilities between SRI and conventional indexes, and also strong co-movement between the two types of indexes in both regimes.

Under these circumstances, an important source of return for SRI funds might be represented by international diversification and, given the recent growth in SRI, this has to be

considered by fund managers. There is one obstacle, though, that fund managers should take into account when considering diversifying their holdings abroad: simply put, the correlations between worldwide SRI markets, and, to a more advanced level, the extent and intensity of linkages between national and/or regional SRI markets. Thus, we enter the field of international capital market integration, which was extremely well studied in recent years. The result is an impressive number of studies that address the issue from different perspectives, but one has to observe that the literature fails to provide definitive conclusions on the matter. Rangvid (2001) identifies a rise in the degree of convergence among European stock markets in the last two decades, followed by Pascual (2003), who finds evidence of increasing integration of the French stock market, but not of the British and German markets; at the same time, Lee (2005) finds that conditional correlations between the US, Japan, and the Hong Kong stock markets are positive and increasing. More recently, Bekaert *et al.* (2009) use a risk-based factor model and conclude that no evidence of an upward trend in returns' correlation across countries is observable, except in the case of European stock markets. Their findings are accompanied by research – for example, Goetzmann *et al.* (2001), del Negro and Brooks (2002), Heaney *et al.* (2002), and Larrain and Tavares (2003),– that shows that cross country correlations in stock returns change over time and are generally higher in periods of accentuated integration and of high volatility of returns.

In the same line of research related to market integration, some studies have investigated the way markets respond to influences coming from other markets. The existing evidence shows that, by far, the United States is the most influential stock market, at least for what concerns the other developed stock markets (see, for example, the research of Fischer and Palasvirta (1990), and of Eun and Shim (1989). Nevertheless, other research suggests that the US market may also receive influences from other markets: in a recent paper, Huyghebaert and Wang (2010) report influences on the US market originating from Singapore and Hong Kong, after implementing a Granger-causality test. In summary, knowing the level of integration between SRI markets, in the framework of increased capital market integration, is critical for the strategies implemented by fund managers that choose to follow SRI approached and aimed at achieving a better risk-return profile of their portfolios.

Data and research methodology

Our study focuses on international integration of SRI markets by taking into account national and regional stock market indices constructed by MSCI that include companies that are screened for respecting high environmental, social and governance (ESG) ratings. There are two categories of indices that we use: (i) MSCI ESG Best-in-class Indices, which include companies that enjoy high ESG ratings compared to their sector peers – these indices cover both global developed markets and the US market; (ii) MSCI SRI Indices, which exclude companies that are involved in business activities that investors may decide to avoid – such as tobacco, nuclear power and GMOs – and, at the same time, include companies with very high ESG ratings compared to their sector peers. Therefore, we explore the international integration of SRI markets by considering both screening perspectives – inclusion and exclusion – taken into account by market indices. The national markets we cover are Australia, Canada, Japan, United Kingdom and United States, while the regional indices we employ in our analysis are MSCI Europe (consists of 16 developed market country indices: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom), MSCI North America (consists of Canada and USA), and MSCI Pacific (consists of five developed market country indices: Australia, Hong Kong, Japan, New Zealand, and Singapore).

The empirical analysis has been carried out on daily data for the period July 1, 2008 to June 29, 2012. The period was determined depending on data availability. The period under analysis covers to a high extent the current financial crisis, which offers us the possibility of observing the process of SRI market integration during more turbulent times relative to previous research (for example, Roca et al., 2010, cover the period between 1994 and 2010, thus preceding the turbulent period after 2010 portrayed by the sovereign debt crisis). All indices price values are in US dollars and were collected from the Morgan Stanley Capital International database. Logarithmic daily returns based on indices values are effectively used in our analysis. *Figures 1* and *2* present the evolution of national and regional indices. One may observe the drop in all indices towards the end of 2008 as a result of the global financial crisis, the subsequent recovery accompanied by a rather high volatility, the smaller drop at the end of 2011 and beginning of 2012 induced by the sovereign debt crisis, and the unstable recovery afterwards.

