

## **THE EFFECT OF PUBLISHED REPORTS OF ENVIRONMENTAL POLLUTION ON STOCK PRICES**

Spuma M. Rao \*

### **Abstract**

This study adds to the empirical evidence supporting a significant connection between ethics and profitability by examining the connection between published reports of unethical behavior—in terms of environmental pollution—by publicly traded U.S. and multinational firms and the performance of their stock. Using reports of environmental pollution—air, or water pollution or environmental cleanup—published in the *Wall Street Journal* from 1989 to 1993, the analysis shows that the actual stock performance for those companies was lower than the expected market adjusted returns. Unethical conduct by firms which is discovered and publicized does impact on the shareholders by lowering the value of their stock for an appreciable period of time. Whatever their views on whether ethical behavior is profitable, managers should be able to see a definite connection between unethical behavior and the worth of their firm's stock. Stockholders, the press and regulators should find this information important in pressing for greater corporate and managerial accountability.

### **INTRODUCTION**

The question of whether there is any causal link between a company's ethical or unethical behavior and its bottom line is an important one. There is always the cynic's view that ethics has no place in business and that businesses only need to appear ethical to succeed (Carr, 1968). The current political adage that those who play by the rules should not be penalized refers to the nagging doubt that those who are ethical are at a disadvantage and are increasingly liable to get edged out by those who bend the rules (Garvin, 1986). Some may argue the virtue is its own reward no matter the level of social misfortune and societal derision which accompanies it but most business practitioners would prefer to believe that ethical actions make good economic sense and that virtue will have good consequences (Goodpaster & Matthews, 1982). A poll of self-selected readers of *Nation's business* (1993) showed 86% believed that ethical behavior and integrity in a company are very important to its financial success, with 11% rating it somewhat important and only 3% rating ethics of little or no importance to financial success. The popular and business press, after heralding the closing of the 1980's as the end of the era of greed, has continued to report on the connection between company profits and their efforts at "green Marketing" and other socially responsible activities. The Council on Economic Priorities and other consumer watchdog groups are rewarding good activities and putting the heat on bad actors through annual awards and press conferences (*Newsweek*, 1991).

The answer to whether ethical behavior affects a firm's financial standing cannot be a simple one because the effects of ethical or unethical behavior can occur both internally and externally (Wood, 1994). Internally, workers and managers can be affected by ethical or unethical behavior and can act on the corporation in various ways. The efficiency of production, distribution and exchange functions can all be influenced by the firm's ethical posture (Sen, 1993; Hamilton & Strutton, 1994).

Internally, the law and government regulations can reward ethical behavior and punish unethical behavior. Other stakeholders external to the firm can also affect its financial posture. Suppliers, customers and stockholders

---

\*University of Southwestern Louisiana

can react directly through buying and selling activities and their activities can be influenced by the press, local communities and the society. A complete answer to the connection between ethics and financial standing would require the measurement of the effects of ethical or unethical activities on all of these groups.

To provide one part of that answer, this study focuses on the effects of the external controls of ethical behavior exercised by the financial markets and more specifically by the stock market. The question being asked is whether stockholders will punish unethical behavior when they become aware of it by driving down the value of the firm's stock.

## LITERATURE SURVEY

There is a great deal of literature on the relationship between the ethical behavior of firms and their financial success (Reidenbach & Robin 1989, Smith 1991). The question has been discussed extensively in the debate over corporate social performance (see Wood, 1991 for an extensive review of this area). Approaches to the topic can be generally divided between the conceptual and empirical, with some researchers drawing evidence for their view from both sources. An example of the primarily conceptual approach can be found in the discussions of the Adam Smith revisionists who focus on the supposed conflict between self-interest and ethics in economic behavior (Sen 1987, Werhane 1991, Rothschild 1992, Solomon 1993). Sen (1993) suggests that self-interest and ethics are not mutually exclusive in that self-interest provides the motivation for economic activity but ethics is needed to govern the activities of production and distribution in order that self-interest can be served. Other primarily conceptual approaches attempt to demonstrate a link between profitability in business and particular ethical strategies designed to win the loyalty of various stakeholder groups (Miles, 1993; Garfield, 1992; Bartkowiak, 1993; Dillon, 1991).

