An Empirical Study on Stock Price Responses to the Release of the Environmental Management Ranking in Japan

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Abstract

This paper investigates how stock prices respond to the release of the environmental management ranking by using a standard event study methodology. Examining top 30 manufacturing companies in the environmental management ranking published by Nihon Keizai Shimbun (Nikkei newspaper) from 1998 to 2005, we find that stock prices on the whole did not respond significantly to the release of the ranking within a three-day event window. Moreover, stock prices of companies that experienced a downgrade increased significantly, while those that experienced an upgrade decreased significantly.

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1. Introduction

As environmental issues have gained global attention, more and more companies have started and/or expanded their environmentally friendly activities in the world. Behind these developments, several economists claim that firms engage in "profit-maximizing" environmental management, expecting benefits that exceed additional costs, by generating innovation, raising their reputation, charging higher prices for their products, recruiting highly skilled workers, and so on. Such an idea is a big change from traditional views on environmental activities that could impose additional costs on private firms.

A number of recent empirical studies have attempted to show the relationship between environmental and financial performance by using an event study methodology.[1] For example, Yamashita et al. (1999) investigated the relationship between environmental conscientiousness (EC) scores, which were published in *Fortune* magazine (1993) and stock returns in the U.S. They found only a weak increase for firms with high EC scores. Gupta and Goldar (2005) also provided evidence that the announcements of poor environmental performance based on the "green leaf rating," the environmental rating evaluated by the Center for Science and Environment, India's environmental NGO, tended to decrease stock prices of pulp and paper, automobile, and chlor alkali companies.

Many previous studies have reported stock markets react positively to environmentally friendly news and negatively to environmentally unfriendly news. In this paper, we investigate how stock prices in Japan respond to the release of the environmental management ranking by using a standard event study methodology. Examining top 30 manufacturing companies in the Nikkei Environmental Management Ranking from 1998 to 2005, we find that their stock prices on the whole did not respond significantly to the release of the ranking within a three-day event window. Moreover, stock prices of companies that experienced a downgrade increased significantly, while those that experienced an upgrade decreased significantly.

The rest of this paper is organized as follows. Section 2 explains the data. Section 3 describes the event study methodology. Section 4 discusses the results. Concluding remarks are provided in Section 5.

2. Data

[1] For a detailed survey of the relevant literature, see, for example, Koehler (2003) and Nagayama and Takeda (2006).

First, we provide a brief description of the Nikkei Environmental Management Ranking. This ranking is conducted and released by Nikkei newspaper every year since 1997. In order to evaluate companies based on their environmental management, Nikkei sends questionnaire to companies. The questions were classified into the following seven categories; (1) management system, (2) long-term goals, (3) anti-pollution measures, (4) recycling, (5) environmentally friendly products, (6) reduction of greenhouse gas emissions, and (7) offices. The companies are ranked based on the total scores.

Next, we calculate daily stock returns of listed manufacturing companies, which are within 30 ranks in the Nikkei Environmental Management Ranking from 1998 to 2005[2] and the index TOPIX are computed as follows, using Toyo Keizai's *Kabuka CD-ROM* 2006:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}, \text{ and } \quad R_{mt} = \frac{T_t - T_{t-1}}{T_{t-1}},$$

where P_{it} is the stock price of the *i*th firm at time *t*, R_{it} refers to its rate of return, T_t presents TOPIX at time *t*, and R_{mt} is its rate of return.

3. **Methodology**

The evaluation is based on the standard event study methodology as described by MacKinlay (1997). This methodology hinges on the assumption that markets are efficient, in the sense that current stock prices reflect all publicly available information. In other words, only unexpected events would move stock prices, by updating the expected profitability of a firm. Here, the event is defined as the date when the Nikkei Environmental Management Ranking is released.

We first choose a three-day event window, which is the period over which stock prices react to the event. We define the event day as t_0, the initial date of the event window as $t_1 = -1$, and the final date of the event window as $t_2 = +1$. We set the estimation window at 150 transaction days prior to the event window.

Then we estimate the following market model for each announcement:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},$$

where ε_{it} is the zero mean disturbance term. By using the estimated parameters $\hat{\alpha}_i$

[2] The 1997 survey results were not published.

and $\hat{\beta}_i$, the abnormal return for the stock of firm *i* in period *t* is obtained by:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}).$$

The cumulative abnormal return (CAR) is calculated by summing up abnormal returns over the event window:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it}.$$

By averaging the CAR and its variance $\sigma_i^2(t_1, t_2)$ across *N* firms in the same category, we can obtain the average cumulative abnormal return ($\overline{CAR}$) and its variance $\bar{\sigma}_i^2(t_1, t_2)$:

$$\overline{CAR}(t_1, t_2) = 1/N \sum_{i=1}^{N} CAR_i(t_1, t_2),$$

$$VAR\left[\overline{CAR}(t_1, t_2)\right] = \bar{\sigma}^2(t_1, t_2) = 1/N^2 \sum_{i=1}^{N} \sigma_i^2(t_1, t_2).$$

Assuming the null hypothesis H_0 that each event does not affect the mean or variance of returns, we can test whether the CAR is normally distributed with a mean 0 and variance $\sigma_i^2(t_1, t_2)$ by using the following J-statistic:

$$J = \frac{\overline{CAR}(t_1, t_2)}{\sqrt{\bar{\sigma}^2(t_1, t_2)}} \sim N(0,1).$$

4. Discussion

Table 1 presents the CARs and the statistical significance for each industry. The CARs of all manufacturing companies are positive, but insignificant. This result seems to be consistent with Nagayama and Takeda (2006), which find that environmentally friendly news in general does not affect stock prices significantly from 1997 to 2004. Among industries listed in Table 1, only electronics and automobiles satisfy the reasonable number of observations. The CARs of these two industries are also insignificant. Although there are three industries, which generate significant stock price reactions to the announcements, caution will be needed to make use of these results, considering their low number of observations.

