

The Stock Price Reaction to Environmentally-Related Company News

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In this paper we examine the stock price reaction to environmentally-related news about companies in the S&P 500. By employing data from the Investor Responsibility Research Center's News and Bibliography database, we study a more current and more diverse set of announcements than have been previously studied. The News and Bibliography Section of Investor Responsibility Research Center (IRRC) database lists corporate profiles and includes a summary of published material about the company that has potential environmental significance. We subdivide the news announcement into ten separate categories and by four separate types of media outlets. This classification system provides the opportunity to examine the stock price reaction to different types of environmentally related news. Our initial sample size contains 2,441 events for an average of about eight event dates for the approximately 300 of the S&P 500 firms in the IRRC database. Using standard event methodology, the null hypothesis tested in this study is that the market values of firms' equities are unaffected by the announcement of an environmentally related company news item.

Our results indicate that announcement of an environmental award tend to produce the most consistent positive abnormal return, regardless of the type of media outlet.

As pressure mounts to protect the environment, companies are rethinking the way they design, develop, produce and deliver their products. To keep their companies competitive in this rapidly changing environment, managers need to pay attention to new measures of performance and changing bases of competition. Corporations are increasingly altering their operations so that the environmental impact of these operations is lessened. For instance, Procter and Gamble has developed methods to reduce the amount of plastic used in packaging their products, and McDonald's has switched to a tanker system for delivery of concentrates (e.g., Coca-Cola and orange juice) to eliminate several million pounds of packaging annually. The decision to change product packaging is influenced by the demands from a wide variety of corporate stakeholders. Prominent among them are the consumers and the stockholders. Given the oftentimes conflicting interests of these stakeholders, it seems natural to question the underlying corporate motive for product repackaging.

In the case of a company making an effort to behave in a more environmentally-friendly manner, investors may wonder whether this action is being undertaken because of, or in spite of, the mandate to maximize shareholder wealth. Today, firms are less apt to admit that their sole goal is the maximization of shareholder wealth. Managers are much more likely to espouse some variant of the stakeholder paradigm, in which business is considered as a system of agreements or contracts between many parties (Freeman, 1984; Cornell and Shapiro, 1987). Management's response to the firm's stakeholders, an amorphous group comprising customers, employees, suppliers, shareholders, competitors and others, depends upon the relative importance of a particular stakeholder group to the company's overall strategy.

Prior research on the relationship between financial and environmental performance has been inconclusive. On the one hand, environmental regulations can impose costs to the company hurting its bottom line. Alternatively, a firm with a comparative advantage at controlling

pollution might also have a comparative advantage in other production processes. Likewise, firms that perform well financially are better able to spend more of its resources on cleaner technologies.

Additionally, it is conceivable that the relationship between financial and economic performance is changing over time as more companies see a proactive environmental stance as being consistent with long term financial health. This contrasts with earlier times when investments by corporations in environmental protection measures were viewed as detrimental to superior financial performance. This study provides evidence of how investors have reacted to reports of the environmental activities of companies in the S & P 500 Index during the time period 1999-2001.

Prior Evidence on Environmental and Financial Performance

Most of the early research attempting to establish a relationship between financial and environmental performance focus on how socially-screened portfolios performed relative to broader market indices. A firm's social performance was typically a function of the firm's reputation based on a variety of issues such as involvement in South Africa, weapons manufacturing, or environmental performance. Results from these earlier studies vary; see e.g., Vance (1975), Bowman (1975), Cochran and Wood (1984), White (1991), and McGuire, Sundgren and Schneeweis (1981).

A second set of studies examines the relationship between environmental performance and financial performance more directly, but again with mixed results. Bragdon and Marlin (1972) and Spicer (1978) find a significant relationship between the Council on Economic Priorities (CEP)'s measures of firm environmental performance in the pulp and paper industry and financial performance. However, Chen and Metcalf (1980) use the same data to show that, when differences in firm size were taken into account, environmental performance is unrelated to financial performance. More recently, Erfle and Fratantuono (1992) analyze CEP's reputation indices of environmental performance and conclude that environmental perfor-

mance for these firms is positive and significantly correlated with return on assets, return on equity and return on investment.