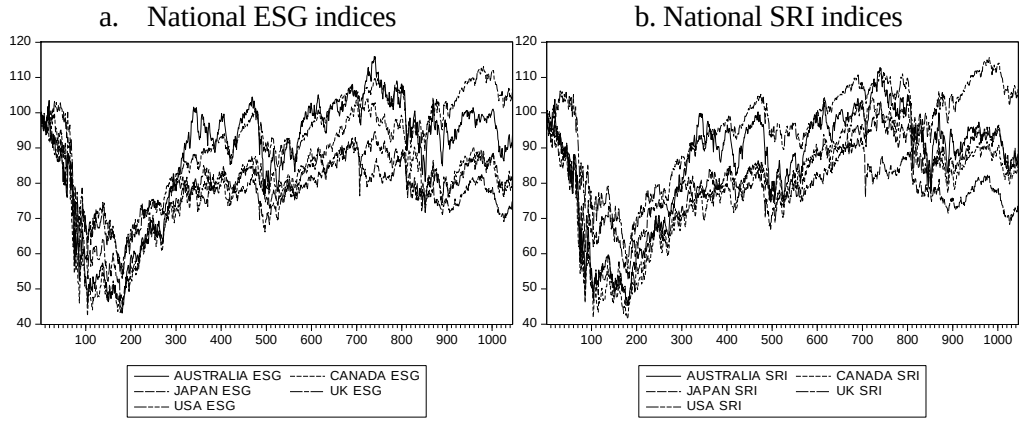

Figure 1. National indices movement, 2008-2012

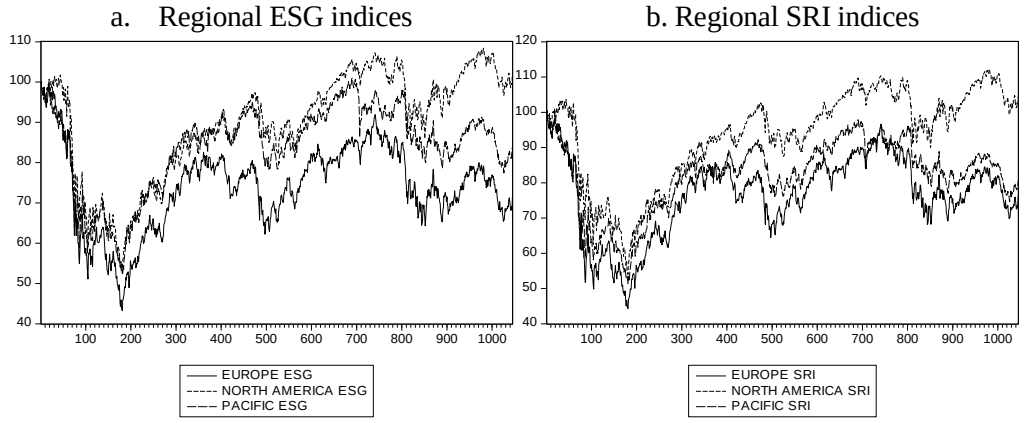

Figure 2. Regional indices movement, 2008-2012

In order to explore the dynamic interactions among international SRI markets, a vector auto-regressive (VAR) analysis is performed. The literature still debates the specification of a VAR when the time series are cointegrated in levels: while Naka and Tufte (1997) find that over short-time horizons both an unrestricted VAR in levels and a Vector-error correction model (VECM) offer comparable performance, there are authors such as Clements and Henry (1995), and Hoffman and Rasche (1996) that find the unrestricted VAR more appropriate. As results provided by the existing literature on the proper specification of a VAR are not very conclusive, we implement VAR in an unrestricted format.

We estimate four VAR systems, of which two are five-market systems that refer to the national indices and two are three-market systems that take into account regional indices. The VAR analysis is undertaken based on the following equation:

$$R_t = \alpha_t + \sum_{k=1}^{L} \beta_k R_{t-k} + \varepsilon_t \qquad (1)$$

where R_t is a 5×1 and, respectively, 3×1 column vector of daily indices returns, and α_t and β_k are 5×1 and 3×1, respectively 5×5 and 3×3 matrices of coefficients. L indicates the lag length, while ε_t is a 5×1 and 3×1, respectively, column vector of serially uncorrelated errors. By definition, the i,j^{th} constituent of the β_k matrices measure the immediate effect of a change in the return of the j^{th} market on the i^{th} market in the k period. As a result, one may consider that the i^{th} constituent of the ε_t is the innovation induced by the i^{th} market in the system that cannot be forecasted by using past returns of the other markets included in the VAR system.

In addition to VAR systems, we use Granger causality tests and innovation accounting techniques – more specifically, impulse response functions (IRF) and variance decomposition (VD) – to investigate the long-term versus the short-term dynamics of the links between international SRI markets. Granger causality tests are used to identify the direction of information transmission between SRI markets and to determine the leading and lagging markets. By definition, a series X_t Granger-causes another series Y_t if Y_t can be predicted better by using the past values of X_t than by using only the historical values of Y_t.

Innovation accounting techniques, on the other hand, allow for the discovery of innovations' effects on variables that are part of the VAR system. The IRF captures the intensity and direction of the response in one variable to innovations (or shocks) in another variable, while VD shows the contribution of a variable's forecast error variance to another variable error variance.

Before performing the VAR analysis we conduct tests on data stationarity, on one hand, and on the optimal lag lengths to be used, on the other hand. Data stationarity was verified using the Augmented Dickey Fuller (ADF) and Philips Perron (PP) unit root tests. Since these tests are standard practice in the field of quantitative analysis and very well-known in the literature, we do not provide a discussion of these tests here. The optimal lag lengths were decided based on the Schwarz Information Criterion (SIC).

Empirical results

We present our results organized around the steps carried out in our analysis for each of the four VAR analyses we have performed.

Descriptive statistics

Table 1 presents the most important descriptive statistics for the series under analysis. All national SRI markets recorded negative average daily returns, except for the United States, the lowest return being found in the case of Japan, both for ESG and SRI indices. Returns displayed a rather high volatility, the US being the market with the lowest volatility and Australia the market with the highest volatility in both ESG and SRI case. Return series based on regional indices also have negative average returns except for the North America indices, accompanied by high volatility, although on average lower compared to national return series, which is the effect of international diversification. The table points to the presence of non-normality in all return series, observed by negative values of the skewness in the majority of indices – the only exception is the Europe SRI index – and by values of kurtosis higher than 3 that indicate leptokurtic return distributions in all return series. Moreover, the Jarque-Bera normality test confirms that series not following a normal distribution.

Table 1. Descriptive statistics for return data series

	AUS_ESG	CAN_ESG	JAP_ESG	UK_ESG	USA_ESG	AUS_SRI	CAN_SRI	JAP_SRI	UK_SRI	USA_SRI
Mean	-0.00006	-0.00020	-0.00027	-0.00019	0.00008	-0.00012	-0.00014	-0.00028	-0.00011	0.00005
Standard deviation	0.02208	0.02068	0.01672	0.01935	0.01731	0.02156	0.02077	0.01725	0.02150	0.01687
Skewness	-0.69366	-0.64661	-0.05199	-0.06209	-0.25601	-0.82565	-0.65647	-0.04328	-0.15476	-0.18398
Kurtosis	9.03382	8.86088	8.94886	8.57286	9.24048	9.55907	9.66108	8.87876	8.60463	8.56940
Jarque-Bera	1667.43*	1566.97*	1539.89*	1351.64*	1705.45*	1990.04*	2005.08*	1503.68*	1370.58*	1355.18*

	EUR_ESG	NAM_ESG	FE_ESG	EUR_SRI	NAM_SRI	FE_SRI
Mean	-0.00032	0.00002	-0.00025	-0.00024	0.00005	-0.00024
Standard deviation	0.01987	0.01709	0.01607	0.01985	0.01673	0.01654
Skewness	-0.03578	-0.38553	-0.12523	0.03568	-0.28221	-0.12501
Kurtosis	6.57045	8.83553	8.85566	7.25513	8.50904	8.77834
Jarque-Bera	554.76*	1507.18*	1494.29*	787.84*	1334.06*	1455.15*

Note: * denotes significance at 1%

Source: own calculations

Correlation analysis

The correlation analysis is preliminary to the analysis of market integration, as it shows the extent and intensity of market co-movements in the period considered. As one may observe in *Table 2a*, correlation values between national ESG markets vary between 0.006 (for Japan and USA) and 0.694 (for Canada and United Kingdom), which does not indicate a high degree of co-movement between these markets, although the analysis covers a crisis period generally acknowledged in the literature by an increase in market correlations. The same conclusions can be reached when analysing national SRI indices. In the case of regional indices, the lowest correlations are found between North America and Far East (0.057 for ESG indices and 0.056 for SRI indices), while the highest are between Europe and North America (0.661 for ESG indices and 0.623 for SRI indices). Again, these values do not point towards a high degree of market co-movement. Consequently, this indirectly suggests a certain level of market segmentation in the case of SRI markets, which remains to be confirmed by our subsequent analysis based on methodologies that overcome the weaknesses of correlation (more specifically the assumption of linearity) and allow for multivariate specifications.

