

Investor Response to the Exxon Valdez Oil Spill

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Abstract

This study examines the impact of the 1989 *Exxon Valdez* Oil spill on investment returns to shareholders in two different groups of firms: firms within the oil industry and a sample of unrelated firms with environmental reputation rankings. Within the oil industry, the effects of the spill were strongly negative and idiosyncratic to the Exxon corporation. Within the sample of unrelated firms, companies with an exemplary reputation for environmentally responsible behavior earned significantly positive abnormal returns, while companies with neutral or negative environmental reputations showed no response. These latter findings support a proactive approach to corporate environmental management and endorse the role of corporations in achieving a sustainable society.

Introduction

Shortly after midnight on March 24, 1989 the supertanker *Exxon Valdez* ran aground on bligh reef in Alaska's Prince William Sound, spilling 11 million gallons of oil and lending its name to one of America's worst ecological disasters.^[1] News of the catastrophe spread quickly, and investors moved to incorporate the effects of cleanup costs, future liabilities and legal fees, supply interruptions, consumer boycotts and additional regulation in their forecasts of future returns to the Exxon corporation, other potentially liable parties and other firms whose fortunes were expected to increase or decrease in the wake of the *Valdez* spill. Previous studies of environmental disasters, e.g., the nuclear accidents at Three Mile Island and Chernobyl, and the chemical leak at Union Carbide's plant in Bhopal, India, have generally confirmed the financial markets' overall efficiency with regard to the release of new information concerning these events (Bowen, Castanias and Daley, 1983; Hill and Schneeweis, 1983; Barrett, Heuson and Kolb, 1986; Pruitt, Tawarangkoon and Wei, 1987; Blacconiere and Patten, 1994) but have generally focused on intra-industry effects only.

Investors' response to the Valdez spill is of particular interest in light of the current era of environmental awareness. The previous year, large quantities of medical waste washed ashore on beaches along the United States' east coast and the Great Lakes, a third of Yellowstone National Park was destroyed by fire, and in the midst of the hottest summer on record, National Aeronautics and Space Agency scientist James Hansen testified before Congress on the increased likelihood of global warming via the greenhouse effect. Six months later, *Time* magazine eschewed its traditional "Man of the Year" award, selecting endangered earth "Planet of the Year." These events (and the Valdez spill itself) touched off a wave of environmental concerns unseen since the early 1970s. In the post-Valdez, post-Chernobyl, post-Bhopal era, oil spills and accidental releases of hazardous substances are no longer idiosyncratic events. Environmental issues are shifting competitive advantage within markets, in turn impacting shareholder returns (Bonifant, Arnold and Long, 1995; Hart, 1995). In addition to the direct costs of litigation and remediation, returns to shareholders of firms with no direct connection to the disaster itself may be permanently affected by changes in perceived risks and firm reputation.

This paper examines the effects of the *Exxon Valdez* oil spill on investment returns for several portfolios of firms. Exxon corporation's co-owners in the Alaska pipeline consortium were hypothesized to earn lower risk-adjusted returns in the aftermath of the spill. Shareholders in Exxon's retail competitors were expected to earn higher returns. A sample of firms with environmental reputation scores awarded by the Council on Economic Priorities (CEP) was used to

investigate the relationship between corporate environmental responsibility and environmental disasters.

Theory and Hypotheses

A small part of the finance literature addresses the impact of unanticipated events on shareholder value. Most of these studies are concerned with documenting market efficiency, i.e., the ability of the market to quickly incorporate new information into stock prices. Researchers have examined the impact of airline disasters (Barrett, Heuson, Kolb and Schropp, 1987; Chance and Ferris, 1987), deaths of chief executive officers (Johnson, Magee, Nagarajan and Newman, 1985; Etabari, Horrigan and Landwehr, 1987; Slovin and Sushka, 1993), the MGM Grand hotel fire (Sprecher and Pertl, 1988) and the Tylenol poisoning incident (Mitchell, 1989; Dowdell, Govindaraj and Jain, 1992) in addition to the Three Mile Island and Chernobyl disasters cited earlier. The *Exxon Valdez* oil spill has itself been the subject of two studies of this kind (Mansur, Cochran and Phillips, 1991; Herbst, Marshall and Wingender, 1996).

