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Abstract

In this paper, we examined the market reaction of SRI funds relative to conventional funds in the Japanese market amid the recent global financial crisis. We chose the bankruptcy of the Lehman Brothers as the momentous event, for it is known to have triggered a further drop in stock prices and economic losses during the recession. Empirical results estimated by event study methodology with the Fama–French three-factor model showed that the event significantly increased the performance of SRI funds at the 5% level, while the significant negative impact on conventional funds was estimated and a difference between two groups of funds were statistically significant at the 1% level. We also found that the resilience of SRI funds amid the event was largely due 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 assume 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.

Keywords: Socially responsible investment, event study, financial crisis

JEL classification: A13, G01, M14

1 Introduction

The global economic recession following the subprime crisis has dealt crippling blows to economies both in the United States and worldwide. Since 2007, the potential global write-downs of loans and securities due to this financial crisis have been estimated to total USD $4.1 trillion (IMF, 2009), and drops in GDP from 2008 to 2009 were 2.6%, 4.1%, 5.2%, and 4.9% in the United States, the eurozone, Japan, and the United Kingdom, respectively (IMF, 2010). In 2010, the unemployment rate in the United States reached 9.6% (US Department of Labor Bureau of Labor Statistics, 2015). In general, all major economic indicators stress the seriousness of impact of the crisis; without a doubt, it has been the worst economic downturn since the Great Depression in 1929. One cause of the crisis was subprime lending intended for low-income households and subprime borrowers, which could more likely to lead to defaults. The securitisation of loans into wide-ranging financial commodities disabled tracking responsibility for defaults, and investment behaviour focusing extensively on short-term economic gains compounded the problem. While calls for remedying the situation by tightening the regulation and governance of financial institutions have been issued, another self-regulatory mechanism is already embedded in the market that could effectively enhance corporate activity for social profit: socially responsible investment (SRI).

SRI is an investment process using positive or negative screening that promotes taking into account while making investment decisions not only financial performance but also the value of corporate social responsibility (CSR), as seen in voluntary activities concerned with environmental or social issues. SRI already occupies space in many major financial markets, and the Global Sustainable Investment Alliance (2015) has reported that the proportion of SRI to total management assets in Europe and the United States is 58.8% and 17.9%, respectively, thereby underscoring SRI's substantial presence in these markets. As a reflection of the popularity of SRI in Western countries, a considerable amount of academic literature addresses SRI, and these studies can be divided into two categories. The first category encompasses research discussing whether SRI funds out- or underperform funds that are not socially screened, and the general conclusion of these studies is that the difference between SRI and conventional funds is not statistically significant, though it depends on the time and place analysed (Renneboog et al., 2008).

In a study ranking among the earliest research to compare the performance of SRI and conventional funds, Hamilton and Statman (1993) used the monthly return data of equity mutual funds in the United States during 1981–1990 and measured performance with Jensen's alpha. Based on the capital asset pricing model (CAPM), Jensen's alpha measures the performance of stock relative to the market

portfolio (Jensen, 1968). Results showed that the mean monthly excess return of SRI funds established before or during 1985 was greater than that of conventional funds, though the difference was not statistically significant, while SRI funds established after 1985 showed a mean excess return lower than that of conventional ones, though also not at a statistically significant level. In effect, the results indicated that the market did not value the non-financial benefits of SRI funds. In line with Hamilton et al. (1993), the performance of SRI funds has also been found to not differ from those of conventional funds in a statistically significant way according to data from the United States (Climent & Soriano., 2011; Gil–Bazo et al., 2010; Goldreyer et al., 1999); the United Kingdom (Gregory et al., 1997); the United Kingdom, the Netherlands, Sweden, and Germany (Kreander et al., 2005); Germany, the United Kingdom, and the United States (Bauer et al., 2005); Australia (Bauer et al., 2006); Canada (Bauer et al., 2007); European countries (Ziegler et al., 2007; Ziegler, 2009), 17 countries worldwide (Renneboog et al., 2008); and Japan, the United States, and the countries of Europe (Itoh et al., 2013).

More recently, Bollen (2007) raised the interesting question of whether investor behaviour regarding SRI and conventional funds differs, a question that characterises the second category of studies addressing SRI. In examining the relationship between fund flows and returns for SRI funds in the United Kingdom, Bollen (2007) found that SRI funds were more sensitive to lagged positive returns than conventional funds, while SRI investors showed less response to negative returns than investors in conventional funds during 1980–2002. He furthermore showed that flow volatility was less in SRI funds than in conventional funds during 1991–2002. In sum, his findings suggested that investors in SRI funds are more loyal investors than those in conventional funds.