Another group of authors, primarily from the accounting profession, provides more consistent evidence linking environmental performance to improved financial position. Barth and McNichols (1994) show that the market's valuation of a firm's environmental liabilities exceeds the book value of the liabilities of the reporting firms. Campbell, Sifcik, and Soderstrom (1995) find that the extent of a company's identification with Superfund sites has a negative effect on market value. In addition, they find this negative association is more pronounced after the Superfund Reauthorization Act of 1986. Moreover, Blacconiere and Northcut (1995) find that the negative stock price reaction to announcements of more stringent environmental legislation is stronger for firms with less disclosure of liabilities.

A fourth strand of the literature consists of studies attempting to find a relationship between financial performance and specific measures of environmental performance over an extended period of time. Most of these studies find a positive relationship between the two types of performance measures. Cormier, Magnum and Morard (1993) find that there is a premium (discount) for firms that meet (do not meet) environmental regulations. Cohen et. al. (1997) show that a subset of the S&P 500 consisting of environmental leaders performed at least as well as the S&P Index itself. Konar and Cohen (2001) demonstrate that firms with below average environmental performance have reduced values of intangible assets. Walmsley and Bond (2003) explore the relationship between corporate environmental reporting and share price performance in two industry groups listed on the FTSE (Financial Times Stock Exchange) 100 as of July 2001. They find that the quality of environmental reporting by FTSE100 companies (in the energy and utilities and financial services sectors) did not result in an improved stock price performance when compared to non-reporting companies.

The papers most closely related this research are those whose authors who

employed event study methodology to determine the effect of various environmentally related events on the stock price of publicly traded firms. Hamilton (1995) finds that there are significantly negative abnormal returns for companies with toxic release inventory (TRI) emissions than when the TRI was first disclosed in 1989. Konar and Cohen (1997) find that those companies experiencing the largest reaction to the TRI disclosure also reduced TRI emissions in the years following the initial TRI release more than companies with less negative reactions to the initial disclosure. Klassen and McLaughlin (1996) discover that good environmental news (e.g., being nominated for a "clean company" award) results in positive abnormal returns, while bad news (e.g., a toxic chemical leak) causes significantly negative abnormal returns. Karpoff, Lott, and Rankine (1999) confirm this relationship. Using a sample of negative environmental incidents involving oil and electric power companies between 1970 and 1992, Jones and Rubin (2001) find an overall insignificant stock market reaction to the announcement of these incidents.

Bosch et al. (1998) estimate the impact of EPA enforcement activity on stockholders' wealth and the value of alternative management response strategies. The authors' sample included a total of 525 cases involving 244 firms based on EPA related announcements in *The Wall Street Journal* between 1970-1990. This sample is divided into subsets according to response strategies (e.g., targeted firms, losers, winners and challengers). The authors use standard event study methodology to determine the impact of the EPA announcements on stock returns. The authors conclude that the market reacts negatively to news that the EPA targeted a firm, and that firms that challenged the EPA and lost suffer a statistically significant negative abnormal returns of 1%.

Data

In this study, we update and expand previous studies by using the News and Bibliography Section of Investor Responsibility Research Center database (IRRC), a larger event database than has been used in the past, and by considering

a wider variety of event types. The News and Bibliography Section of Investor Responsibility Research Center database (IRRC) lists corporate profiles which includes a summary of published material about the company that has potential environmental significance. The database contains entries from approximately 850 newspapers, journals, newsletters and trade publications. In some cases, the database provides additional detail on compliance incidents that are reflected in government data.

All items contained in the News and Bibliography section include full reference citations, date of publication, a brief summary of the article, the article source, and may be sorted by any of these elements. This classification system provides the opportunity to examine the stock price reaction to different types of environmentally related news. News and Bibliography entries are divided into ten possible categories outlined in Table 1 below.

In addition, announcements can be sorted by publication types including different media outlets. We divide the media outlets in four categories: national newspaper (e.g., *The New York Times*), regional newspapers (e.g., *Cincinnati Enquirer*), trade publications (e.g., *Industry Week*) and publications from entities devoted to environmental issues (e.g., *Utility Environment Report*). While most papers that employ event study methodology use *The Wall Street Journal* as the exclusive source of announcement dates, other studies (see e.g., Huberman and Regev, 2001) show

that investors also respond to news from other news sources. Our initial sample size contains over 2,700 announcement. After removing announcements that do not fit into one of the ten categories or are otherwise confounding, the total sample size reduces to 2,441 for an average of about eight event dates for the approximately 300 of the S&P 500 firms that have environmentally related news in the IRRC database. All of the announcements took place between 1999 and 2001.