Table 2a. Correlation values between national SRI markets, 2008-2012

	AUS_ESG	CAN_ESG	JAP_ESG	UK_ESG	USA_ESG		AUS_SRI	CAN_SRI	JAP_SRI	UK_SRI	USA_SRI
AUS_ESG	1					AUS_SRI	1				
CAN_ESG	0.529*	1				CAN_SRI	0.513*	1			
JAP_ESG	0.553*	0.224*	1			JAP_SRI	0.550*	0.224*	1		
UK_ESG	0.663*	0.694*	0.251*	1		UK_SRI	0.669*	0.701*	0.277*	1	
USA_ESG	0.308*	0.736*	0.006	0.584*	1	USA_SRI	0.292*	0.715*	0.012	0.550*	1

Note: * denotes significance at 1% and *** denotes significance at 10%

Source: own calculations

Table 2b. Correlation values between regional SRI markets, 2008-2012

	EUR_ESG	NAM_ESG	FE_ESG		EUR_SRI	NAM_SRI	FE_SRI
EUR_ESG	1			**EUR_SRI**	1		

NAM_ESG	0.6613*	1		**NAM_SRI**	0.6239*	1	
FE_ESG	0.2707*	0.0571***	1	**FE_SRI**	0.2978*	0.0560***	1

Note: * denotes significance at 1% and *** denotes significance at 10%

Source: own calculations

VAR analysis

Before implementing the VAR analysis, we tested the return data series for the presence of unit roots using the ADF and PP stationarity tests. Results of both tests have shown that all return series are stationary at 1% level of significance. Furthermore, we determine the optimum lag length to use in the VAR system by applying the Schwarz Information Criterion (SIC) – *Table 3* shows the results: we have implemented a VAR system considering 1 lag for the national return series and a VAR system with 2 lags for the regional return series.

Table 3. Optimal lag length results

VAR system	**Lags**			
	0	**1**	**2**	**3**
National ESG returns	-27.9020	-28.6243*	-28.6263	-28.5280
National SRI returns	-27.6277	-28.3101*	-28.3053	-28.2003
Regional ESG returns	-16.3881	-17.0476	-17.0630*	-17.0425
Regional SRI returns	-16.3086	-16.9411	-16.9432*	-16.9216*

Note: * indicates the lowest value of the SIC

Source: own calculations

Tables 4a and *4b* show the results of the VAR analysis, aimed at discovering the extent of market linkages. We find that all markets have at least one significant coefficient for another market influencing it and, at the same time, all markets have significant coefficients in the equations where another market is the dependent variable. By far the most influential market is the US one, as it seems to most influence all the other markets – it has significant coefficients in the equations for Australia, Canada, Japan and the United Kingdom, when both ESG and SRI return series are taken into account. On the other hand, Japan is the market that is most influenced by the others, more specifically by the United Kingdom and the USA.

Table 4a. Vector Autoregression results for national ESG returns

	AUS_ESG	**CAN_ESG**	**JAP_ESG**	**UK_ESG**	**USA_ESG**
AUS_ESG – Lag 1	-0.1995 (0.0409)*	0.03013 (0.0452)	-0.0028 (0.0299)	0.0054 (0.0408)	0.05048(0.0384)
CAN_ESG – Lag 1	0.071043 (0.0476)	-0.2622 (0.0526)*	0.04756 (0.0349)	-0.0044 (0.0475)	-0.1822 (0.0447)*
JAP_ESG – Lag 1	-0.0211 (0.0417)	-0.0321 (0.0461)	-0.1895 (0.0306)*	-0.0099 (0.0416)	-0.0654 (0.0392)**
UK_ESG – Lag 1	0.00811(0.0481)	0.07315 (0.0532)	0.2233 (0.0352)*	-0.2558 (0.0480)*	0.0446 (0.0425)
USA_ESG – Lag 1	0.6977 (0.0509)*	0.3922 (0.0563)*	0.3505 (0.0373)*	0.4850 (0.0508)*	0.0085 (0.0478)

Note: * denotes significance at 1% and *** denotes significance at 10%

Source: own calculations

Table 4b. Vector Autoregression results for national SRI returns

	AUS_SRI	**CAN_SRI**	**JAP_SRI**	**UK_SRI**	**USA_SRI**
AUS_SRI – Lag 1	-0.2142 (0.0407)*	.0116 (0.0463)	0.0157 (0.0316)	-0.0584 (0.0461)	0.0534 (0.0377)
CAN_SRI – Lag 1	0.0906 (0.0461)**	-0.1992 (0.0523)*	0.0802 (0.0358)*	0.0999 (0.0521)**	-0.1665 (0.0426)*
JAP_SRI – Lag 1	-0.0134 (0.0396)	-0.0429 (0.0449)	-0.1987 *0.0307)*	0.0000 (0.0447)	-0.0610 (0.0366)**
UK_SRI – Lag 1	0.0263 (0.0430)	0.0923 (0.0488)**	0.1616 (0.0334)*	-0.1997 (0.0487)*	0.0568 (0.0398)
USA_SRI – Lag 1	0.6526 (0.0492)*	0.3021 (0.0558)*	0.3673 (0.3815)*	0.4295 (0.0556)*	-0.0403 (0.0454)

Source: own calculations

For what concerns the regional indices, there are significant coefficients in the VAR for all markets; the European and North American markets seem to have a stronger influence on the Far East market. These results suggest a high degree of interdependence among these markets, which complements our correlation analysis. Nevertheless, more is to be said when subsequent tests are applied: Granger causality, impulse response and variance decomposition.