Environmental and technological catastrophes are of interest partly because they are preventable, at least in theory (Shrivastava, forthcoming). Moreover, in recent years, businesses and governments have given substantial attention to the relationship between organizations and the natural environment. The Valdez spill occupies a special place in the pantheon of environmental disasters, and although it was not the largest oil spill in history, it has been immortalized in books, in song, in motion pictures, and unfortunately, in total costs. [2] Cohen (1995) estimated the accident's *first-year* social costs of the lost fisheries alone at \$108 million. Helm (1995) writes, "Probably the single most publicized human-caused environmental disaster in united states history is the march 1989 *Exxon Valdez* oil spill. Both the efforts to clean up the spill and the efforts to assess its impact were unprecedented, and the final cost to the Exxon corporation will exceed \$10 billion." Shortly after the accident, the spill lent its name (involuntarily) to the *Valdez Principles*, a code of corporate environmental conduct drawn up by the coalition for environmentally responsible economies (Amato, 1989).

Effects within the Oil Industry

Two major lines of inquiry will be pursued in this paper. The first is restricted to the impact the Valdez spill had on firms within the oil industry. To the extent the accident was an *unanticipated event*, we might presuppose the effects would be felt primarily by Exxon itself or perhaps its partners in the Alyeska pipeline service company, a consortium of seven companies founded in 1974 for the purpose of exploiting the prudhoe bay oil fields. Alyeska is responsible for oil spill contingency planning along the pipeline route, the port of Valdez, and Prince William Sound. Alyeska's co-owners and their ownership stakes are: British Petroleum (50.01%), Arco (21.35%), Exxon (20.34%), Mobil (4.08%), Amerada Hess (1.50%), Phillips (1.36%) and Unocal (1.36%) (Lord, 1992).

Ironically, a bill "... to establish limitations on liability for damages resulting from oil pollution and to establish a fund for the payment of compensation for such damages" was introduced into the U.S. House of Representatives a scarce two weeks before the spill. This legislation, which

mandated the use of double-hulled tankers and increased safety measures, eventually became law as the Oil Pollution Act of 1990. The Valdez oil spill undoubtedly provided an impetus for its passage. Therefore, this study tested the hypotheses:

- H₁ Idiosyncratic Response** Exxon should experience negative abnormal returns in the aftermath of the Valdez spill because it will probably be found guilty of negligence and because of boycotts, lost sales due to a damaged reputation, etc.
- H₂ Alyeska Exposure** Members of the Alyeska consortium should also experience negative abnormal returns because they are legally liable for responding to and cleaning up the spill promptly and effectively

A number of factors contributed to the spill's severity, but Exxon's management exacerbated the damage to its corporate image by a reluctance to provide information on the exact nature of the spill. Environmental groups called for a boycott of Exxon's retail gasoline products and some 40,000 consumers returned their Exxon charge cards to the company. Statistically significant negative losses in the stock prices of firms targeted by union-sponsored boycotts have been reported in the past (Pruitt, Wei and White; 1988). In Summer 1994, a boycott of Shell gasoline by German consumers caused Shell's British subsidiary to abandon its plans of sinking the oil platform *Brent Spar* in the North Sea.

The "vulture hypothesis"--that one company's misfortune is another firm's blessing--was examined in this study using a sample of Exxon's ten largest retail competitors in the retail gasoline market. Dowdell, Govindaraj and Jain (1992) examined a similar question in their study of pain-killer pharmaceutical competitors following the 1982 Tylenol poisoning incident.

- H₃ Vulture Behavior** Exxon's major retail competitors should experience positive abnormal returns because they have the opportunity of increased profits at Exxon's expense (boycott sales, decreased supplies offer opportunity to profit from increased prices).

Immediately after the spill, oil shipments from the Prudhoe Bay fields dropped to approximately one-third of their normal level, causing retail prices to increase. For reasons outlined above, Exxon's competitors were expected to benefit more from this change than Exxon itself.

Environmental Reputation Effects

A growing body of research suggests that it "pays to be green," i.e. firms with a reputation for environmentally-responsible behavior outperform those with less pristine credentials (Erfle and Fratantuono, 1992; Diltz, 1993; White, 1995). Fombrun and Shanley (1990) discuss the impact of firm reputation in general, noting that a favorable reputation can generate excess returns by inhibiting the mobility of rival firms. External reputation ratings may also provide a more accurate evaluation than a firm's own environmental disclosures. Verecchia (1983) notes managers have incentives to disclose "good news" and withhold "bad news."

