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Can SRI funds better resist global financial crisis? Evidence from Japan

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ABSTRACT

This paper compared Socially Responsible Investment (SRI) funds and conventional funds in the Japanese market with respect to the impact of the global financial crisis in 2008. Taking the bankruptcy of Lehman Brothers as a particular event, we estimated the average cumulative abnormal returns of both funds by event study methodology using a Fama–French three-factor model and EGARCH model. Our results suggest that SRI funds better resisted the bankruptcy of the Lehman Brothers than conventional funds. We also found that this result can be attributed to the existence of international funds, possibly because investors might evaluate the CSR activities of international firms more than those of domestic firms. Alternatively, it can be interpreted that the universe of domestic SRI funds is too limited to enjoy risk diversification.

1. Introduction

Socially Responsible Investment (SRI) is an investment process using positive or negative screening that promotes investment decisions based not only on financial performance but also on the value of corporate social responsibility (CSR). Already, SRI is used in many major financial markets. The Global Sustainable Investment Alliance (2015) has reported that the respective proportions of SRI to total management assets in Europe and the United States are 58.8% and 17.9%.

As a reflection of the popularity of SRI in Western countries, a considerable amount of academic literature addresses SRI.[1] These studies are divisible into two categories. The first category encompasses research discussing whether SRI funds outperform or underperform funds that are not socially screened. In a study ranking among the earliest research to compare the performance of SRI and conventional funds, Hamilton, Jo, and Statman (1993) used the monthly return data of equity mutual funds in the United States and measured performance using the capital asset pricing model (CAPM) (Jensen, 1968). Results indicated that the market did not value the non-financial benefits of SRI funds. In line with Hamilton et al. (1993), SRI fund performance has also been found to not differ significantly from those of conventional funds according to data from many nations: the United States (Climent & Soriano, 2011; Gil–Bazo, Ruiz–Verdú, & Santos, 2010; Goldreyer, Ahmed, & Diltz, 1999); the United Kingdom (Gregory, Matatko, & Luther, 1997); the United Kingdom, the Netherlands, Sweden, and Germany (Kreander, Gray, Power, & Sinclair, 2005); Germany, the United Kingdom, and the United States (Bauer, Koedijk, & Otten, 2005); Australia (Bauer, Otten, & Rad, 2006); Canada (Bauer, Derwall, & Otten, 2007); European countries (Ziegler, 2009; Ziegler, Schröder, & Rennings, 2007), 17 countries worldwide (Renneboog, Horst, & Zhang, 2008); and Japan, the United States, and some European countries (Ito, Managi, & Matsuda, 2013). The general conclusions of these studies are that the difference between SRI and conventional funds is not significant, although results apparently depend on the time and place analysed (Renneboog et al., 2008).

More recently, Bollen (2007) raised the interesting question of whether investor behaviour related to SRI and conventional funds differs, a question that characterises the second category of studies addressing SRI. From examination of the relation between fund flows and returns for SRI funds, he found that SRI funds were more sensitive to lagged positive returns and were less sensitive to negative returns relative to conventional funds. Some studies have expanded the study of Bollen (2007) by additionally considering screening types and fund characteristics such as age, size, risk and fee structure (Renneboog, Horst, & Zhang, 2011), or current and/or past returns as well as lagged flow (Benson & Humphrey, 2008) as independent variables. Similarly to Bollen (2007), they found that SRI investors cared about returns

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[1] Despite considerable research on SRI conducted in various countries, very few studies have analysed the Japanese SRI market. In one of the few studies to examine the performance of SRI as a means to identify possible roles of SRI in Japanese pension portfolios, Jin, Mitchell, and Piggott (2006) compared the performance of a hypothetical SRI index to that of a market index, between which no indexical inconsistencies were found: they found no major difference between the indices. Comparing investor behaviours related to SRI and conventional funds, Renneboog et al. (2011) included data from Japan, but as information of only one of 17 countries examined in their analysis. It therefore remains unknown exactly how investment behaviour in Japan differs structurally in terms of SRI and conventional funds.

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less than their conventional counterparts, which accords with the hypothesis that investors in SRI funds obtain some additional non-financial utility to investors.

As described in this paper, we compare SRI to conventional funds from a perspective that differs from that of the studies described above: their reaction to financial crises. Results of earlier studies suggest that investors do not regard SRI as entailing special costs, at least because no difference in performance exists between SRI and conventional funds. In terms of investor behaviour, SRI investors are more loyal than conventional investors. In fact, SRI funds are more sensitive to lagged positive returns but less so to negative returns (Bollen, 2007). Therefore, although most countries worldwide have recently experienced a marked economic downturn, SRI investors might have retained their investments rather than selling them. In fact, the SRI performance might have suffered from the financial crisis. However, if the CSR activity was evaluated positively by the market, then the decrease in the returns of SRI can be expected to be less than those of conventional investments. Our hypothesis is that SRI funds have resisted the negative effects of the recent global recession better than conventional funds.

To assess this hypothesis, we adopted event study methodology. Event studies cast light on how unanticipated events affect changes in fund prices, given that the market is efficient. The unanticipated event specifically examined herein is the Lehman Brothers bankruptcy filing, a critical moment during the global financial crisis that triggered further drops in stock prices and even greater economic losses. Among the few studies conducted in pursuit of a similar research objective, Nofsinger and Varma (2014) compared the performance of US SRI and conventional mutual funds during periods of crisis, particularly March 2000–October 2002 as the technology bubble burst, and October 2007–March 2009 during the global financial crisis, in addition to periods of non-crisis other than those two crisis periods during 2000–2011. Their estimation results showed that SRI funds significantly outperformed conventional ones during the crises, although the opposite result was obtained during the non-crisis period. They added that this asymmetric pattern was driven by SRI funds stipulating environmental, social and governance (ESG) positive screening.