Table 4c. Vector Autoregression results for regional ESG returns

	FE_ESG	EUR_ESG	NAM_ESG
FE_ESG – 1 lag	-0.3111 (0.0312)*	-0.0222 (0.046)	-0.0191 (0.0422)
FE_ESG – 2 lags	-0.1287 (0.0264)*	-0.0490 (0.0394)	0.0000 (0.0357)
EUR_ESG – 1 lag	0.2155 (0.0311)*	-0.3362 (0.0465)*	0.0760 (0.0421)**
EUR_ESG – 2 lags	0.1043 (0.0306)*	-0.1134 (0.0457)*	-0.0306 (0.0413)
NAM_ESG – 1 lags	0.3785 (0.0339)*	0.5432 (0.0506)*	-0.1592 (0.0458)*
NAM_ESG – 2 lags	0.0632 (0.0370)**	0.1371 (0.0552)*	-0.0592 (0.0499)

Table 4d. Vector Autoregression results for regional SRI returns

	FE_SRI	EUR_SRI	NAM_SRI
FE_SRI – 1 lag	-0.3047 (0.0314)*	0.0019 (0.0454)	-0.0253 (0.0402)
FE_SRI – 2 lags	-0.1399 (0.0267)*	-0.0401 (0.0387)	-0.0175 (0.0343)
EUR_SRI – 1 lag	0.2246 (0.0307)*	-0.2786 (0.0445)*	0.0743 (0.0394)**
EUR_SRI – 2 lags	0.1025 (0.0302)*	-0.0756 (0.0437)**	-0.0064 (0.0387)
NAM_SRI – 1 lags	0.4036 (0.0339)*	0.5240 (0.0492)*	-0.1650 (0.0435)*
NAM_SRI – 2 lags	0.0623 (0.0373)**	0.0912 (0.0540)**	-0.0748 (0.0478)

Source: own calculations

Granger causality tests

The first test we apply is the Granger causality test, whose results are presented in *Tables 5a* and *5b* (detailed results are presented in *Annex*, *Tables 1* and *2*). Australia appears to be the leading market as far as the national ESG markets are concerned, followed by Japan and the United Kingdom to a lesser extent. At the same time, the United States and Canada act as lagged markets, which are influenced by information transmitted from Australia and the United Kingdom (in the case of the USA), and from Australia and Japan (in the case of Canada). Concerning the national SRI markets, the conclusion is more or less the same: Australia is the leading market by far, while the led market seems to be the United States.

Table 5a. Pairwise Granger causality test results for national ESG returns

Variable on line Granger causes variable on column	AUS_ESG	CAN_ESG	JAP_ESG	UK_ESG	USA_ESG
AUS_ESG	NO	YES	NO	YES	YES
CAN_ESG	NO	NO	NO	NO	NO
JAP_ESG	NO	YES	NO	NO	NO
UK_ESG	NO	NO	NO	NO	YES
USA_ESG	NO	NO	NO	NO	NO

Note: Granger-causality was tested for 1 lag.

Source: own calculations

Table 5b. Pairwise Granger causality test results for national SRI returns

Variable on line Granger causes variable on column	AUS_SRI	CAN_SRI	JAP_SRI	UK_SRI	USA_SRI
AUS_SRI	NO	YES	NO	NO	YES
CAN_SRI	NO	NO	NO	NO	NO
JAP_SRI	NO	NO	NO	NO	YES
UK_SRI	NO	NO	NO	NO	YES
USA_SRI	NO	NO	NO	NO	NO

Note: Granger-causality was tested for 1 lag.

Source: own calculations

The Granger causality test applied to regional markets indicates (see *Tables 5c* and *5d* and more detailed results in *Annex*, *Tables 3* and *4*) the leading role played by Far East and the led role of European and North American markets. Most likely, the importance of Australia as a leading national market is the explanation for these results.

Table 5c. Pairwise Granger causality test results for regional ESG returns

Variable on line Granger causes variable on column	FE_ESG	EUR_ESG	NAM_ESG
FE_ESG	NO	YES	YES
EUR_ESG	NO	NO	NO
NAM_ESG	NO	NO	NO

Note: Granger-causality was tested for 1 lag.

Source: own calculations

Table 5d. Pairwise Granger causality test results for regional SRI returns

Variable on line Granger causes variable on column	FE_SRI	EUR_SRI	NAM_SRI
FE_SRI	NO	YES	YES
EUR_SRI	NO	NO	NO
NAM_SRI	NO	NO	NO

Note: Granger-causality was tested for 1 lag.

Source: own calculations

Impulse response functions

Impulse response functions, proposed by Litterman (1979), aim at exploring the short-term dynamics of variables in a VAR system, and show the response of all the variables in the system to a shock (or innovation) in each variable. A practical way to examine the immediate or lagged response of a variable in the systems to shocks is to plot the impulse response functions. *Figures 2a* to *2d* show the plots of impulse responses for each of the four VAR systems used in our analysis, where shocks are defined as Cholesky one standard deviation. One may observe, by examining the plots 2a and 2b, a rather immediate response of national SRI markets to innovations originating in the other markets, as the reaction of each market to news coming from the other markets is over in less than six days.