Proponents of the "green pays" hypothesis argue that environmentally-responsible firms will benefit from the sale of environmental services and "earth-friendly" products (Elkington, Hailes and Makower, 1990; Cornwell and Schwepker, 1995), reduced waste treatment and/or disposal costs (Hirschhorn and Oldenburg, 1991; Graedel, 1995), decreased litigation and future liability for environmental damages (Smart, 1992), improved public credibility (Kleiner, 1991), more productive employees and/or improved employee working conditions (Bauer and Aiman-Smith, forthcoming), and strategic benefits accruing from proactive responses to environmental

regulations (Barrett, 1991; Dean and Brown, 1995). this study tested three environmental reputation hypotheses:

- H₄ Green Premium** Firms enjoying a reputation for environmental responsibility should see an increase in firm value as investors realize the benefits of being "green"
- H₅ Oatmeal** Firms with neither a positive nor negative reputation for environmental responsibility should experience no significant change following the Valdez spill
- H₆ Brown Penalty** Firms with a reputation for environmentally irresponsible behavior will earn negative abnormal returns as a result of increased scrutiny by consumers, regulators, and environmental groups

A final hypothesis is implied by transitivity and the previous three hypotheses:

- H₇ Differential Performance** The abnormal return performance of green firms will exceed that of oatmeal firms which will exceed that of brown firms

Method And Data

Investor response to the Valdez incident was assessed using standard event study methods. More specifically, the market model was estimated for each security in the sample over a 255 trading day period ending two trading days before the event date.[\[3\]](#) The intercept α_i and slope β_i parameters were determined from the ordinary least squares regression equation

$$R_{i,t} = \hat{\alpha}_i + \hat{\beta}_i R_{M,t} + \varepsilon_{i,t}$$

where

- $R_{i,t}$ = return on security i for day t during the estimation period
- $R_{M,t}$ = return on the market index for day t during the estimation period

Abnormal returns ($AR_{i,t}$) were computed for each security in the sample for each day during the event period-1 to +120. The abnormal return on security i for day t equals

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{M,t})$$

- $R_{i,t}$ = return on security i for day t during the event period
- $R_{M,t}$ = return on the market index for day t during the event period

Average abnormal returns were determined for each day during the event period for the various sample portfolios used in this study. The average abnormal return for day t (AAR_t) for N firms in a particular sample equals:

$$AAR_t = \frac{\sum_{i=1}^N AR_{i,t}}{N}$$

The standardized average abnormal return ($SAAR_t$) is used to test the significance of the average abnormal return during any day t . Using a time series of the average abnormal returns takes into account cross-sectional dependence in the firm-specific excess returns (Schwert, 1981; Brown and Warner, 1985). This is likely to occur in this study because all firms shared a common event day, and for the first part of this study, a common industry. the $SAAR_t$ for any day during the event period is defined as

$$SAAR_t = \frac{AAR_t}{SD_{AAR}}$$

where

$$SD_{AAR} = \sqrt{\frac{\sum_{t=-256}^{-2} (AAR_t - \overline{AAR})^2}{254}}$$

and

$$\overline{AAR} = \frac{\sum_{t=-256}^{-2} AAR_t}{255}$$

The SAARs are assumed to be distributed unit normal due to the large number of observations ($n=255$) during the estimation period.

Cumulative average abnormal returns (CAARs) were determined for event windows $(-1,0)$, $(0,+30)$, $(0,+60)$, $(0,+90)$ and $(0,+120)$ relative to the event date ($t=0$).

$$CAAR_{t_1,t_2} = \sum_{t=t_1}^{t_2} AAR_t$$

To test the null hypothesis that the CAAR equaled zero over a particular event window, standardized cumulative average abnormal return (SCAAR) test statistics were computed:

Data

Daily return data for the firms in this study was obtained from the Center for Research in Security Prices (CRSP) daily files for the period March 21, 1988 through September 14, 1989. Day 0 was

defined as Monday, March 27, 1989--the first trading day after the accident. The market portfolio was proxied by returns on the CRSP value-weighted return index including dividends.^[4] Hypothesis 1, "Idiosyncratic Response," was tested using returns for the Exxon Corporation. the sample used to test Hypothesis 2, "Alyeska Exposure," consisted of the firms listed earlier as members of the Alyeska Consortium minus the Exxon Corporation. Hypothesis 3, "Vulture Behavior," was evaluated using a sample composed of Exxon's ten largest retail competitors (Chevron, Shell, Exxon, Amoco, Mobil, BP America, Texaco, Marathon, Sun, Phillips and Unocal) obtained from a trade publication (National Petroleum News, 1990).

The three variants of Hypothesis 4, "Environmental Reputation," were investigated using a sample of firms rated by the Council on Economic Priorities (CEP), an organization founded in 1969 to inform and educate the American public on corporate responses to environmental and social issues. Over the past twenty-five years, CEP has published numerous reports and reputational rankings of firms in various industries. Its most comprehensive effort (in terms of the number of firms analyzed) is *Shopping for a Better World*, an annual guide rating the social performance of numerous consumer products firms. Several researchers have used CEP's datasets in investigating the relationship between corporate social performance and financial disclosure or performance (Ingram and Frazier, 1980; Shane and Spicer, 1983; Stevens, 1984; Erfle and Fratantuono, 1992; Diltz, 1993; Wolf and Curcio, 1994; White, 1995). The *shopping* data provides a relatively large sample of firms evaluated in a consistent fashion.