More recently, Becchetti, Ciciretti, Dalò, and Herzel (2015) examined the performance of SRI and conventional funds during January 1992–April 2012 with both a market model and a multifactor model. They found that, during the global financial crisis from December 2007–June 2009, SRI funds also significantly outperformed conventional ones in all markets except those in North America, but did not show different performance when the technology bubble burst during March–November 2001. Moreover, they expanded their findings by revealing that the limited diversification constraint did not notably lower SRI performance.

At the same time, Leite and Cortez (2015) compared the performance of SRI and conventional funds during market crises in France: the period until the technology bubble burst (January 2001–March 2003), the global financial crisis (June 2007–February 2009), and the euro sovereign debt crisis (May 2011–May 2012). Their principal finding was that SRI funds significantly underperformed compared to conventional funds during non-crisis periods. Leite and Cortez (2015) discovered that the difference between SRI and conventional funds was not significant during crises. Although SRI funds achieved returns comparable to those of conventional funds during crises, they were unable to provide additional protection to investors at such times. These authors demonstrated that the inferior performance of SRI during non-crisis periods was spurred by funds employing negative screenings. In fact, SRI funds with positive screenings showed no significant differences in performance when compared with conventional funds.

Although these studies provide a broad perspective on the resilience of SRI funds during crises, they have also all identified long-term periods of market crises lasting 1–2 years. In this sense, their results might accommodate the effects of other events or factors on fund performance during times of crisis. In contrast to these studies, our study identifies events lasting three days only, meaning that results can show the immediate effects of financial crises on fund performance. According to a survey of individual investors in Japan (Japan Securities Dealers Association, 2014), the most important determinant of investment is stability and low risk. Consequently, this study can provide information that is useful to stakeholders for exploring the resilience of SRI from a short-term perspective on top of mid-term and long-term perspectives that earlier studies used. Although the Japanese SRI market remains in its development stage, an assessment of the potential effects of SRI is worthwhile, given its expected growth attributable to the steady growth of pension funds. Because studies of Japanese SRI performance (Ito et al., 2013; Nakai, Yamaguchi, & Takeuchi, 2013; Nakajima, 2011) have not investigated how market crises affect fund performance, our study can fill a gap in current knowledge of SRI, especially for Japan.

The remainder of this paper is structured as follows. After Section 2 presents a description of the data, Section 3 introduces the event study method, along with the EGARCH model and Fama–French three-factor model. Estimated results are summarised in Section 4, followed by an explanation of the significance of results in Section 5 and a summary of findings in Section 6.

2. Data

The history of SRI funds in Japan is much briefer than that of similar funds in Europe and the United States. Early SRI funds were eco-funds launched in the late 1990s and early 2000s, an era when attention to environmental problems escalated considerably (Dentsu Macromill Insight, 2012). Eco-funds were imported from the West as new financial products as part of a push to introduce new market mechanisms for intermediate cash flow from households into SRIs (Sakuma & Louche, 2008). This situation differs drastically from those prevailing in the United States and Europe, where SRI has religious roots. Furthermore, although many SRI investors in Europe and the United States are fundamentally institutional investors, especially in pension funds, most SRI in Japan occurs in publicly offered SRI funds targeting individual investors.

Fig. 1 shows changes in the number of publicly offered SRI funds in Japan and their total net assets in billions of USD (JSIF, 2015). At the beginning of the SRI market in Japan, few funds existed. Although both the number of funds and their total net assets have grown steadily, a sudden, sharp decrease occurred in 2008 because of the financial crisis. Total net assets of SRI funds amounted to USD $10 billion at the end of December 2011, a figure that represents only 0.2% of the Japanese mutual fund market, and a smaller share than in Europe or the US, where SRI funds constitute more than 10% of mutual fund markets (JSIF, 2013). In Japan, screening has targeted environmental aspects since 2007. As of 2013, more than 70% of SRI funds have been environmentally screened (JSIF, 2014).

Fig. 2 depicts the number of conventional funds and their total net assets in Japan (The Investment Trusts Association, Japan, 2010a). Because the conventional fund market seems to have already matured, no rapid increase in the number or net assets of conventional funds has occurred while the SRI fund market in Japan continues to develop. Conventional funds experienced a slight drop in total net assets compared to that of SRI funds. Their number has increased gradually since 2004.

To conduct our analyses, we used data for the value of funds and the market portfolio. Daily return data related to publicly offered investment trusts are available from the Investment Trusts Association, Japan, which offers a sample of 3824 funds as of the end of July 2010 (The Investment Trusts Association, Japan, 2010b). Data related to privately offered investment trusts are unavailable and were therefore not included in our sample. We applied JSIF classification to identify SRI funds, of which 89 were listed for the same period. An additional condition was that the funds had to survive during the entire period under study, from 7 February to 17 September 2008. As a result, our data encompass 2136 conventional funds and 62 SRI funds (for the