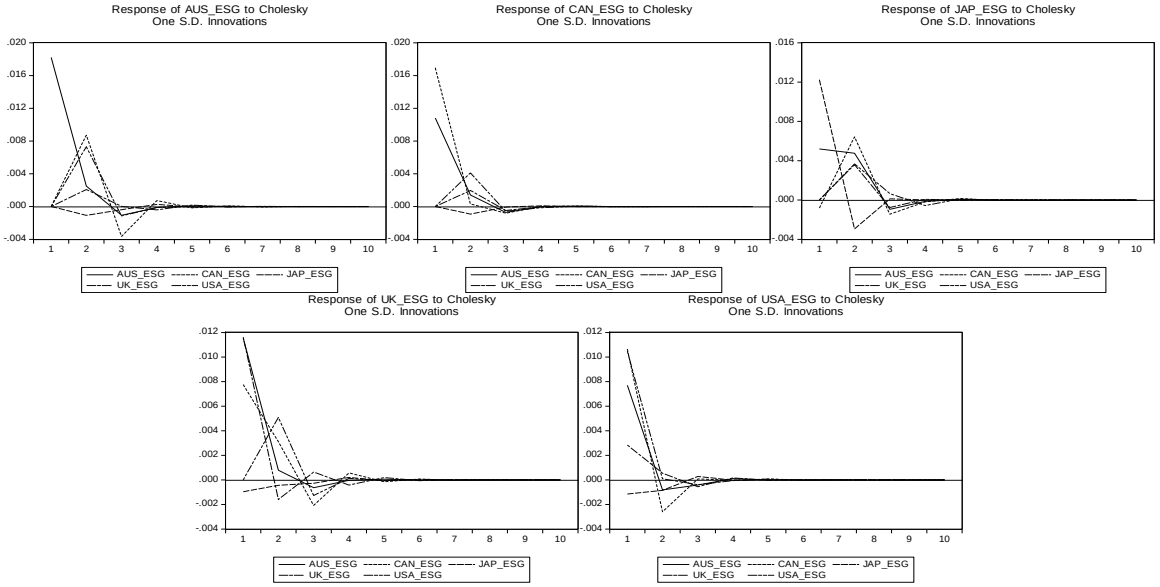

Figure 2a. Impulse responses for national ESG markets
Source: own calculations

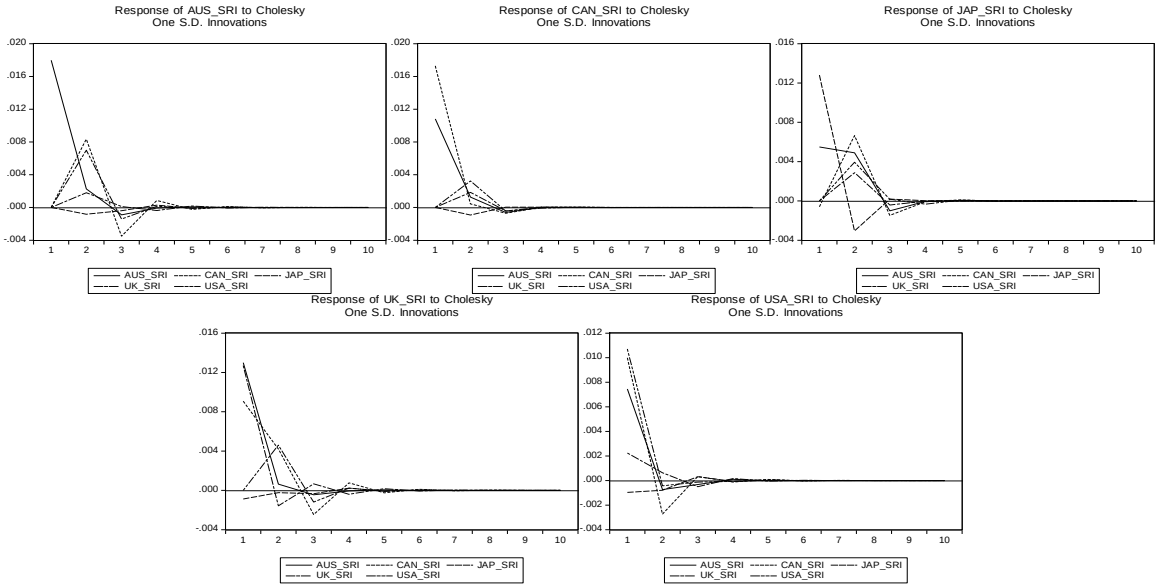

Figure 2b. Impulse responses for national SRI markets
Source: own calculations

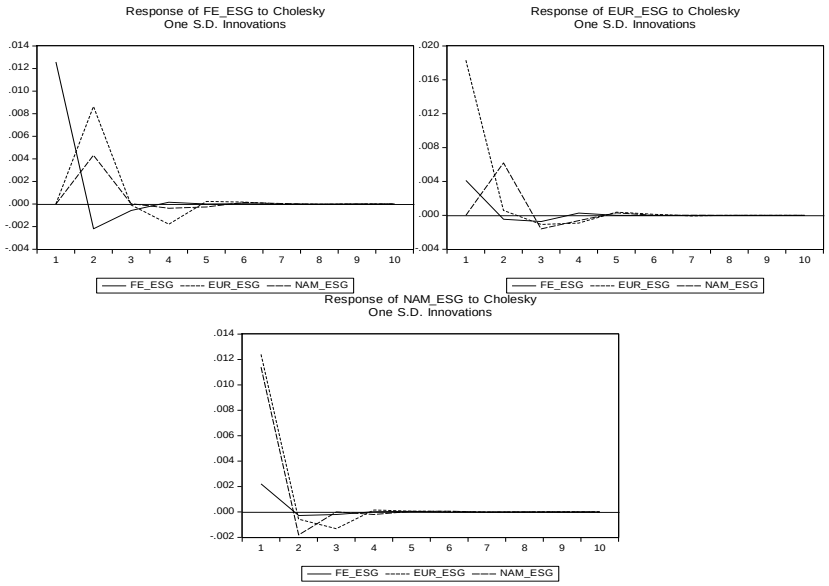

Figure 2c. Impulse responses for regional ESG markets
Source: own calculations

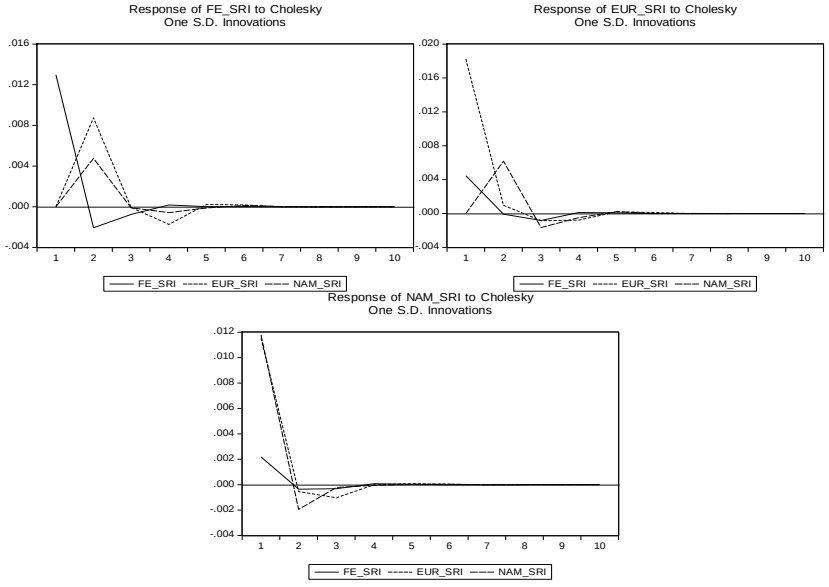

Figure 2d. Impulse responses for regional SRI markets
Source: own calculations

Although the sheer speed of this market reaction suggests a high degree of market efficiency among SRI markets and an increased level of market integration, there are some differences between the five markets we analysed regarding their response to shocks: Australia reacts to other markets' shocks with a one-day delay (which may be explained by the markets' different time zones) and is more responsive to news coming from Canada and the US; the Japanese market seems to be the one most strongly influenced by all the others, but the reactions spread over an interval of five days, while the United Kingdom and the United States have the quickest response to innovations from all markets (one day).