While Bollen (2007) focused on the relationship between past returns and money flows for US SRI funds, Renneboog et al. (2011) expanded the analysis by investigating whether investment decisions were made considering not only past returns, but also other factors, including fund size, age, risk, and fee structure. Their chief findings showed that, along with conventional investors, investors in SRI funds chased past returns, return rankings, and persistence in performance. Moreover, similar to Bollen (2007), Renneboog et al. (2011) found that investors in SRI funds did not mind negative returns too much more than positive ones, unless poor performance persisted, as well as that greater money inflows stemmed from smaller, younger funds and funds belonging to large-fund families. These authors additionally showed that higher-intensity screenings attracted more inflows than otherwise, yet that some types of screening, such as those considering the environment or ethics, reduced cash flows. At the same time, the volatility of money flows in SRI funds was greater than that in conventional ones—again, unless poor performance persisted—and smaller, younger, or riskier SRI funds were associated with a greater magnitude of volatile money flows than conventional funds.

Benson and Humphrey (2008) provided further insights into SRI investor behaviour by incorporating both monthly and annual returns in order to investigate whether investors reacted to current and/or past information, as well as by incorporating lagged flow in order to account for the persistence of fund flow. Unlike the flow of conventional funds, that of SRI funds was shown to be a negative function of current, past, and lagged returns, which suggested that SRI investors cared about returns less than their conventional counterparts. If such is the case, then this finding would accord with the hypothesis that investors in SRI funds obtained some additional non-financial utility. Furthermore, the lagged flow of SRI funds was significantly positive and its coefficient greater than that of conventional funds, meaning that SRI fund flows were more persistent than conventional ones. It therefore seems likely that investors in SRI funds have reinvested in funds that they already own. Benson and Humphrey (2008) also investigated the differences in flow performance regarding the best- and worst-performing funds; whereas conventional fund investors responded to good performance greatly but reacted less to poor performance, SRI fund investors were less sensitive to performance than their conventional fund counterparts.

Despite considerable research on SRI in various countries, very little has been analysed about 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 et al. (2006) compared the performance of a hypothetical SRI index to that of a market index, between which there were no indexical inconsistencies. In short, they found no major differences between the indices. With stock-by-stock panel data analysis, they additionally investigated whether SRI added excess return to the period before the first SRI index was launched in Japan; however, holding an SRI portfolio was found to have prompted lesser returns during the post-launch period. Together, these results implied that including SRI portfolios in pension funds would not offer any additional benefits to pension participants in Japan. Comparing investor behaviour between SRI and conventional funds, Renneboog et al. (2011) included data from Japan, though as information of only one of 17 countries examined in their analysis. It thus remains unknown how exactly investment behaviour in Japan structurally differs in terms of SRI and conventional funds.

In response, this paper compares SRI and conventional funds from a perspective other than that of the abovementioned studies—namely, their reaction to financial crisis. The findings of earlier studies suggest that investors do not consider SRI to constitute costs, at least because there is no difference in performance between SRI and conventional funds. In terms of investor behaviour, SRI investors are more loyal than conventional investors, since SRI funds are more sensitive to lagged positive returns but less so to negative returns. Taking these results into consideration, we expect that, though most counties worldwide have recently experienced a significant economic downturn, SRI investors might retain their funds instead of selling them. In this sense, the performance of SRI might have suffered from the

financial crisis; however, if CSR activity was evaluated positively by the market, then the decrease in the returns of SRI would be lower than those of conventional investments. We therefore articulated the hypothesis that SRI funds have been able to better resist the negative impact of the recent global recession than conventional funds, particularly in Japan