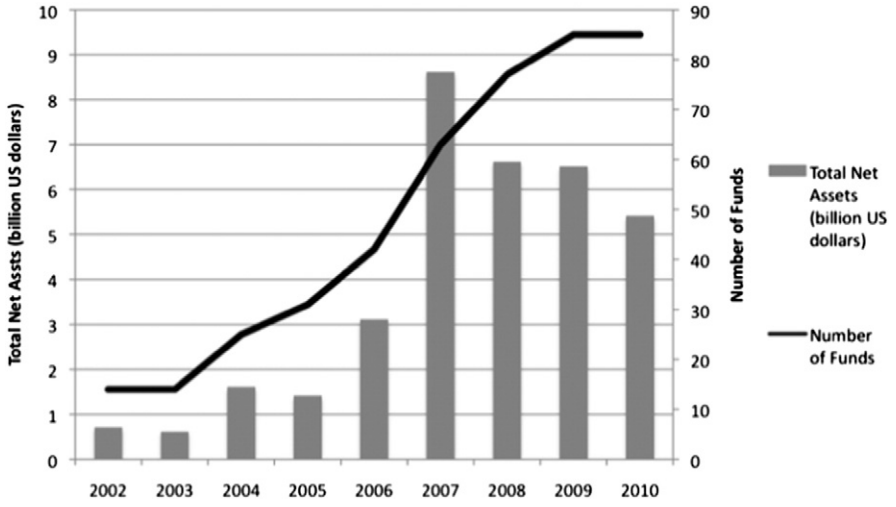

Fig. 1. Socially responsible investment funds and total net assets in Japan, 2002–2010.

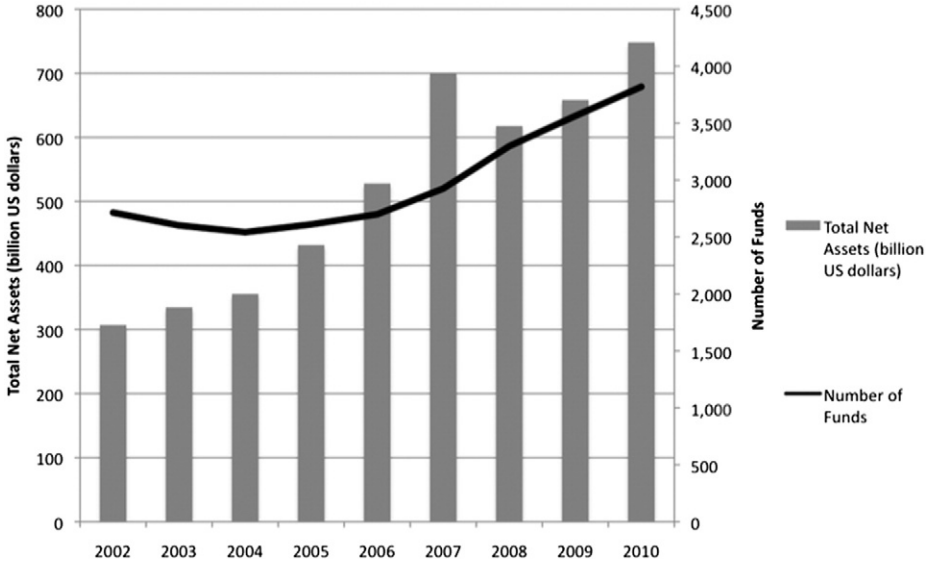

Fig. 2. Conventional funds and total net assets in Japan, 2002–2010.

latter, see Appendix A). Funds were also classified as domestic or international funds. Whereas domestic funds are mutual funds that invest in stocks and/or bonds, chiefly of domestic companies, international funds are those investing in both domestic firms and foreign companies, or only the latter. In accordance with these criteria, our sample included 793 domestic conventional funds and 24 domestic SRI funds. International funds had 1343 conventional funds and 38 SRI funds (Table 1). We used the Tokyo Stock Price Index (TOPIX), Russell–Nomura Large Cap Growth Index, Russell–Nomura Large Cap Value Index, Russell–Nomura Small Cap Growth Index, Russell–Nomura Small Cap Value Index, and the Japan Benchmark 10-Year Government Index to construct the Market Premium index, small minus big (*SMB*) index, and high minus low (*HML*) index to analyse with the Fama–French three-factor model, as explained in Section 3.3. All data were downloaded from Datastream. Table 2 provides descriptive statistics of the fund returns of SRI funds, conventional funds, and other indexes, the calculation of which is presented in Section 3.1. Each fund had 152 returns during the study period.

Table 1
Sample sizes of SRI and conventional funds.

	Domestic	International	Total
SRI	24	38	62
Conventional	793	1343	2136
Total	817	1381	2198

3. Method

3.1. Event studies with ordinary least squares

Event study methodology was introduced by Fama, Fisher, Jensen, and Roll (1969) to examine the relation between a particular unanticipated event and changes in stock prices. More specifically, numerous

Table 2
Descriptive statistics.

	Observations	Mean	Std. dev.	Min.	Max.
SRI	9424	−0.0009	0.0150	−0.0672	0.0661
Conventional	325,128	−0.0009	0.0135	−0.1852	0.1131
Market proxy (TOPIX)	152	−0.0001	0.0168	−0.0519	0.1131
Market Premium	152	−0.0013	0.0206	−0.0644	0.0570
SMB index	152	0.0001	0.0067	−0.0206	0.0266
HML index	152	0.0005	0.0045	−0.0079	0.0169

studies have used the methodology to analyse whether positive or negative CSR-related events affect corporations' share prices (Arora, 2001; Gupta & Goldar, 2005; Hamilton, 1995; Takeda & Tomozawa, 2006, 2008; Yamaguchi, 2008, 2009). The validity of any event study relies on a few assumptions: the notion of market efficiency, unexpectedness of the event, and nonexistence of other contemporaneous events that might affect the analysed share prices (McWilliams & Siegel, 1997).

To conduct our event study, we necessarily defined the event window: the period examined for changes in fund prices. We set a three-day period as our event window, which included the day before the event, the day of the event, and the day after the event. The event window is normally set for a period longer than the day of the event to encompass both changes in fund prices resulting from information leaked before the event and the investment action taken by latecomers on the day after the event.