Though there is a question as to whether the research is conclusive (Dillon 1991), there have been a number of empirical studies seeking to demonstrate a correlation between ethical or unethical behavior and company profitability. A variety of definitions of what constitutes ethical/unethical behavior or socially responsible behavior are used and research methodologies vary. Zetlin (1991), for example, finds that profits in 15 Fortune 500 companies that adhered to written ethical principles over 20 years or more grew twice as fast as the rest of the Fortune 500 over a 30 year period. Stoffman (1991) reports on a study of 60 Canadian companies which showed that, within industry groups, those firms that rate the highest on ethics and social responsibility, on a scale based on factors such as labor and customer relations, environmental protection and product safety, show profitability over the long run. Donaldson and Davis (1990) studied companies in the United Kingdom to show a range of benefits for companies beginning a program for the systematic handling of values. Smith's (1992) study of Salomon Brothers concludes that the value of reputational capital is reflected in current stock prices. Anecdotal accounts range from reports on individuals who acted ethically in difficult situations and were successful (Berney, 1987) to those of companies who acted unethically and were not (Lohr, 1992). Rao, Kochunny and Rogers (1993) examined the ethical perceptions of accounting and finance students using head/heart traits developed by Maccoby. Results indicate that finance students are no less ethically inclined than are the accountants. In general head traits dominated over heart traits, an indication that business schools continue to do a good job emphasizing and developing analytical skills but a poor job of developing the qualities of the heart that are generally associated with ethical behavior.

The efficient Market Hypothesis maintains that the markets are very efficient in interpreting data and arriving at equilibrium security prices. Most empirical studies have found that stock prices reflect publicly available information. If managers are true agents for owners (shareholders), increasing shareholder wealth is an appropriate way to judge managerial behavior. Negative stock market returns, then, should discourage managers from engaging in unethical behavior. Are there abnormal reductions in stock market returns following such situations as accusations of bribery, fraud, and illegal political contributions and automobile recalls. If managers acted as true agents to the shareholders, they would not allow their firms to fall into predicaments of ethical compromise.

It is hypothesized that, as a result of unethical behavior, the expected market adjusted stock returns are negative for the firms and will persist this way for an appreciable period of time. The data needed for calculating the rates of return for the publicly traded firms will be taken from the database Compustat. This study will examine the effect of unethical behavior on shareholder wealth by examining the investor returns on and around the reported date of unethical behavior. This study tests the timing and adjustment of stock prices to 'unethical conduct'

announcements. The null hypothesis to be tested is that the stock market acts quickly and in an efficient manner to public announcements of unethical conduct - environmental pollution. If investors could consistently obtain above normal returns by trading after an announcement of unethical conduct, the null hypothesis would be rejected.

## DATA AND METHODOLOGY

Numerous event studies provide insights concerning the degree of market efficiency. Previously studied events include stock splits, earnings announcements, acquisitions and divestitures, and financial distress. This study identified a specific development or event that is expected to influence stock prices, and a sample of companies is identified where the "event" has occurred. The event is announcement of unethical conduct of environmental pollution reported in the *Wall Street Journal* during 1989 through 1993.

Data analyzed in this study consist of a sample of public announcements of environmental pollution of firms. To be included in the sample, this unethical conduct of environmental pollution must be reported in the *Wall Street Journal* during the 1989-1993 period. Unethical conduct not reported in the *Wall Street Journal* are excluded from the sample. The sample was obtained from the *Wall Street Journal Index*. The announcement date of unethical conduct is the date when a report was first published in the *Wall Street Journal*. To determine event dates accurately and to insulate announcements from other major corporate events around the same period, the corporate history, contained in the *Wall Street Journal Index*, was reviewed for all firms included in the sample for the period around the announcement of the unethical conduct. Firms with concurrent major corporate events (e.g., takeover bids, leveraged buyouts, or other sell-off and divesting activities) for -1 to +1 month relative to the announcement date ( $t=0$ ) are not included in the final sample. Finally, firms selected for this study have monthly returns in Compustat database. The final sample contains 14 firms. Table 1 furnishes the names of companies, ticker symbols, announcement date of the event and the event category.

Once the event and sample of firms is identified, holding period returns (HPRs) are calculated on a monthly basis, for periods both before and after the event. Forty nine months of HPRs are calculated for each stock in the sample involved in the event study. The 30 earliest observations before the event were used to estimate the regression parameters of the characteristic line for the stock.