CEP uses a three-element scale to rate a firm's environmental performance. "Green: companies are characterized by "...positive programs, such as the use and encouragement of recycling, alternative energy sources, waste reduction, etc." and a relatively clean record of major environmental regulatory violations. This paper uses the term "oatmeal" to describe companies receiving the middle rating. "Oatmeal" firms have mixed records: "... some positive programs, such as the use and encouragement of recycling, alternative energy sources, waste reduction, etc. Problems such as accidents, regulatory infractions, fines, complaints, etc." "Brown" companies are firms rated lowest on the scale, indicating a consistently poor public record of repeated violations and/or major accidents and "... relatively little effective positive effort."^[5] (CEP, 1989, P. 18). All firms rated in the 1989 edition of *Shopping for a Better World* whose stock was listed on either the New York Stock Exchange, American Stock Exchange or in the National Association Of Security Dealers Automated Quotation (NASDAQ) system and with data in the crsp daily stock files were included in the sample. These were assigned to portfolios according to the hypothesis to be tested. The members of each portfolio are shown in table 1.

Table 1. Firm Samples Used in Hypothesis Testing
Alyeska Exposure Hypothesis Vulture Hypothesis

| | |
|--------------------|-----------------------|
| Amerada Hess | Amoco |
| Atlantic Richfield | British Petroleum |
| British Petroleum | Chevron |
| Mobil | Marathon Oil (USX) |
| Phillips Petroleum | Mobil |
| Unocal | Phillips Petroleum |
| | Royal Dutch Petroleum |
| | Sun Company |
| | Texaco |

Unocal

Environmental Reputation Hypothesis**"Green" Firms**

Anheuser Busch
 Ben and Jerry's Homemade
 Campbell Soup
 Church & Dwight
 Clorox
 Gillette
 Hershey Foods
 Kellogg
 Minnesota Mining and Mfg.
 Procter and Gamble
 Sara Lee
 Schering-Plough
 J. M. Smucker

"Oatmeal" Firms

Abbott Laboratories
 American Home Products
 Amoco
 Atlantic Richfield
 Dow Chemical
 Eastman Kodak
 General Mills
 H. J. Heinz
 James River
 Kimberly-Clark
 McCormick & Co.
 Mead
 PepsiCo
 Pfizer
 Phillips Petroleum
 Polaroid
 Reynolds Metals
 Scott Paper
 Upjohn

"Brown" Firms

American Brands
 American Cyanamid
 Borden
 British Petroleum
 Carter Wallace
 Chevron
 Coca-Cola
 Exxon
 General Electric
 GTE
 Holly Farms
 Iroquois Brands
 Mobil
 Pennwalt
 Philip Morris
 Royal Dutch Petroleum
 Squibb
 Texaco

Empirical Results**Oil Industry Sample**

Table 2 shows the abnormal return results for various days during the event period for each of the three oil industry hypotheses.

Table 2. Abnormal Returns: Oil Industry Sample, CRSP Value-Weighted Index

| Day | Exxon | | Alyeska | | Vulture | |
|-----|-----------------|-------|-----------------|-------|-----------------|-------|
| | Abnormal Return | t | Abnormal Return | t | Abnormal Return | t |
| -1 | -0.28 | -0.33 | -0.19 | -0.24 | -0.35 | -0.57 |
| 0 | -0.49 | -0.58 | 0.31 | 0.40 | 0.16 | 0.26 |
| 1 | -1.35 | -1.58 | -0.27 | -0.34 | -0.24 | -0.39 |
| 2 | -1.47 | -1.72 | 0.26 | 0.34 | 0.74 | 1.19 |