Because the Japanese market was closed on 15 September 2008, a public holiday, we have identified the bankruptcy of Lehman Brothers as having occurred on 16 September 2008, designated here as T_0. Also, the last transaction day before the event (12 September) is labelled T_{-1}; the transaction day following the event (17 September) is labelled T_{+1}. We used fund price data for 150 transaction days before the event window as our estimation window. Using the following formula, we calculated the fund returns from fund prices as

$$r_{i,t} = log\left(\frac{P_{i,t}}{P_{i,t-1}}\right), \tag{1}$$

where $r_{i,t}$is the fund return and $P_{i,t}$ is the fund price on day t for firm i.

We next estimated the normal return, or the counterfactual return in the case in which the event did not occur. We assumed that the return of the market proxy, TOPIX, and the return of each fund have a linear relation. To calculate the normal return, α_i and β_i were estimated in the market model with data from the estimation window as

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t}, \tag{2}$$

in which $E[\varepsilon_{i,t}] = 0$ and $Var[\varepsilon_{i,t}] = \sigma_{(\varepsilon_{i,t})}{}^2$. In addition, $r_{m,t}$ signifies the return of the market index; α_i and β_i are unknown parameters. With estimated parameters, the normal return for each three-day event window can be estimated. Subtracting this value from the realised return gives the abnormal return (AR).

$$AR_{i,t} = r_{i,t} - \left(\hat{\alpha}_i + \hat{\beta}_i r_{m,t}\right) \tag{3}$$

The cumulative abnormal return (CAR) is then calculated after adding the abnormal returns of firm i for the three-day event window.

$$\mathrm{CAR}_i(T_{-1}, T_1) = \sum_{t=T_{-1}}^{T_1} AR_{i,t} \tag{4}$$

All CAR values can be analysed for the entire sample in the same category, called the *average cumulative abnormal return* (ACAR), as

$$\mathrm{ACAR}(T_{-1}, T_1) = \sum_{i=1}^{N} \mathrm{CAR}(T_{-1}, T_1)/N. \tag{5}$$

The variance of the average cumulative return can thereby be obtained as

$$VAR[\mathrm{ACAR}(T_{-1}, T_1)] = \frac{1}{N^2}\sum_{i=1}^{N} \hat{\sigma}^2(T_{-1}, T_1). \tag{6}$$

Once ACAR values are obtained, we used the following J-statistics to test the null hypothesis that the event did not affect fund returns:

$$J = \frac{\mathrm{ACAR}(T_{-1}, T_1)}{\sqrt{\frac{1}{N^2}\sum_{i=1}^{N} \hat{\sigma}^2(T_{-1}, T_1)}} \sim N(0,1). \tag{7}$$

If we had been unable to reject the null hypothesis, then would become meaningless to interpret the value of ACAR.

3.2. Event studies with EGARCH model

Most earlier studies listed in Section 3.1 adopted an event study methodology that does not account for heteroscedasticity. In fact, the standard market model includes the assumption that the residuals of share prices are simply white noise. However, financial time series data such as those of share prices and exchange rates generally have non-constant variance. An autoregressive conditional heteroscedasticity (ARCH) model (Engle, 1982) and a more extended version, a generalised autoregressive conditional heteroscedasticity (GARCH) model (Bollerslev, 1986), were therefore developed to account for heteroscedasticity. In several earlier studies, the GARCH model was used to estimate time-variant conditional variance, although it exacted some limitations such as non-negative restriction on estimators. By contrast, the EGARCH model introduced by Nelson (1991) does not assume the non-negative constraint when using a natural logarithm, thereby making it superior to the GARCH model because the non-negative conditions are often violated by estimators. We used the EGARCH (1,1) model to confirm that results found using ordinary least squares (OLS) were robust. In the same manner as in the OLS model, parameters were estimated to calculate the normal return. The error term was divided into independent white noise and standard error as

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t}, \tag{8}$$

in which $\varepsilon_{i,t} = \sqrt{h_{i,t}}\nu_{i,t}$. The variance of the standard error, called conditional variance, can be shown as

$$log(h_{i,t}) = \omega_i + \alpha_{1,i}\left|\frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}}\right| + \alpha_{2,i}\left|\frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}}\right| + \beta_i log(h_{i,t-1}), \tag{9}$$

in which $\varepsilon_{i,t}|\Omega_t \sim N(0, h_{i,t})$ and Ω represent information set at time t upon which the distribution of errors is assumed to be conditioned. This formula is well known as the *conditional variance equation* in the EGARCH (1,1) model. Abnormal returns, CAR, and ACAR were estimated in the same manner as those estimated using the OLS model.

To obtain the standardised residual terms, we calculated the conditional variance in each three-day event window for firm i using estimated parameters from Eq. (9) and data from the estimation window. Once the conditional variances for each event window were calculated for firm i, we took the exponential for each and found the average over the three-day period. We then obtained the average conditional variance for firm i as

$$\overline{h}_{i,t}(T_{-1}, T_1) = \frac{exp\left(\hat{h}_{i,T_{-1}}\right) + exp\left(\hat{h}_{i,T_0}\right) + exp\left(\hat{h}_{i,T_1}\right)}{3}. \tag{10}$$

The variance of the average cumulative return can therefore be obtained as shown below.

$$VAR[\mathrm{ACAR}(T_{-1}, T_1)] = \frac{1}{N^2}\sum_{i=1}^{N} \overline{h}_i(T_{-1}, T_1) \tag{11}$$