Equation 1

$$r_{jt} = \hat{\alpha}_j + \hat{\beta}_j r_{m,t} + e_t$$

where:

- $r_{j,t}$  estimate of r sub j
- $\hat{\alpha}_j$  estimate of alpha
- $\hat{\beta}_j$  estimate of beta for stock j
- $r_{m,t}$  HPR for market index for period t
- $e_t$  residual error in period t

The event under study is defined to occur in month 0 ( $t=0$ ), then  $\hat{\alpha}_j, \hat{\beta}_j$ , calculated using the above equation, could be used to estimate HPRs for 12 months immediately prior to the event ( $t= -12$  to  $-1$ ) and the seven months ( $t = 0$  to  $6$ ) after the event, including the month the event occurred. The HPR for each of these 19 months is estimated as:

Equation 2

$$\hat{r}_{j,t} = \hat{\alpha}_j + \hat{\beta}_j r_{m,t}$$

where:

- $\hat{r}_{j,t}$  estimate of HPR for stock j in period t
- $\hat{\alpha}_j$  estimate of stock j's alpha
- $\hat{\beta}_j$  estimate of stock j's beta
- $r_{m,t}$  actual HPR for market index for period t

The error or residual term can be calculated for each period as:

Equation 3

$$e_{j,t} = r_{j,t} - \hat{r}_{j,t}$$

The residual is a measure of the *abnormal* performance of stock. Hence this is also known as abnormal return ( $AR_{j,t}$ ). If  $e_{j,t}$  or  $AR_{j,t} < 0$ , then the actual HPR is less than the estimated return. This implies that after removing the influence of the market, stock j's price decreased more than expected. An average residual for each month is calculated using all of the stocks in the sample. The average residual is the average deviation of returns from their normal relationships with the market. For example, assume that n stocks are included in the event study so that the average residual for month t = -12 can be calculated as:

Equation 4

$$\bar{e}_{t=-12} = \frac{\left[ \sum_{j=1}^n e_{j,t=-12} \right]}{n}$$

The above equation is then used to calculate an average residual for each of the 19 months (t = -12 to 6). This average residual is also known as Average Abnormal Return ( $AAR_t$ ). A 't' test is used to determine the level of significance of abnormal returns for a given sample. The test uses the estimated standard error of the returns computed for the estimation period.

Equation 5

$$t = \frac{AAR_t}{\hat{s}(AAR_t)}$$

where  $\hat{s}(AAR_t)$  is the estimated standard error of abnormal returns during the estimation period.<sup>1</sup> This test statistic follows a Student at T-1 degrees of freedom. In order to test for the persistence of the impact of the announcement during the period t to t+n, the abnormal returns must be cumulated. The cumulated abnormal return in a period from t to t+n is given by:

Equation 6

$$CAAR_t^{t+n} = \sum_{i=t}^{t+n} ARR_i$$

The t test is then defined by:

Equation 7

$$t = CAAR_t^{t+n} / \hat{s}(CAAR_t^{t+n})$$

Equation 8

$$\hat{s}(CAAR_t^{t+n}) = n^{1/2} \times \hat{s}(AAR_t)$$

An analysis of the cumulated average abnormal returns for the months prior to and after the event is used to analyze the pattern and speed of the price adjustments to the event. The expected values of AAR and CAAR are zero in the absence of abnormal performance.

## RESULTS

Table 2 presents results for the behavior of monthly average abnormal returns for the firms, AARs for time intervals prior to and after the Announcement Date ( $t=0$ ). The first column presents event time in terms of trading months. The second column contains monthly average abnormal returns (AARs) for each month for the fourteen firms. The third column shows t-statistics for monthly average abnormal returns. These statistics, based on average standardized abnormal returns, indicate whether the null hypothesis of zero-average standardized abnormal returns on a given month can be rejected. Finally, the fourth column has CAARs (Cumulative Average Abnormal Returns).

Based on the results for the sample shown in table 2, announcements of reports of pollution have a negative effect on commonstock prices of firms. There is strong abnormal return 12 months before the announcement to six months after the announcement. The portfolio abnormal return two months prior to the first announcement of the pollution report in the *Wall Street Journal* ( $t=-2$ ) is -3.02 percent which is significantly different from zero at the 0.10 level ( $t = -1.81$ ). The announcement date ( $t = 0$ ) portfolio abnormal return is -5.29 percent and one month after the announcement ( $t = +1$ ) it is -2.78 percent. Both are significant at 0.05 level. The study provides strong evidence that firms with poor pollution performance are not being viewed positively by the market. In order to safeguard the public interest for a clean environment, strict pollution standards may be necessary to encourage management to invest in pollution abatement activities.