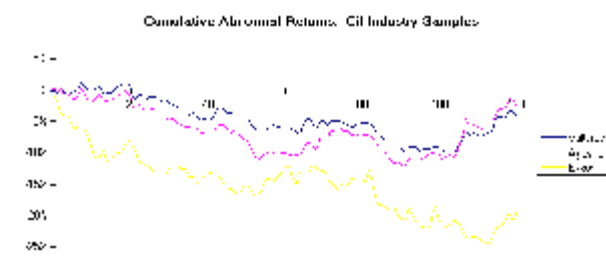
| | | | | | | |
|-----|-------|--------|-------|-------|-------|-------|
| 3 | -0.39 | -0.46 | -0.94 | -1.21 | -0.78 | -1.26 |
| 4 | -0.22 | -0.26 | 0.04 | 0.05 | -0.15 | -0.24 |
| 5 | -2.03 | -2.38* | -0.69 | -0.89 | 0.30 | 0.49 |
| 6 | 0.33 | 0.38 | 0.38 | 0.49 | 0.29 | 0.46 |
| 7 | 0.17 | 0.20 | 1.27 | 1.63 | 1.20 | 1.93 |
| 8 | -0.80 | -0.94 | -0.76 | -0.98 | -0.68 | -0.42 |
| 9 | -1.37 | -1.60 | -1.14 | -1.46 | -0.51 | -0.40 |
| 10 | -1.77 | -2.07* | 0.04 | 0.05 | 0.00 | 0.00 |
| 30 | 0.96 | 1.13 | -0.39 | -0.51 | -0.50 | -0.80 |
| 60 | 0.82 | 0.96 | -0.07 | -0.09 | 0.01 | 0.01 |
| 90 | -0.57 | -0.67 | -0.30 | -0.38 | -0.02 | -0.03 |
| 120 | 1.53 | -1.43 | -1.85 | -0.73 | -1.17 | |

* Significant at the .05 level

** Significant at the .01 level

Only Exxon experienced one-day abnormal returns significantly different from zero during the 120-day investigation period. These returns are all negative and most likely reflect information flows surrounding the post-spill activities of Exxon and the state and federal governments. A chronology of events related to the Exxon Valdez oil spill is attached in the Appendix. Further analysis of this possibility was not carried out due to confounding events and this study's focus on the accident itself.

The cumulative abnormal returns (CARs) for the three oil-related hypotheses are plotted in Figure 1.



Exxon's shareholders experienced an immediate, sustained and significant negative reaction to the Valdez spill, supporting Hypothesis 1, "Idiosyncratic Response." Exxon's co-owners in the Alyeska Pipeline Company and the firm's retail competitors responded much the same in the aftermath of the spill. Little impact was observed for the first twenty or so trading days. Then, both sets of firms earned negative cumulative abnormal returns, a circumstance which corrected itself near the end of the 120-day investigation period. No support was found for either Hypothesis 2, "Alyeska Exposure" or the "Vulture Hypothesis" (Hypothesis 3). Table 3 presents cumulative average residuals and associated test statistics for several different event windows during the post-spill examination period.

Table 3. Cumulative Abnormal Returns: Oil Industry Sample, CRSP Value-Weighted $\leq t$

| Day | Exxon | | Alyeska | | Vulture | |
|----------|----------------------------------|---------|----------------------------------|-------|----------------------------------|-------|
| | Cumulative Abnormal Return | t | Cumulative Abnormal Return | t | Cumulative Abnormal Return | t |
| (-1,0) | -0.77 | -0.64 | 0.12 | 0.11 | -0.19 | -0.22 |
| (0,+30) | -12.44 | -2.62** | -4.60 | -1.06 | -1.67 | -0.49 |
| (0,+60) | -12.11 | -1.82 | -9.91 | -1.63 | -5.65 | -1.17 |
| (0,+90) | -20.12 | -2.47* | -11.50 | -1.55 | -8.85 | -1.50 |
| (0,+120) | -19.04 | -2.03* | -2.59 | -0.30 | -3.77 | -0.55 |

Within the oil industry, the *Exxon Valdez* oil spill appears to have had a lasting impact only shareholders of the Exxon Corporation.

Environmental Reputation Sample

The results of analyses relating to the impact of the Valdez oil spill on unrelated consumer goods firms rated "green," "brown," or "oatmeal." are presented in Tables 4 and 5.

Table 4. Abnormal Returns: Environmental Sample, CRSP Value-Weighted Index

| Day | Green | | Oatmeal | | Brown | |
|-----|--------------------|--------|--------------------|-------|--------------------|-------|
| | Abnormal Return | t | Abnormal Return | t | Abnormal Return | t |
| -1 | 0.32 | 0.80 | 0.06 | 0.17 | -0.18 | -0.55 |
| 0 | -0.66 | -1.66 | -0.49 | -1.50 | -0.14 | -0.43 |
| 1 | 0.51 | 1.28 | -0.13 | -0.41 | -0.33 | -1.03 |
| 2 | 0.06 | 0.14 | 0.08 | 0.26 | -0.56 | -1.71 |
| 3 | 0.53 | 1.33 | 0.08 | 0.24 | -0.49 | -1.51 |
| 4 | -0.25 | -0.64 | -0.07 | -0.23 | -0.19 | -0.59 |
| 5 | 0.64 | 1.59 | -0.05 | -0.15 | 0.09 | 0.28 |
| 6 | 0.40 | 1.00 | 0.21 | 0.63 | 0.46 | 1.40 |
| 7 | 0.36 | 0.91 | 0.00 | -0.48 | 0.19 | 0.01 |
| 8 | 0.03 | 0.09 | 0.01 | 0.03 | -0.19 | -0.58 |
| 9 | -0.04 | -0.10 | -0.11 | -0.35 | -0.45 | -1.39 |
| 10 | 1.32 | 3.31** | 0.07 | 0.20 | -0.07 | -0.20 |
| 30 | 0.08 | 0.21 | 0.29 | 0.89 | 0.02 | 0.06 |
| 60 | -0.02 | -0.04 | 0.10 | 0.31 | -0.05 | -0.17 |
| 90 | 0.14 | 0.34 | -0.29 | -0.89 | -0.37 | -1.14 |
| 120 | 0.02 | 0.06 | -0.33 | -1.02 | 0.17 | 0.52 |