Finally, we used the following *J*-statistics to test the null hypothesis that the event did not affect fund returns:

$$J = \frac{\mathrm{ACAR}(T_{-1}, T_1)}{\sqrt{\frac{1}{N^2}\sum_{i=1}^{N} \overline{h}_i(T_{-1}, T_1)}} \sim N(0,1). \tag{12}$$

3.3. Event studies with the Fama–French three-factor model

The multifactor model must be used for our analysis (Fama & French, 1993) if our data have similar biases to those of other countries' data used for earlier studies. First, it is necessary to ascertain whether those factors have a significant effect on the return of funds, or not. We follow the study of Faff (2004) to construct the Fama–French "*SMB*" and "*HML*" factors using existing style indexes: *Russell–Nomura Large Cap Growth Index*, *Russell–Nomura Large Cap Value Index*, *Russell–Nomura Small Cap Growth Index*, and *Russell–Nomura Small Cap Value Index* developed by Global Research Division, the Nomura Securities Co. Ltd. and Russell Investments.[2] *SMB* stands for "*Small Minus Big*", which enables us to control for a small-effect based on the idea that firms with smaller market capitalisation can earn higher returns than larger firms in the financial market. The proxy of *SMB* at time *t* is obtained as

$$SMB_t = \left(\frac{R_{SV_t} + R_{SG_t}}{2}\right) - \left(\frac{R_{LV_t} + R_{LG_t}}{2}\right), \tag{13}$$

where R_{SV_t} stands for the return on the *Russell–Nomura Small Cap Value Index* at time *t*, R_{SG_t} signifies the return on the *Russell–Nomura Small Cap Growth Index* at time *t*, R_{LV_t} denotes the return on the *Russell–Nomura Large Cap Value Index* at time *t*, and R_{LG_t} represents the return on the *Russell–Nomura Large Cap Growth Index* at time *t*. Another Fama–French factor, *High Minus Low* (*HML*) shows the difference in returns between a firm with a high book-to-market ratio (often designated as a *value stock*) and a firm with a low book-to-market ratio (so-called *growth stocks*). *HML* at time *t* can be constructed as presented below:

$$HML_t = \left(\frac{R_{LV_t} + R_{SV_t}}{2}\right) - \left(\frac{R_{LG_t} + R_{SG_t}}{2}\right). \tag{14}$$

Using SMB_t and HML_t proxies, we estimated the expected return with a multifactor model to ascertain the effects of these variables on fund return and to compare them in terms of SRI and conventional funds, according to the following:

$$\begin{aligned} r_{i,t} - r_{f,t} &= \alpha_i + \beta_{1i}\mathrm{MarketPremium}_{i,t} + \beta_{2i}\mathrm{SMB}_t \\ &+ \beta_{3i}\mathrm{HML}_t + \beta_{4i} d\_SRI * \mathrm{MarketPremium}_{i,t} \\ &+ \beta_{5i} d\_SRI * SMB_t + \beta_{6i} d\_SRI * HML_t + e_{i,t}. \end{aligned} \tag{15}$$

Market Premium is calculated by subtracting the risk-free rate $r_{f,t}$ calculated from the 10-Year Japanese Government Bond Index from the market portfolio. If the coefficients of $\beta_{1i}, \beta_{2i}, \beta_{3i}$ are estimated as significant, then the variables must be controlled for according to event study methodology. An interaction term among the three factors and a dummy variable *d_SRI* were included as *d_SRI*Market Premium, d_SRI*SMB, and d_SRI*HML*, in which the dummy variable equalled 1 if the fund group was an SRI fund and 0 if the fund group was a conventional fund. This technique enabled us to investigate whether these risk exposures differ significantly between SRI and conventional funds.

Table 3 shows that all variables and interactions with the SRI dummy have significant coefficients. Therefore, we concluded that the Fama–French three-factor model should be applied. The coefficient of market premium and that interacted with the SRI dummy was statistically significant and positive, indicating that SRI funds had greater exposure to the market premium than conventional funds did. That finding is consistent with the results of earlier studies encompassing crisis periods (Becchetti et al., 2015; Leite & Cortez, 2015; Nofsinger & Varma, 2014).

Table 3
Regression results using the Fama–French model.

	Coeff.	Std. err.
Constant	0.0001***	0.0000
Market Premium	0.8917***	0.0011
SMB	0.64776***	0.0035
HML	−0.29115***	0.00527
*d_SRI*Market Premium*	0.4083***	0.00672
*d_SRI*SMB*	−0.3976**	0.0210
*d_SRI*HML*	−0.0891***	0.0312

*** Significant at the 1% level.
** Significant at the 5% level.

Our finding that the *SMB* factor was significantly positive at the 1% level indicated that funds comprising smaller firms' stock are more likely to obtain larger returns than their counterparts, which marks a small effect. By contrast, the coefficient of *d_SRI*SMB* showed that SRI funds were less exposed to small effects than conventional ones, a finding consistent with the results of Leite and Cortez (2015). As Leite and Cortez (2014) explained earlier, because their sample of French funds was mostly screened with best-in-class strategies, larger, well-established companies might therefore be selected as the best companies for CSR. SRI funds in Japan are also identified with either positive screening or best-in-class, meaning that SRI funds in Japan and France are less exposed to *SMB* effects than conventional funds are.

The coefficients of *HML* were found to be significant and negative at the 1% level, suggesting that funds in our study are more growth-oriented than value-oriented, which runs counter to the results reported by Nofsinger and Varma (2014) and by Leite and Cortez (2015), yet is similar to those reported by Becchetti et al. (2015). Furthermore, the negative coefficient of *d_SRI*HML* underscores that SRI funds are more growth-oriented than conventional funds are.