To examine this hypothesis, we adopted event study methodology. Event studies cast light on how unanticipated events impact changes in fund prices, given that the market is efficient. The unanticipated event focused on here is the bankruptcy of Lehman Brothers, a critical moment during the global financial crisis that triggered further drops in stock prices and even greater economic losses. Among the few studies with a similar research objective, Nofsinger and Varma (2014) compared the performance of US SRI and conventional mutual funds during periods of crisis—namely, March 2000 to October 2002 as the technology bubble burst, and October 2007 to March 2009 as the global financial crisis—and periods of non-crisis that was one other than two crisis periods during 2000-2011. Their estimation results showed that, during the crises, SRI funds significantly outperformed conventional ones, whereas the opposite result emerged 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 et al. (2015) examined the performance of SRI and conventional funds, albeit in different markets, during the period 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, yet did not differ 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 periods of market crisis 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, which aligns with Nofsinger and Varma's (2014) results. Unlike Nofsinger and Varma (2014), however, Leite and Cortez (2015) discovered that the difference between SRI and conventional funds was not statistically significant during crises; though SRI funds achieved returns comparable to those of conventional funds during crisis, they could not provide additional protection to investors at the time. These authors also demonstrated that the inferior performance of SRI during non-crisis periods was spurred by funds employing negative screenings, for 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 crisis, they have also all identified long-term periods of market crisis lasting 1–2 years. In this sense, their results could have accommodated 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 effect of financial crisis 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. From this angle, the present study can provide information useful to stakeholders in exploring the resilience of SRI from short-term perspective on top of mid-, and long-term perspectives that earlier studies looked from. Although the Japanese SRI market remains at a developing stage, an assessment of the potential impact of SRI is worthwhile, given its expected growth due to the steady growth of pension funds. Since studies of Japanese SRI performance (Itoh et al., 2013; Nakai et al., 2013; Nakajima, 2011) have nevertheless not investigated how market crisis impacts fund performance, our study can fill a gap in current knowledge of SRI, especially in Japan.

The principal findings of this paper are that the abnormal impact of the recent global financial crisis on SRI funds was significantly positive, while that on conventional funds was significantly negative estimated by Fama–French three-factor model (Fama & French, 1993); and that the greater resilience of SRI funds in Japan amid the global financial crisis has been induced by international SRI funds. Other recent studies (Leite & Cortez, 2015; Nofsinger & Varma, 2014) have examined whether the types of screening prompt any difference in performance, largely because SRI funds in European countries or the United States exhibit a variety of screenings. At the same time, Japanese SRI funds identified by the Japan Sustainable Investment Forum (JSIF) have employed positive screening and focus mostly on environmental issues.[1] We therefore do not investigate the effect of differences in screening on fund performance.

The rest of this paper is structured as follows. After Section 2 describes the data, Section 3

[1] SRI funds analysed in this study exhibit a few notable features. First, none use the exclusion approach according to the JSIF classification rule. Second, only four of the 62 SRI funds focus on issues other than environment-related ones; three SRI funds—namely, the Amundi Risona Woman J Fund, Amundi Womenomics Balance Kabushiki 30 (monthly distribution type), and Amundi Womenomics Balance Kabushiki 30 (active growth)—actively invest in firms in which numerous women have played important roles or that provide goods or services to women, while the Mitsubishi UFJ SRI Fund actively invests in family-friendly firms in which employees can choose flexible working hours in order to strike better life–work balances, as based on an evaluation by the Good Bankers Co., Ltd. The 58 other funds focus on environmental issues in some way; 17 of them pose CSR as a screening criterion, 10 pose ESG, and eight pose environmental issues. By contrast, some funds specify their interest of screening to be climate change or sustainable energy. It should be noted that CSR activities of Japanese firms encompass environmental conservation efforts, meaning that most SRI funds in the present study have adopted a homogeneous screening strategy. We therefore conclude examining the impact of differences in screening criteria on performance is unnecessary.

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 far brief 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, the same time during which attention to environmental problems escalated noticeably (Dentsu Macromill Insight, 2012). Eco-funds were imported from the West as new financial products as part of the push to introduce new market mechanisms for intermediate cash flow from households into SRIs (Sakuma & Louche, 2008). This situation differs drastically from that in the United States and Europe, where SRI has religious roots. Furthermore, though many SRI investors in Europe and the United States are basically institutional investors, especially in pension funds, most SRI in Japan occurs in publicly offered SRI funds targeting individual investors.

Figure 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, and though both the number of funds and their total net assets have steadily grown, a sudden, considerable decrease occurred in 2008 due to 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 market—a smaller share than in Europe and the US, where SRI funds constitute more than 10% of mutual fund markets (JSIF, 2013). In Japan, screening has targeted environmental aspects since 2007, and it is reported that, as of 2013, more than 70% of SRI funds have been environmentally screened (JSIF, 2014).