* Significant at the .05 level

** Significant at the .01 level

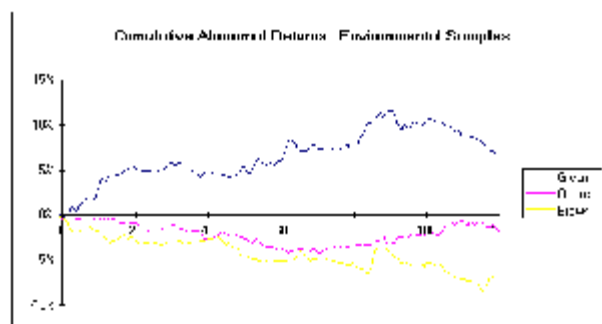
Table 5. Cumulative Abnormal Returns: Environmental Sample, CRSP Value-Weighted

| Window | Green | | Oatmeal | | Brown | |
|----------|----------------------------|--------|----------------------------|-------|----------------------------|-------|
| | Cumulative Abnormal Return | t | Cumulative Abnormal Return | t | Cumulative Abnormal Return | t |
| (-1,0) | -0.34 | -0.60 | -0.43 | -0.94 | -0.31 | -0.69 |
| (0,+30) | 5.44 | 2.44* | -1.16 | -0.65 | -2.46 | -1.36 |
| (0,+60) | 5.69 | 1.82 | -3.90 | -1.54 | -4.95 | -1.95 |
| (0,+90) | 11.20 | 2.93** | -3.35 | -1.08 | -4.09 | -1.32 |
| (0,+120) | 6.40 | 1.45 | -1.89 | -0.53 | -6.80 | -1.90 |

* Significant at the .05 level

** Significant at the .01 level

No single-day abnormal returns for either green or brown or oatmeal portfolios are different significantly from zero, with one exception. [6] Cumulative abnormal returns tell a different story, however. Table 5 indicates "green" firms experienced significantly positive cumulative abnormal returns in the wake of the Valdez spill, while "oatmeal" and "brown" firms showed zero or weakly negative abnormal returns. These findings are illustrated with greater clarity in Figure 2.



The effect varies over time and begins to fade only after approximately four to five months (90 trading days) have passed. Of the four hypotheses associated with the value of an environmental reputation, only Hypothesis 4, "Green Premium," is upheld consistently. Tests of the other environmental reputation hypotheses are encouraging (green firms have higher CARs than oatmeal firms, which have higher CARs than brown firms), but not at a high level of significance.

Discussion and Conclusions

The *Exxon Valdez* oil spill was a seminal event re-igniting environmental concerns within the United States during the early 1990s. Its impact on Exxon's corporate image and risk-adjusted returns to the firm's shareholders is a chilling harbinger for managements operating in ecologically sensitive areas. To the extent the accident was associated with a change in investors' perceptions regarding the probability distributions of future cash flows, one would expect to see an impact on the affected firms. Two sample sets of firms--an oil industry sample and an environmental reputation sample--were examined in this study.

Effects of the Spill on the Oil Industry

The rationales behind the expected effects of the spill on the three oil industry groups (Exxon, Alyeska ownership, and retail competitors) were discussed during formulation of the hypotheses earlier in the paper. The immediate, cumulative and lasting drop in Exxon's abnormal returns indicates the market anticipated neither the accident itself nor management's response following its occurrence. Results from the Alyeska sample and tests of the "vulture hypothesis," which showed no significant effect for either group, must be interpreted with care, however. Uncertainties about future liability, oil prices, and the imposition of stricter safety regulations most certainly existed during the time of the spill. Four of the six firms included in the Alyeska group (British Petroleum, Mobil, Phillips Petroleum and Unocal) were also among Exxon's largest retail competitors. This study's failure to find a significant effect for these two groups may have occurred because the two driving forces (looming Alyeska liability and expected windfall profits at Exxon's expense) canceled each other out.