To render the Fama–French model applicable to the event study, we estimated parameters using Eq. (15) instead of Eq. (2) and calculated the abnormal return for each three-day event window, as shown below.

$$AR_{i,t} = r_{i,t} - \left[\hat{\alpha}_i + \hat{\beta}_{1i}(r_{m,t} - r_{f,t}) + \hat{\beta}_{2i} SMB_t + \hat{\beta}_{3i} HML_t + \varepsilon_{i,t}\right] \tag{16}$$

Eq. (16) is equivalent to Eq. (3) of the market model. We can take exactly the same step as the market Model afterwards to examine whether the event significantly affects the fund price with Eq. (5) to Eq. (7).

4. Empirical results

As we confirmed in Section 3.3, the Fama–French factor did have an effect on SRI performance and conventional funds. This section mainly discusses the estimation results of the model. Unlike the empirical results obtained with the other two models (discussed later in this section), the ACAR of SRI funds is significantly positive (0.0026) at the 5% level, while that of conventional funds remains significantly negative (−0.0069) at the 1% level. Therefore, we reject the null hypothesis that the event had no effect on the funds. The difference of those ACARs is also significant at the 1% level (see Table 4). Hence, we conclude that SRI funds were more resilient against the Lehman Brothers bankruptcy filing event. We infer from our results that investors did not sell their investments in SRI funds even under difficult circumstances, while they seemed to sell off their investments in conventional funds.

The resilience of SRI funds against the Lehman Brothers collapse was also found in the OLS and EGARCH models. Although the ACARs of SRI funds are negative in these models, the absolute value is smaller than the ACARs of conventional funds. This result means that the effects of

[2] See http://qr.nomura.co.jp/QR/FRCNRI/frnri_info.html for more details.

Table 4
Comparisons of ACAR.

Type of fund	OLS	EGARCH	Fama–French model
SRI fund	−0.0034***	−0.0024**	0.0026**
	(−3.0408)	(−1.7236)	(1.9031)
Conventional fund	−0.0112***	−0.0110***	−0.0069***
	(−56.5757)	(−41.3268)	(−25.2622)
Difference	0.0078**	0.0086***	0.0095***
	[2.2420]	[5.3272]	[2.7442]

Numbers in parentheses and square brackets are, respectively, *J* statistics and *t* statistics.
*** Significant at the 1% level.
** Significant at the 5% level.

the Lehman Brothers bankruptcy filing on SRI funds were less severe than those on conventional funds. Using the OLS model, the difference in the ACARs between SRI funds and conventional funds is significant at the 5% level. We also applied the EGARCH model because the stock price data often include heteroscedasticity. We conducted an ARCH-LM test for all data, which revealed that 24 out of 62 SRI funds and 1003 out of 2139 conventional funds have ARCH effects. The results of the ARCH-LM test for SRI funds are shown in Appendix B. Because it was confirmed that an ARCH-effect exists in numerous funds, we also analysed the data using the EGARCH (1,1) model. We obtained similar results to those obtained using the OLS model.

To analyse how severe this negative shock was, it is necessary to compare the obtained ACARs with those from other event studies. Unfortunately, our search of the relevant literature reveals no report of any other event study using fund data. Comparison of the effects of the financial crisis on SRI funds with effects of other events that might influence the returns of SRI funds demands further study.

5. Discussion: domestic versus international funds

It remains unclear why the effects of the recent global financial crisis on SRI funds were less drastic than the effects on conventional funds. A possible reason is that investors might have presumed that any company targeting CSR would be one with a sound long-term strategy. Therefore, it might be a more forward-looking firm than its counterparts because its goods or services can be differentiated in terms of long-term environmental or social aspects from an understanding that it incurs a short-term expense, complementing CSR activities. In this case, investors might believe that such a firm would be more likely to weather a financial crisis, which is consistent with the idea that CSR activity is a factor that can induce stable, growing development for firms (Scalet & Kelly, 2010). Consequently, SRI funds would have been sold less than conventional ones on the day of the Lehman Brothers bankruptcy filing. To explore this idea, this section presents the specific examination of the differences of investment destination to explain why SRI funds have been more resilient during the financial crisis than conventional funds.

For our study, we classified funds as either domestic or international funds. Domestic funds are mutual funds that invest in the stocks and/or bonds of domestic companies, whereas international funds invest in both domestic and foreign companies or in foreign companies only. If investors behave differently towards domestic SRI and international SRI funds, then they also respond differently to financial shocks sustained with these funds. We estimated ACAR values with the OLS, EGARCH, and Fama–French three-factor model, yet separately for the group of domestic funds and the group of international funds. We first found that most ACARs of domestic funds were estimated as negative with all models. Furthermore, the Lehman Brothers collapse dropped the return of SRI funds more than that of conventional funds, although the difference between the two funds was significant only with the EGARCH model, as Table 5 shows. Second, the ACAR of international SRI funds by Fama–French three-factor model turned significantly positive and the difference between ACARs of SRI and conventional funds is significant at the 1% level, which is a result that is similar to that estimated with the entire sample. The result might therefore indicate that an increase in SRI performance can be induced by the resilience of international SRI funds, possibly because international funds can enjoy greater diversification of investment opportunities than domestic ones. Consequently, the effects of financial shocks on domestic SRI funds and domestic conventional funds might become increasingly similar.