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

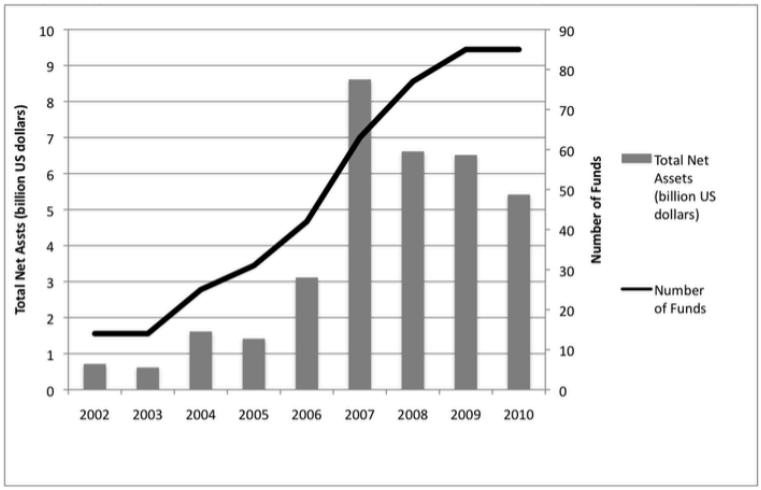

Figure 1. Socially responsible investment funds and total net assets in Japan, 2002–2010

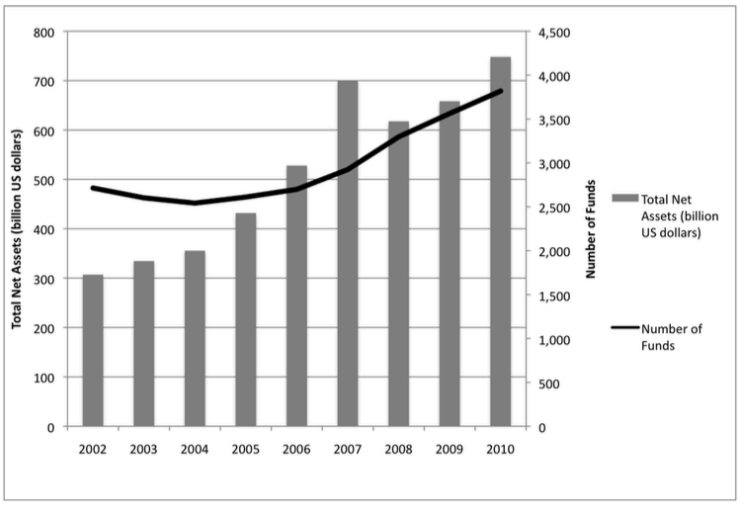

Figure 2. Conventional funds and total net assets in Japan, 2002–2010

To conduct our analysis, we used data purporting the value of funds and the market portfolio. Daily return data regarding publicly offered investment trusts are available from the Investment Trusts Association, Japan, which offers a sample of 3,824 funds as of the end of July 2010. Data concerning privately offered investment trusts are unavailable and thus were 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 encompasses 2,136 conventional funds and 62 SRI funds (for the latter, see Appendix A). Funds were also classified into domestic or international funds; whereas domestic funds are mutual funds that invest in stocks and/or bonds of chiefly domestic companies, international funds as those investing in both domestic firms and foreign companies, or only the latter. In

accordance with these criteria, there were 793 domestic conventional funds and 24 domestic SRI funds in our sample. International funds had 1,343 conventional funds and 38 SRI funds (Table 1). We used the Tokyo Stock Price Index (TOPIX), Russel Nomura Large Cap Growth Index, Russel Nomural Large Cap Value Index, Russel Nomura Small Cap Growth Index, Russel Nomura Small Cap Value Index, and Japan Benchmark 10-Year Government Index to construct the market premium index, small minus big (SMB) index, and high minus low (HML) index, as well as to complete the Fama–French three-factor model, as detailed in section 3.3. All data were downloaded from Datastream. Table 2 provides the descriptive statistics of the fund returns of SRI funds, conventional funds, and other indexes, the calculation of which appears in section 3.1; each fund showed 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

Table 2. Descriptive statistics

	Observation	Mean	Std.Dev.	Min.	Max.
SRI	9,424	-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

3 Method

3.1 Event Studies with Ordinary Least Squares

Event study methodology was introduced by Fama et al. (1969) for the purpose of examining the relationship between a particular unanticipated event and changes in stock prices. More specifically, numerous studies have used the methodology to analyse whether positive or negative CSR-related events impact 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, the unexpectedness of the event, and the nonexistence of other contemporaneous events that could have affected share prices analysed (McWilliams & Siegel, 1997).