When we analyse the plots of impulse response functions for regional SRI markets, we observe a similar pattern to the reaction of national markets: all three regions considered in our

analysis react quickly to news originating from the other markets, but the reactions are over in approximately four to five days. Again, this implies a high level of integration among the three regions, supported by market efficiency.

Variance decomposition (VDC)

Variance decomposition discloses information about the extent to which shocks in a variable in a system are explained by shocks in all the variables that form the system, while the forecast error variance decomposition explains the proportion of the movements in a sequence due to its own shocks versus shocks to the other variables. By definition, if shocks do not explain any of the forecast error variance of one variable Y_t in all forecast horizons, then Y_t should be treated as an exogenous variable. At the opposite side, if shocks can explain all the forecast error variance of Y_t at all forecast horizons, then Y_t should be treated as an endogenous variable.

The results of VDC indicate which markets seem to influence the others the most, and which markets are more prone to influences from the others. The two types of national SRI markets display a similar pattern: in an immediate manner, the US market followed by UK market's forecast error variance is explained by the forecast variance of the other markets – approximately 60% in the first day, moving up to approximately 65% after five days. The Australian and Canadian markets' variance is explained by the other markets' variance only to a proportion of 30% after five days, which suggests that the markets that are open to more influences are US and UK, while Australia and Canada are, to some extent, more insulated. When we analyse the regional SRI markets, the North American market's forecast error variance is explained up to 50% by the other two regional markets variance, while Europe accounts for a total of only 15% of the forecasted error variance of the other regional markets. At the regional level, the influence of one market on the others is more obvious, as the European market seems to drive the Far East and North American markets.

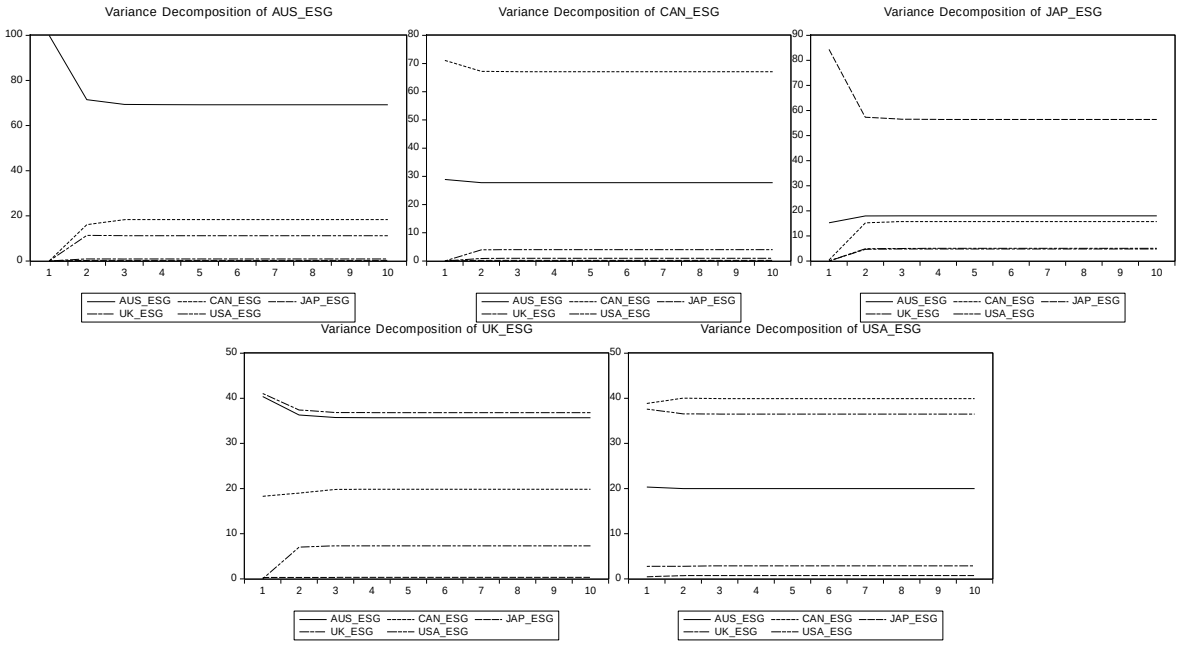

Figure 3a. Variance decomposition results for national ESG markets
Source: own calculations