6. Conclusion

Using event study methodology, we examined the market reaction of SRI funds relative to conventional funds in the Japanese market amid a recent global financial crisis. We chose the Lehman Brothers bankruptcy filing as the momentous event for this study because it is known to have triggered a further drop in stock prices and economic losses during the recession. Empirical results obtained using the Fama–French three-factor model showed that the event significantly increased the performance of SRI funds at the 5% level, whereas a significant negative effect on conventional funds was estimated. The difference between the two groups of funds was significant at the 1% level. We also found that the resilience of SRI funds during the event was largely attributable to international funds, a possibility given that investors might evaluate the CSR activities of international firms more than those of domestic firms. Alternatively, we can infer that the universe of domestic SRI funds is too limited to enjoy risk diversification. Altogether, we confirmed that SRI funds better resisted the bankruptcy of the Lehman Brothers than conventional funds did. This result might provide useful information to support the diffusion of SRI because stability is regarded as the most important investment factor for individual investors in Japan (Japan Securities Dealers Association, 2014).

Our approach can be extended to investigate the effects of financial crises in other countries and in other time periods. Comparison of the effects of the financial crisis on SRI funds with other events, using data from other countries as well, can be expected to provide useful information. Fund data in the United States market might be analysed using the same methodology because the financial crisis was triggered by defaults on subprime loans in the US. Such studies might engender some

Table 5
Comparison of average cumulative abnormal return of domestic and international funds.

	Domestic			International		
	Ordinary least squares	EGARCH	Fama–French model	Ordinary least squares	EGARCH	Fama–French model
SRI funds	−0.0015***	−0.0016***	−0.0006	−0.0045***	−0.0003*	0.0046***
	(−2.7269)	(−5.9867)	(−0.8911)	(−2.5418)	(−1.3304)	(2.0954)
Conventional funds	−0.0002	−0.0002*	0.0000	−0.0178***	−0.0175*	−0.0110***
	(−1.1822)	(−1.3242)	(0.1709)	(−60.7034)	(42.3994)	(−27.5943)
Difference	−0.0013	−0.0014*	−0.0006	0.0133***	0.0172***	0.0156***
	(−1.1078)	(−1.4190)	(−0.2969)	(7.5220)	(6.9517)	(2.9353)

Note. Numbers in parentheses and brackets are *t*-statistics.
*** Significant at the 1% level.
* Significant at the 10% level.

interesting comparisons of the effects on SRI funds in Japan with the effects on SRI funds elsewhere in the world.

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Appendix A. SRI funds analysed

ID	Name	Stock company	Initial date
1	Nikko Eco Fund	Nikko Asset Management Co., Ltd.	20 Aug 1999
2	Nenkin Tsumitate Eco Fund	Nikko Asset Management Co., Ltd.	31 Oct 2001
3	Sompo Japan Green Open	Sompo Japan	30 Sep 1999
4	Eco Partners	Mitsubishi UFJ Trust and Banking Corporation	28 Jan 2000
5	Asahi Life SRI Shakai Kouken Fund	Asahi Life Asset Management Co., Ltd.	28 Sep 2000
6	Sumishin SRI Japan Open	The Sumitomo Trust and Banking Co., Ltd.	26 Dec 2003
7	Sumishin DC Good Company	The Sumitomo Trust and Banking Co., Ltd.	27 Feb 2004
8	Fukoku SRI Fund	Shinkin Asset Management Co., Ltd.	27 Feb 2004
9	Daiwa SRI Fund	Daiwa Asset Management Co. Ltd.	20 May 2004
10	DC Daiwa SRI Fund	Daiwa Asset Management Co. Ltd.	20 July 2004
11	Mitsubishi UFJ SRI Fund	Mitsubishi UFJ Trust and Banking Corporation	3 Dec 2004
12	SAIKYO Nihon Kabushiki CSR Fund	PineBridge Investments Japan Co., Ltd.	18 Mar 2005
13	Risona Japan CSR Fund	PineBridge Investments Japan Co., Ltd.	18 Mar 2005
14	Sompo Japan SRI Open	Sompo Japan	25 Mar 2005
15	PainBridge Hirogin Nihon Kabushiki CSR Fund	PineBridge Investments Japan Co., Ltd.	28 Apr 2005
16	Nihon SRI Open	Okasan Asset Management Co., Ltd.	12 Aug 2005
17	Daiwa Eco Fund	Daiwa Asset Management Co. Ltd.	9 Mar 2006
18	Sumishin Nihon Kabushiki SRI Fund	The Sumitomo Trust and Banking Co., Ltd.	12 Jun 2006
19	Amundi Risona Woman J Fund	Amundi Japan Ltd.	30 May 2006
20	Chuo Mitsui Shakaiteki Sekinin Fund	Chuo Mitsui Asset Management Co., Ltd.	30 Nov 2006
21	Shinkin SRI Fund	Shinkin Asset Management Co., Ltd.	8 Dec 2006
22	STAM SRI Japan Open (only for separately managed account)	The Sumitomo Trust and Banking Co., Ltd.	16 Feb 2007
23	PineBridge Nihon Kabushiki SRI Fund	PineBridge Investments Japan Co., Ltd.	20 Dec 2007
24	Eco Balance	Sumitomo Mitsui Asset Management Company, Limited	31 Oct 2000
25	Nikko Global Sustainability Fund A (without hedge)	Nikko Asset Management Co., Ltd.	17 Nov 2000
26	Nikko Global Sustainability Fund B (with hedge)	Nikko Asset Management Co., Ltd.	17 Nov 2000
27	Nenkin Tsumitate Global Sustainability (without hedge)	Nikko Asset Management Co., Ltd.	25 Oct 2001
28	Nenkin Tsumitate Global Sustainability (with hedge)	Nikko Asset Management Co., Ltd.	25 Oct 2001
29	World Water Fund A Course (with currency hedge)	Nikko Asset Management Co., Ltd.	26 Mar 2004
30	World Water Fund B Course (without currency hedge)	Nomura Asset Management Co., Ltd.	26 Mar 2004
31	Nomura Global SRI 100	Nomura Asset Management Co., Ltd.	28 May 2004
32	Nomura Sekai SRI Index Fund (for defined contribution pension fund)	Nomura Asset Management Co., Ltd.	30 July 2004
33	Chikyu Ondanka Boushi Kanren Kabu Fund	Shinko Asset Management Co., Ltd.	30 May 2006
34	Nikko DWS New Resource Fund	Deutsche Asset Management	20 Dec 2006
35	Global Water Fund	Nikko Asset Management Co., Ltd.	15 June 2007
36	New Generation Sekai Kankyo	United Investments Ltd.	29 June 2007
37	Chikyu Ondanka Boushi Kanren Kabu Fund (3-month closing type)	Shinko Asset Management Co., Ltd.	25 July 2005
38	Mitsubishi UFJ Global Eco Water	Mitsubishi UFJ Trust and Banking Corporation	27 July 2007
39	Nomura Aqua Toushi A Course (with exchange hedge)	Nomura Asset Management Co., Ltd.	29 Aug 2007
40	Nomura Aqua Toushi B Course (without exchange hedge)	Nomura Asset Management Co., Ltd.	29 Aug 2007
41	UBS Chikyu Ondanka Taiou Kanren Kabu Fund	UBS Global Asset Management	31 Aug 2007
42	Ondanka Taisaku Kabushiki Open	Kokusai Asset Management Co., Ltd.	31 Aug 2007
43	Chikyu Ondanka Taisaku Kabushiki Open	Kokusai Asset Management Co., Ltd.	31 Aug 2007
44	Chikyu Kankyo Kabu Fund	Daiwa Asset Management Co. Ltd.	31 Aug 2007
45	DWS Shinshigen Technology Fund	Deutsche Asset Management	31 Aug 2007
46	Ondanka Boushi Kankyo Kanren Kabu Open	Okasan Asset Management Co., Ltd.	27 Sep 2007
47	Fidelity Three Basic F	Fidelity Investments Limited	29 Oct 2007
48	Tokyo Kaijo Select Sekai Kabushiki Fund	Tokio Marine Asset Management Co., Ltd.	6 Dec 2007
49	Amundi Sekai Mizukanren Kabushiki F	Amundi Japan Ltd.	17 Dec 2007
50	TA Clean Energy Fund	Toyota Asset Management Co., Ltd.	20 Dec 2007
51	Amundi Sekai Kankyoryoku Kabushiki Fund	Amundi Japan Ltd.	21 Dec 2007
52	DIAM Koukakuduke Income Open SRI (monthly closing type)	DIAM Co., Ltd.	22 Dec 2005
53	6 Shisan Balance Fund (distribution type)	Daiwa Asset Management Co. Ltd.	14 Mar 2006
54	6 Shisan Balance Fund (growth type)	Daiwa Asset Management Co. Ltd.	14 Mar 2006
55	Shizen Kankyo Hogo Fund	DIAM Co., Ltd.	26 May