To conduct our event study, we needed to define the event window—that is, the period examined for changes in fund price. We set a three-day period as our event window that 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 in order to encompass both changes in fund price resulting from information leaked before the event and the investment action taken by latecomers on the day after the event.

Since the Japanese market was closed on 15 September 2008 due to a public holiday, we have identified the bankruptcy of Lehman Brothers to have occurred on 16 September 2008, here designated as T_0 ; the last transaction day before the event (12 September) is labelled T_{-1} and the transaction day following the event (17 September) 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:

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

in which $r_{i,t}$ 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 that the event did not occur. We assumed that the return of the market proxy—here, TOPIX—and of each fund has a linear relationship. To calculate the normal return, α_i and β_i were estimated in the market model with data from the estimation window, as shown below:

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

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

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

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

$$CAR_i(T_{-1}, T_1) = \sum_{t=T_{-1}}^{T_1} AR_{i,t}. \tag{4}$$

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

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

The variance of the average cumulative return can thus be obtained as follows:

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

Once ACAR values are obtained, we tested the null hypothesis that the event did not impact fund returns by using the following *J*-statistics:

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

If we could not reject the null hypothesis, then it became meaningless to interpret the value of ACAR.

3.2 Event Studies with EGARCH

Most earlier studies listed in 3.1 adopted an event study methodology that does not account for heteroskedasticity. In fact, the standard market model assumes 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 nonconstant variance. An autoregressive conditional heteroscedasticity (ARCH) model (Engle, 1982) and a more extended version, a generalised autoregressive conditional heteroskedasticity (GARCH) model (Bollerslev, 1986), were thus developed to account for heteroskedasticity. In several earlier studies, the GARCH model was employed to estimate time-variant conditional variance, though it

exacted some limitations—for example, nonnegative restriction on estimators. By contrast, the EGARCH model introduced by Nelson (1991) does not assume the nonnegative constraint when using a natural logarithm, thereby making it superior to the GARCH model since the nonnegative 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:

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

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 $\varepsilon_{i,t}\left|\Omega_t \sim N(0,h_{i,t})\right.$ 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 same manner as with the OLS model.

To obtain the standardised residual terms, we calculated the conditional variance in each three-day event window for firm i using both 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 take the exponential for each and found the average over the three-day period. We then obtained the average conditional variance for firm i as follows:

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

The variance of the average cumulative return could thus be obtained as follows.

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

Finally, we tested the null hypothesis that the event did not impact fund returns by using the following *J*-statistics:

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

3.3 Event Studies with the Fama–French Three-Factor Model

If our data has similar biases as other countries' data of earlier studies, the multifactor model must be employed to our analysis, too. Firstly, we need to check whether those factors have a significant effect on the return of funds. We follow the study of Faff (2004) to construct the Fama-French "SMB" and "HML" factors using existing style indexes that are *Russel Nomura Large Cap Growth Index*, *Russel Nomura Large Cap Value Index*, *Russel Nomura Small Cap Growth Index*, and *Russel 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*" that enables us to control for small-effect based on the idea that firms with smaller market capitalisation can earn higher return than bigger firms in the financial market. The proxy of SMB at time t is obtained as following:

$$SMB_t = \left(\frac{R_{SVt} + R_{SGt}}{2} \right) - \left(\frac{R_{LVt} + R_{LGt}}{2} \right) \tag{13}$$

where R_{SV_t} is the return on the *Russel Nomura Small Cap Value Index* at time t; R_{SG_t} is the return on the *Russel Nomura Small Cap Growth Index* at time t; R_{LV_t} is the return on the *Russel Nomura Large Cap Value Index* at time t; R_{LG_t} is the return on the *Russel Nomura Large Cap Growth Index* at time t. Another Fama-French factor, HML (*High Minus Low*) shows the difference in the return between the firm with a high book to market ratio (often called as *value stock*) minus the one with a low book to market ratio (so-called *growth stocks*). HML at time t can be constructed as below:

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

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 compare them in terms of SRI and conventional funds, according to the following:

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

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1i}\text{MarketPremium}_{i,t} + \beta_{2i}SMB_t + \beta_{3i}HML_t + \beta_{4i}d\_SRI * \text{MarketPremium}_{i,t} + \beta_{5i}d\_SRI * SMB_t + \beta_{6i}d\_SRI * HML_t + \varepsilon_{i,t} \quad (15)$$

Market Premium can be 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 to be significant, then the variables have to 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. Regression results using the Fama–French model

	Coeff.	Std. Err.
Constant	0.0001***	0.0000
Market Premium	0.8917***	0.0011
SMB	0.6478***	0.0035
HML	-0.2912***	0.0053
*d_SRI*Market Premium*	0.4083***	0.0067
*d_SRI*SMB*	-0.3976**	0.0210
*d_SRI*HML*	-0.0891***	0.0312

***Statistically significant at the 1% level.
**Statistically significant at the 5% level.

As shown in Table 3, all variables and interactions with the SRI dummy have statistically significant coefficient. We thus 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, a finding consistent with the results of earlier studies encompassing crisis periods (Becchetti et al., 2015; Leite & Cortez, 2015; Nofsinger & Varma, 2014).

Our finding that the *SMB* factor was significantly positive at the 1% level indicated to us 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) earlier showed, since their sample of French funds was mostly screened with best-in-class strategies, larger, well-established companies could thus 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* effect than conventional funds.

At the same time, the coefficients of *HML* became statistically significant and negative at the 1% level, suggesting that funds in our study are more growth- than value-oriented, which runs counters to the results of Nofsinger and Varma (2014) and Leite and Cortez (2015), yet is similar to those of Becchetti et al (2015). Furthermore, the negative coefficient of *d_SRI*HML* underscores that that SRI funds are more growth-oriented than conventional ones.

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

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

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

4 Empirical Results

As we confirmed in 3.3 that Fama-French factor did have effect on performance of SRI and conventional funds, we mainly discuss the estimation results of the model in this section. Unlike the empirical results with other two models (discussed later in this section), the ACAR of SRI funds is significantly positive (0.0026) at the 5% level, while the one of conventional funds remains significantly negative (-0.0069) at the 1% level. Therefore, we reject that the null hypothesis that the event did not have any effect on the funds. The difference of those ACARs is also significant at the 1% level (See the Table 4). Hence, we conclude that SRI fund is more resilient towards the bankruptcy of Lehman Brothers. The result can be interpreted that investors did not sell out SRI funds even under the difficult situation, while they seemed to sell off conventional funds.

The resilience of SRI funds towards the collapse of the Lehman Brothers was also found in

OLS and EGARCH model. Although the ACARs of SRI funds are negative in these models, the absolute value is smaller than the ACARs of conventional funds. This means the impact of the bankruptcy of Lehman Brothers on SRI funds was less severe than that on conventional funds. With the OLS model, the difference in the ACARs between SRI funds and conventional funds is statistically significant at the 5% level. We also applied the EARCH model since the stock price data often contains the heteroskedasticity. We conducted an ARCH-LM test for all of the data and found that 24 out of 62 SRI funds and 1,003 out of 2,139 conventional funds have ARCH effects. (The results of the ARCH-LM test for SRI funds are shown in Appendix 3B). Since it is confirmed that there exists an ARCH-effect in a considerable number of funds, we also analysed the data using the EGARCH (1,1) model, and we obtained the similar results with the OLS model.

In order to analyse how serious this negative shock was, we would have to compare the obtained ACARs with other event studies. Unfortunately, there have been no other event studies using fund data that we know of. Comparison of the impact of the financial crisis on SRI funds with other events that might affect the returns of SRI funds would require further study.

Table 4. Comparisons of ACAR

The 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]

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

5 Discussion: Domestic versus International Funds

It remains unclear why the impact of the recent global financial crisis on SRI funds was less than that upon conventional funds. One possible reason is that investors might have supposed that any company targeting CSR would be one with a sound long-term strategy and hence a more forward-looking firm than its counterparts, since its goods or services could 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 could 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 bankruptcy of Lehman Brothers. To explore this idea, the present section focuses on the differences of investment destination to explain why SRI funds have been more resilient during the financial crisis than conventional funds.