The results of the oil industry analysis are in line with other researchers' findings on the impact of the Valdez oil spill, i.e., the negative impacts were confined to Exxon alone. Mansur, Cochran and Phillips (1991) report that the market was able to discriminate among oil companies based on their exposure to the Trans-Alaska Pipeline; losses were greater for high-exposure firms than for low-exposure firms. Herbst, Marshall and Wingender (1996) examined the impact of the spill on the volatility of share prices for other major oil firms. They report no significant change.

However, the Valdez oil spill did impact oil firms' willingness to disclose environmental activities in their annual reports. Patten (1992) found a significant increase in environmental disclosures among firms with an ownership interest in the Alyeska Pipeline Service Company in their 1989 annual reports.^[7] The previously-mentioned Valdez Principles (renamed the CERES Principles in 1993) were proposed as a formal means by which firms might demonstrate their commitment to environmental responsibility. White (1995) presents evidence indicating shareholders earn positive abnormal returns the day their firms sign these principles.

The Effects of Environmental Reputation

Perhaps the most interesting findings of this study is that the Exxon Valdez oil spill had an impact on seemingly-unrelated firms. Shareholders in firms with a positive reputation for environmental responsibility--"green" firms--earned superior risk-adjusted returns vis-à-vis their "brown" or "oatmeal" counterparts. There are several implications from these results.

First, it paid to be "green" during the Valdez misfortunes. Exactly why this was so is a matter of some speculation. As mentioned earlier, this could be due to a number of positive initiatives on the part of the individual firms making up the "green" portfolio. Hart and Ahuja (1994) find firms which reduce their emissions of toxic chemicals enjoy higher accounting measures of return in subsequent years. Cohen, Fenn and Naimon (1995) note that firms with lower toxic emissions are associated with higher investment returns. It is also possible green firms' superior performance arose more from their position as an alternative to 'tainted' firms than as investments in their own right. That is, these results might reflect a "flight to cleanliness" in the aftermath of the spill.

Second, regardless of the reason *why* green firms earned superior returns, these results present hard evidence concerning the value of corporate environmental responsibility as an overall strategy. According to Shrivastava (1995a), "... a central feature of postindustrial modernization is the proliferation of technological and environmental risks and crises." In this environment, which Shrivastava terms the "risk society," we are not sure when or in what form the next "technoenvironmental" disaster will occur, but we *are* certain it will happen eventually. Given this perspective, a new form of management is necessary--"ecocentric," in Shrivastava's vocabulary.

The positive response of investors towards environmentally-proactive firms following the Valdez oil spill suggests this transformation is coming about. Companies are re-thinking their strategies in light of growing environmental concerns. Moreover, corporations are in a unique position as engines of change in the movement toward ecologically and economically sustainable development (Gladwin, Kennelly and Krause, 1995; Hart, 1995; Shrivastava, 1995b).

Third, the market does not reward fence-sitters. Only "green" firms demonstrated superior investment performance over the investigation period. Despite their better environmental records, "oatmeal" firms performed little better than "brown" firms over the course of time--and even then, their average cumulative abnormal returns were negative. [8] company wishing to capture the benefits of a positive environmental reputation must take their commitment seriously and "walk the talk."

Suggestions for Future Research

Within the oil industry, it would be instructive to learn whether the level of risk shifted as a result of the Exxon Valdez spill. Several related events--passage of the Oil Pollution Act of 1990, Exxon's 1991 \$1 billion settlement with the State of Alaska and the U.S. Federal government, the \$5 billion punitive damage award in September 1994--suggest avenues for fruitful research. A comparison and contrast investors' perceptions of environmental risks before and after the Exxon spill, the Bhopal disaster and the Three Mile Island nuclear accident would seem to be of interest.

The results from the environmental reputation analyses should provoke a search for more comprehensive measures of environmental responsibility. Determining exactly what components of a positive environmental reputation, e.g., green products, pollution prevention activities, environmental disclosure practices, etc., are valued most by investors will require additional research. Finally, though barely touched upon in this paper, the most important topic for future research would seem to be the investigation of ways to eliminate or at best minimize the impacts of Valdez-type disasters once they occur. This study has demonstrated the significant negative financial impact such a spill can have upon the responsible party and the significant positive effects accruing to unrelated, yet environmentally proactive firms. Moving from one position to the other would seem to be an obvious goal.