If the market is efficient with respect to these announcements and the market model gives the correct pricing relationship for risk and return, it would be impossible to react to these announcements in a way that gave significant negative abnormal return one month after the announcement. Consequently, the conclusion would be that the market is not reacting very efficiently to this type of information and the null hypothesis is rejected.

## CONCLUSION

The discussion of whether socially responsible or ethical behavior influences the profitability of companies has received a great deal of attention in the business ethics literature through conceptual and empirical studies. This paper has examined the impact of the announcement of diverse pollution incidents on firms' equity value. The author of this study has attempted to add to the empirical evidence supporting a significant connection between ethics and profitability by examining the connection between published reports of unethical behavior - in terms of environmental pollution - by publicly traded U.S. and multinational firms and the performance of their stock. Using reports of unethical behavior published in the *Wall Street Journal* from 1989-1993, the author was able to show that the actual stock performance for those companies was lower than the expected market adjusted returns. These findings suggest that unethical conduct by firms which are discovered and publicized do have a negative impact on the shareholders of the company by lowering the value of their stock for an appreciable period of time. Whatever their views on whether ethical behavior is profitable, managers would be able to see a definite connection between unethical behavior and the worth of their firm's stock. Stockholders, the press and regulators should find this information important in pressing for greater corporate and managerial accountability.

**TABLE 1****Category: Air Pollution; Water Pollution; Environmental Cleanup; Pollution**

Company	Ticker Symbol	Announcement Date
1. Boeing Co	BA	07/02/92
2. Bristol-Myers Squibb Co	BMY	04/27/92
3. Allied Signal	ALD	01/13/92
4. Louisiana Pacific Corp	LPX	09/10/91
5. Westinghouse Electric Corp	WX	07/30/91
6. Publicker Industries Inc.	PUL	04/26/91
7. Occidental Petroleum Corp	OXY	09/13/90
8. PPG Industries Inc	PPG	05/17/90
9. Bethlehem Steel Corp	BS	04/06/90
10. Unocal Corp	UCL	02/23/90
11. United Technologies Corp	UTX	01/05/90
12. Rockwell International Corp	ROK	06/27/89
13. Dexter	DEX	06/27/89
14. Exxon Corp	XON	03/30/89

**TABLE 2**

**Category: Air Pollution; Water Pollution; Environmental Pollution & Cleanup**  
**Monthly Average Abnormal Returns (AAR), Cumulative Abnormal Returns (CAAR)**  
**For The Sample Of Fourteen Firms For Twelve Months Before**  
**And Six Months After The Announcement Date (Month Zero)**

Month Relative To Announcement Date	ARR %	t	CAAR %
-12	-2.98458	-1.6153	-2.98458
-11	-2.49042	-1.3573	-5.47500
-10	-0.27791	-0.1371	-5.75291
-9	-3.13346	-1.3678	-8.88637
-8	-3.22977	-1.8566*	-12.11613
-7	-0.88394	-0.5818	-13.00007
-6	0.16688	0.0642	-12.83319
-5	-2.12777	-0.8698	-14.96096
-4	3.31859	1.0276	-11.64237
-3	-1.91524	-0.9926	-13.55761
-2	-3.01992	-1.8104*	-16.57753
-1	3.20381	0.7733	-13.37372
0	-5.29109	-2.1812**	-18.66481
1	-2.78122	-2.7231**	-21.44603
2	-2.80566	-1.2341	-24.25169
3	-2.63939	-0.7261	-26.89108
4	-2.30377	-0.8044	-29.19485
5	-0.11089	-0.0539	-29.30574
6	1.82604	0.7950	-27.47970

\*Significant at 0.10 level, \*\*Significant at 0.05 level, \*\*\*Significant at 0.01 level