In 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 toward domestic SRI and international SRI funds, then they also respond differently to financial shock sustained by 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 the most ACARs of domestic funds were estimated to be negative with all models. Besides, the collapse of Lehman Brothers dropped the return of SRI funds more than that of conventional funds, though the difference between the two funds was statistically 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 similar to that estimated with the entire sample. The result might thus indicate that an increase in SRI performance could be induced by the resilience of international SRI funds, possibly because international funds can enjoy a greater diversification of investment opportunities than domestic ones. As a result, the impact of financial shock on domestic SRI funds and domestic conventional funds might become similar.

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.
***Statistically significant at the 1% level.
*Statistically significant at the 10% level.

6 Conclusion

Using the event study methodology, in this paper we examined the market reaction of SRI funds relative to conventional funds in the Japanese market amid the recent global financial crisis. We chose the bankruptcy of the Lehman Brothers as the momentous event, for it is known to have triggered a further drop in stock prices and economic losses during the recession. Empirical results with the Fama–French three-factor model showed that the event significantly increased the performance of SRI funds at the 5% level, while the significant negative impact on conventional funds was estimated and a difference between two groups of funds were statistically significant at the 1% level. We also found that the resilience of SRI funds amid the event was largely due 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 assume 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. This result could be useful information to help the diffusion of SRI since stability is the most important investment factor for individual investors in Japan (Japan Securities Dealers Association, 2014).

Our approach can be extended to investigate the impact of financial crisis in other countries and in other time periods. Comparison of the impact of the financial crisis on SRI funds with other events, using data from other countries as well would provide useful information. Fund data in the United States market

could be analysed with the same methodology, since the financial crisis was triggered by defaults on subprime loans in the US. Such studies might lead to some interesting comparison of the level of impact on SRI funds in Japan with 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	20 Aug 1999
2	Nenkin Tsumitate Eco Fund	Nikko Asset Management	31 Oct 2001
3	Sompo Japan Green Open	Sompo Japan	30 Sep 1999
4	Eco Partners	Mitsubishi UFJ Trust and Banking	28 Jan 2000
5	Asahi Life SRI Shakai Kouken Fund	Asahi Asset Life 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	20 May 2004
10	DC Daiwa SRI Fund	Daiwa Asset Management	20 July 2004
11	Mitsubishi UFJ SRI Fund	Mitsubishi UFJ Trust and Banking	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	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 Asset Management	30 May 2006

		Japan	
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 Co., Ltd.	31 Oct 2000
25	Nikko Global Sustainability Fund A (without hedge)	Nikko Asset Management	17 Nov 2000
26	Nikko Global Sustainability Fund B (with hedge)	Nikko Asset Management	17 Nov 2000
27	Nenkin Tsumitate Global Sustainability (without hedge)	Nikko Asset Management	25 Oct 2001
28	Nenkin Tsumitate Global Sustainability (with hedge)	Nikko Asset Management	25 Oct 2001
29	World Water Fund A Course (with currency hedge)	Nomura Asset Management	26 Mar 2004
30	World Water Fund B Course (without currency hedge)	Nomura Asset Management	26 Mar 2004
31	Nomura Global SRI 100	Nomura Asset Management	28 May 2004
32	Nomura Sekai SRI Index Fund (for defined contribution pension fund)	Nomura Asset Management	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	15 June 2007
36	New Generation Sekai Kankyo	United Investments Co., Ltd.	29 June 2007
37	Chikyu Ondanka Boushi Kanren Kabu	Shinko Asset Management Co.,	25 July 2005

	Fund (3-month closing type)	Ltd.	
38	Mitsubishi UFJ Global Eco Water	Mitsubishi UFJ Trust and Banking	27 July 2007
39	Nomura Aqua Toushi A Course (with exchange hedge)	Nomura Asset Management	29 Aug 2007
40	Nomura Aqua Toushi B Course (without exchange hedge)	Nomura Asset Management	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	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 Asset Management Japan	17 Dec 2007
50	TA Clean Energy Fund	Toyota Asset Management Co., Ltd.	20 Dec 2007
51	Amundi Sekai Kankyoryoku Kabushiki Fund	Amundi Asset Management Japan	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	14 Mar 2006
54	6 Shisan Balance Fund (growth type)	Daiwa Asset Management	14 Mar 2006
55	Shizen Kankyo Hogo Fund	DIAM Co., Ltd.	26 May 2006

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

Appendix B: ARCH-LM Test for SRI Funds

Fund ID	Arch	Fund ID	Arch
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***

***Statistically significant at the 1% level.
*Statistically significant at the 5% level.
*Statistically significant at the 10% level.