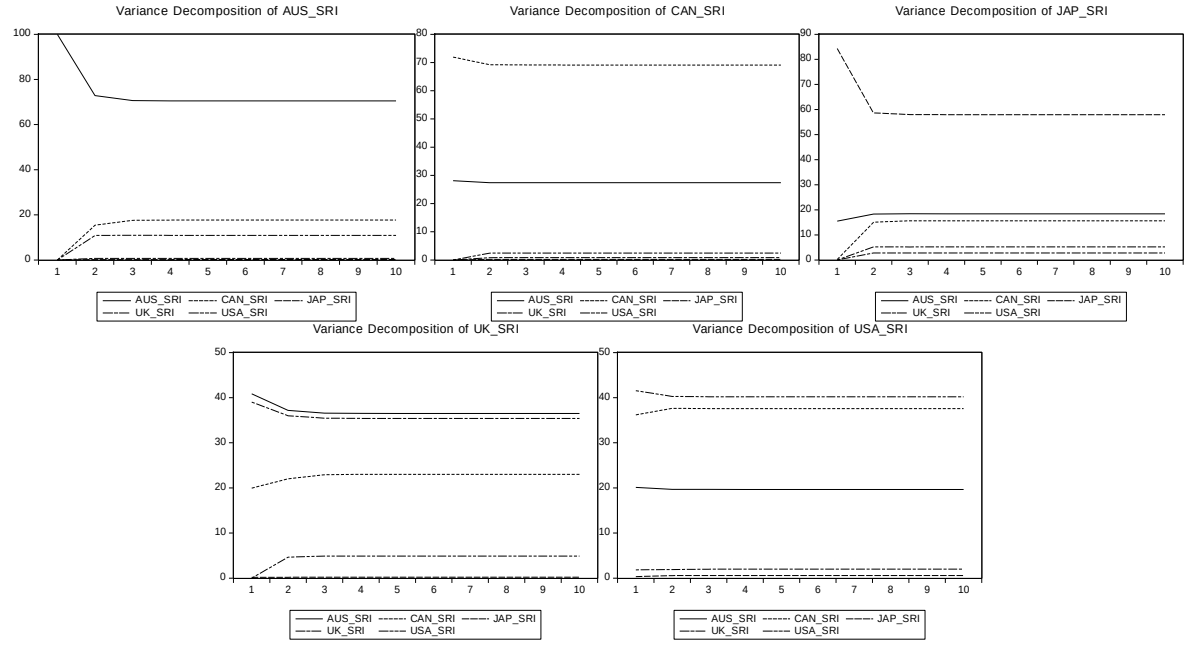

Figure 3b. Variance decomposition results for national SRI markets
Source: own calculations

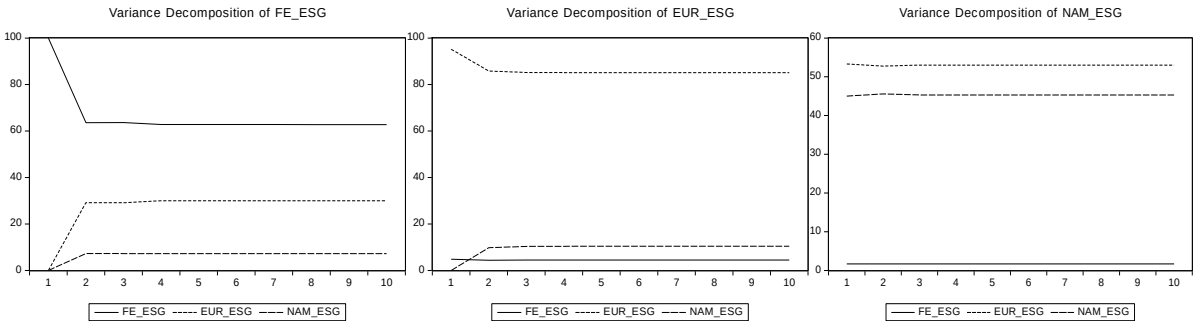

Figure 3c. Variance decomposition results for regional ESG markets
Source: own calculations

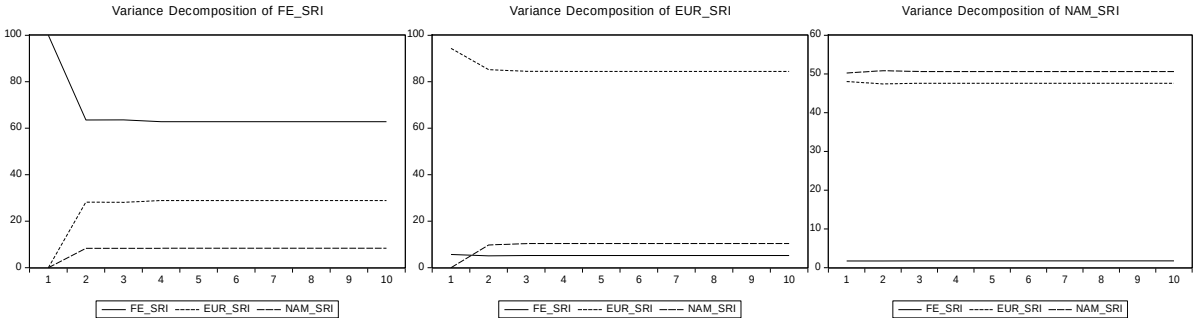

Figure 3d. Variance decomposition results for regional SRI markets
Source: own calculations

Conclusions

Our study addressed the international integration of SRI markets by considering national and regional stock market indices constructed by MSCI that include companies that are screened for respecting high environmental, social and governance ratings. Given the opportunities presented by international diversification of SRI funds, an understanding of how international SRI markets behave is essential; knowing the extent of linkages between national SRI markets becomes motivating for managers of SRI assets due to higher risks induced at portfolio level when constituent markets are integrated, and the transmission of shocks among markets is more rapid. Since the period under analysis is represented by the years of the global financial crisis (2008-2012), we investigate market integration in a context that has not been previously addressed in the SRI literature.

The VAR analysis we performed, accompanied by a preliminary correlation analysis, indicates that national and regional SRI markets are integrated, although at a level that is below the expected one, given the specificity of the period considered. The correlation analysis suggests a certain level of market segmentation in the case of SRI markets, but one should not forget the weaknesses of correlation (more specifically the assumption of linearity). In the VAR systems applied to national markets, we find that all markets have at least one significant coefficient for another market influencing it and, at the same time, all markets have significant coefficients in the equations where another market is the dependent variable. The US market seems to be the one that most influences the other markets, while the Japanese market is most influenced by the others, more specifically by the United Kingdom and the USA. In the case of regional indices, our results suggest a high degree of interdependence among these markets, compared to national markets.

The Granger causality test we applied indicates that for national ESG markets, Australia appears to be the leading market, followed by Japan and United Kingdom to a lesser extent. At the same time, the United States and Canada act as lagged markets, influenced by information transmitted from Australia and the United Kingdom (in the case of the USA), and from Australia and Japan (in the case of Canada). The same test applied to regional markets indicates the leading role played by Far East and the lagged role of European and North American markets. The differences in the results achieved at by using the VAR and Granger causality methodology stem from the different model specifications: while the VAR methodology takes into account markets influences on all the markets in the system, the Granger methodology investigates the explanatory power of a specific market lagged returns on the actual returns on another market, on a bilateral basis. Under these circumstances, when the entire system of markets considered is taken into account, the United States influences all the other markets, while on a bilateral basis it receives influences from Australia and the United Kingdom.