Next, Table 2 and Figure 1 show the CARs by year. The CARs are significantly negative in 1999 and 2002, but turn into positive since 2003. However, the recent

positive trend does not necessarily reflect the enhancement of environmental consciousness of market participants, considering the results presented in Table 3. Table 3 provides evidence that stock prices of companies that experienced a downgrade increased significantly, while those that experienced an upgrade decreased significantly. This result implies that Japanese stock markets react negatively to environmentally friendly news and positively to environmentally unfriendly news. As for stock prices of companies whose ranking were not changed, we could not obtain reliable results due to the low number of observations.

In sum, Japanese investors do not seem to appreciate firms' environmental performance unlike the US and European investors that were examined in the previous literate. This may because Japanese companies fail to increase profits from environmentally friendly activities. In other words, environmentally friendly activities may impose additional costs on Japanese companies that exceed benefits. Further research will be needed to examine how profitable environmental activities really are by using financial statements of Japanese companies.

5. Concluding remarks

This paper investigates how stock prices respond to the release of the environmental management ranking by using a standard event study methodology. Examining top 30 manufacturing companies in the environmental management ranking published by Nikkei newspaper from 1998 to 2005, we find that their stock prices on the whole did not respond significantly to the release of the ranking within a three-day event window. Moreover, stock prices of companies that experienced a downgrade increased significantly, while those that experienced an upgrade decreased significantly.

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Figure 1: CARs by year

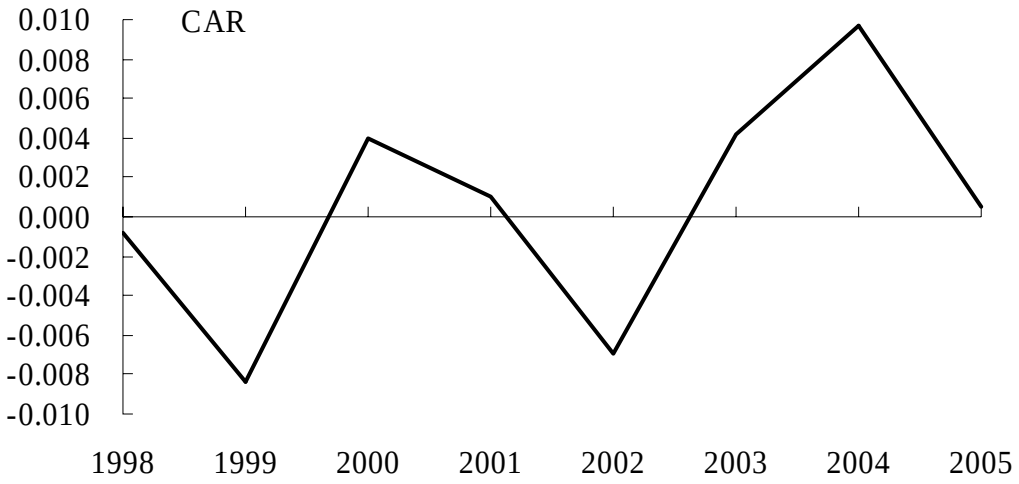

Table 1: CARs by industry

Industry	Number of observations	CAR	J-statistic (1)
All Manufacturing Industry	206	0.005	0.367
Electronics	117	0.003	1.336
Automobiles	29	-0.003	-0.878
Electricity & Gas (2)	12	0.006	1.125
Office Supplyers & Publishers	11	0.010	1.915 *
Food	9	-0.011	-1.876 *
Machinery	8	-0.003	-0.500
Chemicals	10	0.006	0.938
Others (3)	10	-0.025	-3.983 ***

Notes:

1. *** and * indicate statistical significance at 1% and 10%, respectively.
2. Electiricity & gas are included in the ranking of manufcaturing industry from 1998 to 2002.
3. Others include rubbers, pharmaceuticals, pulp, steel, metal, and non-ferrous metal.

Table 2: CARs by year

Year	Number of observations	CAR	J-statistic
1998	27	-0.0008	-0.1932
1999	25	-0.0084	-1.6565 **
2000	26	0.0040	0.9269
2001	27	0.0011	0.2460
2002	21	-0.0069	-1.7311 **
2003	25	0.0042	1.1128
2004	24	0.0097	3.4741 ***
2005	28	0.0005	0.1951

Note. *** and ** indicate statistical significance at 1% and 5%, respectively.

Table 3: CARs by rank

Rank	Number of observations	CAR	J-statistic
1-10	66	0.001	0.407
11-20	69	-0.002	-0.798
21-30	71	0.003	1.039
Upgrade	137	-0.004	-2.209 **
Unchanged	4	-0.008	-0.802
Downgrade	65	0.011	4.607 ***

Note. *** and ** indicate statistical significance at 1% and 5%, respectively.