Methodology

The null hypothesis tested in this study is that the market values of firms' equities are unaffected by the announcement of an environmentally related company news item. This study tests this hypothesis using standard event study methodology (see e.g., Brown and Warner, 1985). This methodology is normally used in finance studies to test the stock price reaction to more traditional financial events such as announcements of earnings, dividends, or mergers. The purpose of this methodology is to determine whether the announcement of some upcoming event produces a "significant" stock price reaction around the time of the announcement. To conduct such tests, daily stock returns are measured around the announcement date and compared with the expected return. The expected return is generally based on the Capital Asset Pricing Model or some other suitable market based return generating mechanism.

Daily return data are available from the University of Chicago's Center for Research in Security Prices (CRSP) tape. We specify the market model as

$$R_{j,t} = \alpha_j + \beta_j R_{m,t} + u_{j,t}, j=1, \dots, N; t=-325, \dots, -71,$$

where N is the number of issues in the sample, $R_{j,t}$ is the return on stock j for day t , $R_{m,t}$ is the return on market proxy m for day t , $u_{j,t}$ is the random error for stock j for day t normally distributed with $E[u_{j,t}] = 0$, α_j is the estimated intercept term for stock j , and β_j is the estimated risk coefficient for stock j . The market model is estimated by using the equally-weighted market returns from CRSP files as the market proxy.

The prediction errors are calculated for each day in the test period, which begins 10 days before the announcement day and ends 10 days after the announcement day. The prediction error (PE) for stock j for day t is defined as

$$PE_{j,t} = R_{j,t} - (\alpha_j + \beta_j R_{m,t}), j=1, \dots, N; t=T_1, T_1 + 1, \dots, T_2$$

such that $E[PE_j] = 0$, i.e., the prediction error is not expected in an efficient market in equilibrium. If $E[PE_j] \neq 0$, then we infer that some unanticipated information had come to the market and was used by well-informed individuals.

The cross-sectional average prediction error (APE) for day t for a sample of size n is

$$APE_t = \frac{1}{N} \sum_{j=1}^N PE_{j,t}$$

and the cumulative average prediction error (CAPE) is

$$CAPE_j = \sum_{k=T_1}^i APE_k.$$

The time-series of CAPEs tells us whether prediction errors would have occurred had investors bought the test portfolio in day T_1 and held until day I , $i=T_1, T_1+1, \dots, T_2$.

Following Patell (1976), tests of statistical significance are based on standardized prediction errors. The standardized prediction error (SPE) for stock j in day t , is calculated as

$$SPE_{j,t} = \frac{PE_{j,t}}{S_{j,t}}$$

TABLE 1
Types of Environmental Announcements

Announcement Type	Number of Observations
1. A firm wins an environmental award	146
2. A firm announces an environmental initiative affecting production	232
3. A firm sponsors an environmental event	422
4. A firm is the subject of an environmental lawsuit	117
5. A firm wins an environmental lawsuit	52
6. A firm loses an environmental lawsuit	178
7. An environmental group speaks ill of a company lawsuit	116
8. A firm sues the government on an environmental matter	29
9. Other bad environmental news	606
10. Other good environmental news	542

where σ_j^2 is the residual variance from the market model estimation for stock j , T is the number of days in the period used to estimate the model, and R_m is the mean market return in the estimation period. The average standardized prediction error (ASPE) for day t is

$$ASPE_t = \frac{1}{N} \sum_{j=1}^N SPE_{j,t} \cdot$$

For each day, the Z-statistic is calculated as

$$Z_t = \sqrt{N} \cdot ASPE_t \cdot$$

The limiting distribution Z_t is the unit normal, under the null hypothesis that the mean normalized, standardized prediction error equals zero. Over the testing period, which begins with T_1 and ends with T_2 , the cumulative normalized, average standardized prediction error (CASPE) is

$$CASPE_{T_1, T_2} = \left(\frac{1}{N} \right) \frac{\sum_{t=T_1}^{T_2} \sum_{j=1}^N SPE_{j,t}}{\sqrt{T_2 - T_1 + 1}}$$

Then, the Z-statistic is calculated as

$$Z_{T_1, T_2} = \sqrt{N} \cdot CASPE_{T_1, T_2}$$

and has a unit normal limiting distribution under the null hypothesis that the cumulative normalized, average standardized prediction error over the period from T_1 through T_2 equals zero.