(*continued*)

ID	Name	Stock company	Initial date
56	Sekai 6Shisan Kintou Bunsan Fund (monthly distribution type)	Daiwa Asset Management Co. Ltd.	2006 28 June 2006
57	Shigagin SRI 3Shisan Balance Open (odd-month distribution type)	Daiwa Asset Management Co. Ltd.	27 Sep 2006
58	Amundi Womenomics Balance Kabushiki 30 (monthly distribution type)	Amundi Japan Ltd.	19 Jan 2007
59	Amundi Womenomics Balance Kabushiki 30 (active growth)	Amundi Japan Ltd.	19 Jan 2007
60	Chikyu Kankyo Kabu Gaisai Balance Fund	Daiwa Asset Management Co. Ltd.	31 Aug 2007
61	Kankyo Hozen Global Balance	Shinko Asset Management Co., Ltd.	14 Dec 2007
62	Amundi Risona Sekai Green Balance Fund	Amundi Japan Ltd.	21 Dec 2007

Appendix B. ARCH-LM test for SRI funds

Fund ID	Arch	Significance	Fund ID	Arch	Significance
1	0.966067		32	15.87687	***
2	1.027735		33	16.22302	***
3	2.68646	*	34	7.315012	***
4	1.402577		35	3.2449	*
5	0.010112		36	1.531446	
6	0.525505		37	16.2176	***
7	0.471471		38	5.985241	**
8	1.227087		39	3.641264	*
9	0.116404		40	5.598984	**
10	0.087552		41	6.926547	***
11	0.00211		42	16.0997	***
12	1.582857		43	16.04057	***
13	0.948066		44	19.68416	***
14	0.163512		45	7.191673	***
15	1.650385		46	0.436857	
16	0.901857		47	6.381472	**
17	0.044793		48	29.76349	***
18	0.061683		49	33.6517	***
19	0.03634		50	0.752861	
20	0.040993		51	24.56617	***
21	1.197089		52	17.05208	***
22	0.695522		53	3.056855	*
23	0.661225		54	0.630496	
24	0.082158		55	23.84215	***
25	25.51617	***	56	0.096191	
26	25.48944	***	57	9.647576	***
27	11.17471	***	58	20.62302	***
28	12.13686	***	59	5.670033	**
29	5.405308	**	60	20.79893	***
30	9.281398	***	61	16.46026	***
31	15.70286	***	62	24.95287	***

*** Significant at the 1% level.
** Significant at the 5% level.
* Significant at the 10% level.

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