### ENDNOTE

1. Specifically:

$$\hat{s}(AAR_t) = \left[ \left( \sum_{t=1}^T (ARR_t - AAR_t^*)^2 \right) / (T-1) \right]^{1/2}$$

$$AAR_t^* = (1/T) \left( \sum_{t=1}^T AAR \right)$$

### REFERENCES

- [1] Bartkowiak, J.J., "Trends Towards Part Time Employment: Ethical Issues," *Journal of Business Ethics* 12, No. 10, 1993, pp. 811-815.
- [2] Baron, D.P., *Business and Its Environment*, Prentice-Hall, Englewood Cliffs, N.J., 1993, pp. 54-59.
- [3] Berney, K., "The Ethical Edge," *Nation's Business*, August 1987, pp. 18-24.
- [4] *Nations Business*, December 1993, p. 85.
- [5] Carr, A., "Is Business Bluffing Ethical?" *Harvard Business Review* 46, 1968, pp. 143-153.
- [6] Donaldson, J. and P. Davis, "Business Ethics? Yes, but What Can It Do for the Bottom Line?" *Management Decision* 28, No. 6, 1990, pp. 29-33.
- [7] Dillon, G.C., "Does It Pay to Do the Right Thing?" *Across the Board* 28, No. 7,8, 1991, pp. 15-17.
- [8] Garvin, D., *Study on Productivity*, Harvard Business School, Cambridge, ed. 1986.
- [9] Garfield, C.A., "Do Profits and Social Responsibility Mix?" *Executive Excellence* 9, No. 30, 1992, p. 5.
- [10] Goodpaster, K. and J. Matthews, "Can a Corporation Have a Conscience," *Harvard Business Review* 60, 1982, pp. 132-141.
- [11] Hamilton, J.B., III and D. Strutton, "Two Practical Guidelines for Resolving Truth-Telling Problems," *Journal of Business Ethics* 13, in Press, 1994.
- [12] Hoch, D. and J.B. Hamilton III, "Do shareholder Resolutions Influence Corporate Ethics?" *Southeastern Journal of Legal Studies in Business* 3, No. 1, 1994, pp. 1-18.
- [13] Kohlberg, L., "Moral Stages and Moralization: The Cognitive-Development Approach," in T. Lickona, ed., *Moral Development and Behavior: Theory, Research, and Social Issues*, Holt, Rinehart and Winston, New York, 1976, pp. 31-53.
- [14] Lohr, S., "Lessons from a Hurricane: It Pays Not to Gouge," *New York Times* 142, September 22, 1992, D1.
- [15] Miles, G., "In Search of Ethical Profits: Insights from Strategic Management," *Journal of Business Ethics* 12, No. 3, 1993, pp. 219-225.

- [16] *Newsweek*, January 7, 1991, pp. 42-43.
- [17] Rao, S.M., Kochunny, C.M. and Rogers, H., "Ethical Inclinations of Future Financiers" *American Business Review*, Vol. XI, No. 2, June 1993, pp. 69-76.
- [18] Reidenbach, R. and D. Robin, *Ethics and Profits: A Convergence of Corporate America's Economic and Social Responsibilities*, Prentice-Hall, Englewood Cliffs, N.J., 1989.
- [19] Rothschild, E., "Adam Smith and Conservative Economics," *Economic History Review* 45, 1992.
- [20] Sen, A., *On Ethics and Economics*, Blackwell, Oxford, 1987.
- [21] Sen, A., "Does Business Ethics Make Economic Sense?" *Business Ethics Quarterly* 3, No. 1, 1993, pp. 45-54.
- [22] Smith, C., Jr., "Economics and Ethics: The Case of Solomon Brothers," *Financial Management Collection* 7, 1992, pp. 3-8.
- [23] Smith, N.C., *Morality and the Market: Consumer Pressure for Corporate Responsibility*, Routledge, New York, 1991.
- [24] Solomon, R.C., "Beyond Selfishness: Adam Smith and the Limits of the Market," *Business Ethics Quarterly* 3, No. 4, 1993, pp. 453-460.
- [25] Stoffman, D., "Good Behavior and the Bottom Line," *Canadian Business* 64, No. 5, 1991, pp. 28-32.
- [26] Werhane, P.H., *Adam Smith and His Legacy for Modern Capitalism*, Oxford University Press, New York, 1991.
- [27] Wood, D.J., "Corporate Social Performance Revisited," *The Academy of Management Review* 16, No. 4, 1991, pp. 691-718.
- [28] Wood, D.J., *Business and Society*, 2nd Ed., Harper Collins, New York, 1994, pp. 305.
- [29] Zetlin, M., "Ethics and Common Sense," *Management Review* 80, No. 6, 1991, p. 59.