If stock returns are significantly different than expected on the event date, then this constitutes evidence that the action announced affected shareholder wealth. In this study, the event date is the date on which the announcement of an environmentally-related news item appears in the press.

Results

Environmental awards

Table 2 shows the Z statistics for the test of the cumulative standard prediction errors equality to zero for the 10 different events and the 4 different publication venues for which there are more than 15 observations. Generally the most consistent significant event was for firms winning an environmental award, which was significant for three of the four publication types as well as for the announcements in the aggregate set of publications. While the award may be indicative of a company having environmentally benign processes in place, the

award is most likely to be in recognition of past performance rather than future promise. Examples of this type of announcement are Norfolk Southern receiving a South Carolina Wildlife Federation award for providing habitat for endangered red-cockaded woodpeckers and Northrop Grumman being one of five finalists for the 1999 Conservation Leadership Award of the Nature Conservancy of Texas. This result is consistent with that found by Klassen and McLaughlin (1996) using earlier data.

Environmental initiatives

Interestingly, environmental initiatives, which may seem most likely to affect future cash flows, holds little significance for shareholders, regardless of the type of publication for which the news is delivered. Examples of these types of announcements include Phillips Petroleum having a \$1.1 billion plan to remove and recycle 14 unused oil and gas installations from a Norwegian North Sea oil field and Hilton Hotels having a systemwide recycling program and offering guests the opportunity to reuse their linens rather than receive fresh ones daily.TM

TABLE 2
Z Scores for Cumulative Abnormal Prediction Errors on the Announcement Date

PUBLICATION	Major Publication	Regional Publication	Enviro Journal	Trade Journal	All Publications
EVENT					
Award	2.48**	1.69*		2.13*	3.26***
Enviro initiative	0.18	0.67		0.15	1.01
Company P.R.	-1.28	-1.81	1.45\$	0.51	-1.28
Lawsuit Announced	-2.21	-1.16	0.32	-0.97	-2.06*
Lawsuit resolved					
For better			1.35\$	1.66*	
For worse	0.95	2.93**	0.45	-0.97	1.49\$
Enviro groups speak ill	0.43	-0.19		-0.52	-0.17
Company sues government				-0.05	-1.38\$
Other bad events		-1.26	0.61	-0.65	-0.28
Other good events	-0.96	-1.66*	0.95	2.43**	0.13

*** significant at the .001 level

**significant at the .01 level

*significant at the .05 level

\$ significant at the .1 level

Company public relations events

Examples of this type of event include the Coca-Cola Co. providing funding for the Center for Marine Conservation's 13th annual International Coastal Cleanup and CSX Transportation co-sponsoring the Rails-to-Trails Conservancy's Second International Trails and Greenways Conference. Of all the event types, these are the ones that are least likely to affect future class flows or to be indicative of an environmentally friendly policy. Not surprisingly, there is no stock price reaction to the announcement of this type of event.

Lawsuit Announced

There have been several studies in the finance literature that show a significant reaction to the announcements of corporations being named as a defendant in a lawsuit as well as announcement of the resolution of a lawsuit (see e.g., Strachen et al., 1983 and Bosch et al. 1998). Examples of this type of event are the EPA's issuance of an administrative complaint and order to Alberto Culver for illegally and improperly storing hazardous wastes and the EPA's filing of a lawsuit alleging that Union Pacific Railroad Co. exhibited "gross negligence" in eight chemical and oil spills over seven years. For announcements that took place in national outlets and for the overall sample, the stock price reaction is negative. This is consistent with previous studies (e.g., Bosch, et al.) regarding the increased uncertainty about the company pending the resolution of the lawsuit.

Lawsuit resolved:

- *A company wins an environmental lawsuit*

The announcement that a company was successful in the outcome of an environmental lawsuit/litigation resulted in positive stock price reaction, although there were not many of these announcements occurring in national media outlets (6). For example, the Pennsylvania Environmental Hearing Board ruled that Westinghouse Electric Corp. won't have to pay \$ 2 million of a year-old fine over groundwater pollution at an Adams County, Pa., industrial site.