When the impulse response functions are performed, we observe a rather immediate response of national SRI markets to innovations originating in the other markets, as the reaction of each market to news coming from the other markets is over in less than six days. Although the speed of this market reaction suggests a high degree of market efficiency among SRI markets and an increased level of market integration, there are differences between the five markets we analysed regarding their response to shocks. When we analyse the impulse response functions for regional SRI markets, we observe a pattern similar to the reaction of national markets: all three regions considered in our analysis react quickly to news originating from the other markets, with this reaction finishing in approximately four to five days. Again, this implies a high level of integration among the three regions, supported by market efficiency. The results of VDC indicate similar patterns for the two types of national SRI markets: the markets that are open to more influence are the United States and the United Kingdom, while Australia and Canada are, to some extent, more insulated. At the regional level, the influence of one

market on the others is more obvious, as the European market seems to drive the Far East and North American markets.

To conclude, the results of our research indicate that SRI markets, both at national and regional level, are interdependent, although less than expected given the crisis period under analysis, marked by financial turbulences that, according to a high number of empirical evidences, should have led to an increase in the overall level of market interdependence. At the same time, one should be cautious in interpreting the results, given the governments' involvement in solving the financial crisis and the subsequent sovereign debt crisis with different instruments and at different timing. More insights into this phenomenon would have been possible by splitting the period under study in two different periods, before and after January 2009, which we intend to perform in a future study. However, since these markets are somehow segmented, managers of SRI funds may still benefit from the virtues of international diversification when deciding to extend their holdings of SRI assets abroad. Our results are also relevant for financial decision makers at market level: since these markets are integrated to some extent, the perils of shocks propagating from one country to the other cannot be ignored, which requires a consistent policy in the area of SRI markets regulation, so that contagion risks may be better mitigated.

Acknowledgement

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Annex

Table 1. Pairwise Granger causality test results for national ESG returns

Null Hypothesis:	Obs	F-Statistic	Prob.
CAN_ESG does not Granger Cause AUS_ESG	1043	235.892	4.E-48
AUS_ESG does not Granger Cause CAN_ESG		0.04259	0.8365
JAP_ESG does not Granger Cause AUS_ESG	1043	17.1867	4.E-05
AUS_ESG does not Granger Cause JAP_ESG		120.407	1.E-26
UK_ESG does not Granger Cause AUS_ESG	1043	115.601	1.E-25
AUS_ESG does not Granger Cause UK_ESG		2.23929	0.1348
USA_ESG does not Granger Cause AUS_ESG	1043	490.891	2.E-89
AUS_ESG does not Granger Cause USA_ESG		0.38876	0.5331
JAP_ESG does not Granger Cause CAN_ESG	1043	3.45490	0.0633
CAN_ESG does not Granger Cause JAP_ESG		348.741	2.E-67
UK_ESG does not Granger Cause CAN_ESG	1043	8.99773	0.0028
CAN_ESG does not Granger Cause UK_ESG		41.3310	2.E-10
USA_ESG does not Granger Cause CAN_ESG	1043	59.1930	3.E-14
CAN_ESG does not Granger Cause USA_ESG		15.2716	0.0001
UK_ESG does not Granger Cause JAP_ESG	1043	362.217	2.E-69
JAP_ESG does not Granger Cause UK_ESG		5.00399	0.0255
USA_ESG does not Granger Cause JAP_ESG	1043	471.908	1.E-86
JAP_ESG does not Granger Cause USA_ESG		4.19173	0.0409
USA_ESG does not Granger Cause UK_ESG	1043	146.229	1.E-31
UK_ESG does not Granger Cause USA_ESG		0.13770	0.7107

Table 2. Pairwise Granger causality test results for national SRI returns

Null Hypothesis:	Obs	F-Statistic	Prob.
CAN_SRI does not Granger Cause AUS_SRI	1043	226.404	2.E-46
AUS_SRI does not Granger Cause CAN_SRI		0.02832	0.8664
JAP_SRI does not Granger Cause AUS_SRI	1043	12.4926	0.0004
AUS_SRI does not Granger Cause JAP_SRI		110.903	1.E-24
UK_SRI does not Granger Cause AUS_SRI	1043	107.810	4.E-24
AUS_SRI does not Granger Cause UK_SRI		5.50242	0.0192
USA_SRI does not Granger Cause AUS_SRI	1043	453.904	7.E-84
AUS_SRI does not Granger Cause USA_SRI		0.00803	0.9286
JAP_SRI does not Granger Cause CAN_SRI	1043	3.15749	0.0759
CAN_SRI does not Granger Cause JAP_SRI		344.897	1.E-66
UK_SRI does not Granger Cause CAN_SRI	1043	7.43846	0.0065
CAN_SRI does not Granger Cause UK_SRI		53.4034	5.E-13

USA_SRI does not Granger Cause CAN_SRI	1043	36.6223	2.E-09
CAN_SRI does not Granger Cause USA_SRI		10.9126	0.0010
UK_SRI does not Granger Cause JAP_SRI	1043	303.104	9.E-60
JAP_SRI does not Granger Cause UK_SRI		4.91933	0.0268
USA_SRI does not Granger Cause JAP_SRI	1043	442.665	4.E-82
JAP_SRI does not Granger Cause USA_SRI		2.62833	0.1053
USA_SRI does not Granger Cause UK_SRI	1043	122.692	5.E-27
UK_SRI does not Granger Cause USA_SRI		0.04259	0.8365

Table 3. Pairwise Granger causality test results for regional ESG returns

Null Hypothesis:	Obs	F-Statistic	Prob.
EUR_ESG does not Granger Cause FE_ESG	1042	218.447	7.E-80
FE_ESG does not Granger Cause EUR_ESG		2.62362	0.0730
NAM_ESG does not Granger Cause FE_ESG	1042	277.011	4.E-97
FE_ESG does not Granger Cause NAM_ESG		0.16816	0.8452
NAM_ESG does not Granger Cause EUR_ESG	1042	62.0086	4.E-26
EUR_ESG does not Granger Cause NAM_ESG		2.87031	0.0571

Table 4. Pairwise Granger causality test results for regional SRI returns

Null Hypothesis:	Obs	F-Statistic	Prob.
EUR_SRI does not Granger Cause FE_SRI	1042	205.592	6.E-76
FE_SRI does not Granger Cause EUR_SRI		1.96929	0.1401
NAM_SRI does not Granger Cause FE_SRI	1042	270.240	3.E-95
FE_SRI does not Granger Cause NAM_SRI		0.29411	0.7453
NAM_SRI does not Granger Cause EUR_SRI	1042	62.0880	3.E-26
EUR_SRI does not Granger Cause NAM_SRI		2.17266	0.1144