- *A company loses an environmental lawsuit.*

There were over three times as many cases in which the company was unable to reach a favorable settlement in an environmentally related lawsuit. This may explain why the very announcement of the lawsuit produces a negative stock price reaction. There is an overall positive stock price reaction to the announcement of the loss of a lawsuit. Examples being Louisiana-Pacific Corp.'s agreement to pay California \$712,500 to settle charges that its plant polluted Humboldt Bay and a federal appeals court denying a petition to rehear a decision upholding a Unocal Corp patent for reformulated gasoline submitted by Royal Dutch Petroleum's Shell Oil Products unit and four other oil companies. It's conceivable that the marginally positive reaction was due to the nature of the judgement being less severe than originally anticipated. It's possible too that the positive price reaction was due to the an increase in the likelihood that the corporation might now become a more responsible corporate citizen.

An environmental group makes a negative statement comment about a company

Environmental groups will frequently make allegations and judgements about the environmental performance of companies, oftentimes noting which companies have the worst environmental records. One example is a story about an environmental group running an advertisement in *The New York Times* criticizing the amount of recycled polyethylene terephthalate PET plastic used by the Coca-Cola Company. Another story reports that environmental groups will expand their challenge of Nucor's plan to build a steel recycling plant along the Chowan River after North Carolina regulators approved an environmental assessment of the project. The stock price reaction to these types of announcements is insignificant. This contrasts with the positive reaction to the news about environmental awards previously discussed.

A company sues the government

This is the smallest of the subsamples (29 announcements) and the stock price reaction is marginally

negative. One possible explanation is that the lawsuit itself may call attention to the difficulty that the company is having as well as the uncertainty about the future.

Other negative and positive events

The two largest number of events are those that did not really fit into one of the previously mentioned categories but are generally either negative or positive from an environmental perspective (606 and 542 respectively). Oftentimes though, the announcement contains ambiguous implications for the companies' future cash flows irrespective of the implication for the environment. This is consistent with the contention of Palmer et al. (1995) that doing what is best for the environment is not always what is best for the bottom line. This contrasts with the more positive perspective of Porter and Van der Linde (1995) who assert that proactively spending on the environment will necessarily create shareholder value.

A consideration of some of the examples of good and bad news about the environment demonstrates the difficulty in making a confident prediction of the stock price reaction.

Other bad events

Consider first two "negative" announcements:

- The latest head of the former Federal Crown corporation is aveteran of Imperial Oil Ltd. and its parent, Exxon Mobil Corp., and also a hardliner in opposing Kyoto's ambitious timetable for reducing emissions of carbon dioxide and other greenhouse gases.
- Ellen Raines, spokeswoman for Akron-based FirstEnergy Corp., said her company will have to spend up to \$500 million to convert its coal-burning generating plants to a cleaner technology that reduces nitrogen oxide. FirstEnergy owns Cleveland Electric Illuminating Co. and Ohio Edison.

Opposing the Kyoto agreement and being required to spend \$500 million to convert a coal burning plant cast both companies in question in a negative light, but it's not clear in either case how

we might expect the shareholders to react. Our results show a lack of statistically significant reaction to such events.

Other good events

Similarly, two events that cast the companies in a positive environmental light may not necessarily improve the bottom line.

- Fort James Corp. will contribute an extra \$2 million to help complete a pilot PCB cleanup project on the Fox River in Wisconsin.
- U.S. automakers say they will accept lower limits on nitrous oxide and move faster to bring light-truck emissions in line if EPA lets outside experts review and change the standards.

The difficulty in classifying events as either positive or negative is reflected in comparing the second event from each pair. It is not clear in either case exactly what the degree of resistance or compliance the companies are exhibiting.

Conclusions

Many of the results of this paper are somewhat surprising and present challenges for further study. One of the guiding principles of finance is that stock prices are a better reflection of future cash flows rather than past performance. However, we find that the type of event eliciting the strongest positive stock market reaction is the announcement of an environmental award. This type of event may be an indicator of future environmental performance, but one would expect the events more explicitly linked to environmental performance such as the intention to begin using an environmentally benign technology to produce larger and statistically significant abnormal returns.

As noted previously, the events listed in the last two categories ("other" bad and "other" good environmental news) comprise almost half of all events. Given the lack of a clear stock price reaction across the different publication types, it is apparent that more work needs to be done in developing more refined subsamples with respect to event

types, publication outlets in addition to other possibilities such as industry or sector classifications, as well as others such as the magnitude of the cash flow involved relative to the overall size of the company.

In addition, as more years of IRRC data becomes available, there will be more opportunity to further refine the types of announcements and media outlets as well as how the relationship between announcement type and stock price reaction changes over time.

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