EPILOGUE

The *Exxon Valdez* oil spill was a seminal event re-igniting environmental concerns within the United States during the early 1990s. It is interesting to review the results of the spill five years

later. The ship's captain, Joseph Hazelwood, who had been under the influence of alcohol at the time of the accident, was eventually cleared of criminal charges and is now a maritime consultant at a law firm. In October 1991, the Exxon Corporation settled out of court with state and federal governments to pay \$1 billion dollars over ten years into a fund dedicated to the restoration and enhancement of the affected areas. the **Exxon Valdez** was repaired and now transports oil in Europe as the **SeaRiver Mediterranean**. Exxon's chief executive officer retired in 1993, to be succeeded by the company's president during the time of the spill (Lord, 1992; Rogers, 1994).

An estimated 260,000 to 580,000 birds and 3,500 to 5,500 sea otters were killed by the spill. The accident also had disastrous effects on the shellfish and salmon populations. (The latter had record runs in 1990 and 1991, however). The company's four-year effort to clean up the spill cost more than \$2.5 billion, including approximately \$80,000 spent for each otter "saved." (Lord, 1992). In general, marine life has recovered, though observers disagree whether it will ever return to pre-spill conditions.

In June 1994, Exxon and Joseph Hazelwood were found guilty of recklessness in the accident. In August and September 1994, a federal jury in Anchorage, Alaska awarded \$287 million in compensatory damages and a whopping \$5 billion dollars in punitive damages to parties injured by the spill (Schachner, 1995). According to one analyst, if Exxon's appeals fail and the company is required to pay the full amount, its debt ratio could increase by as much as 30 percent (Nambiar, 1995). Hundreds of lawsuits are still outstanding.

NOTES

[1] Thousands of pages have been written on the environmental and economic effects of the Exxon Valdez oil spill. See Davidson (1990), Keeble (1991) or Wheelright (1994) for popular accounts of the spill's impact on Prince William Sound communities.

[2] In 1979, the Ixtoc I drilling platform spilled 140 million gallons of oil off the Mexican coast +/- the world's largest oil spill. The 1967 **Torrey Canyon**, 1978 **Amoco Cadiz** and 1993 **Braer** tanker disasters released 37 million, 70 million and 26 million gallons of oil into the environment, respectively. The 1969 Union Oil oil well spill off Santa Barbara, credited with prompting passage of the 1970 National Environmental Policy Act, released a mere 235,000 gallons of oil.

[3] There are roughly 255 trading days in a calendar year.

[4] All analyses were replicated using the CRSP equal-weighted index, with no appreciably different results. Brown and Warner (1985) and Peterson (1989) note the value-weighted index is a more appropriate surrogate for the market portfolio.

[5]In 1989, CEP specifically included cigarette manufacturers in this category.

[6]On Trading Day 10 (April 7, 1989), the green portfolio experienced a significantly positive abnormal return. On this day, President Bush announced he would send U.S. military troops to assist in the cleanup. It is not clear why this information might have a positive impact on green firms.

[7]Blacconiere and Patten (1994) report that chemical firms with more extensive environmental disclosures experienced less negative stock market reactions in the aftermath of the Bhopal chemical leak.

[8]Some of the oil firms from the first part of this study are included in the brown and oatmeal portfolios. Their removal does not change the results appreciably.

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APPENDIX

Chronology of Events Related to the Exxon Valdez Oil Spill

- 24 March 1989 At 12:04 a.m., the Exxon Valdez runs aground on Bligh Reef in Prince William Sound, Alaska. Oil begins gushing from its tanks at an astonishing rate of 840,000 gallons per hour. At 12:27 a.m., Captain Joseph Hazelwood reports the accident to the Coast Guard in Valdez.
- 24–26 March 1989 Emergency response teams assemble and to begin stemming the flow. A lack of containment booms and oil recovery equipment frustrate attempts. The use of dispersants is considered, but rejected, because of calm weather conditions. Offloading of the remaining oil begins. Oil begins to spread in an ever-widening swath. The flow of oil through the Trans Alaska pipeline drops to approximately one-third its normal flow.
- 27 March 1989 Seventy mile per hour winds restrict the use of dispersants. Prices of crude oil, gasoline and heating oil start to climb in the lower 48 states. Exxon's common stock price drops \$xxx--a \$yy loss in market capitalization for the firm .
- 28 March 1989 Oil continues to spread from the Valdez area. Three federal officials -- the Secretary of Transportation, Director of the Environmental Protection Agency and Commandant of the U.S. Coast Guard -- meet with the Governor of Alaska to discuss plans for remediating the spill.
- 30 March 1989 The National Transportation and Safety Board announces Captain Hazelwood, who departed the state two days previous, was drunk at the time the spill occurred. Federal officials refuse to take responsibility for the cleanup.
- 31 March 1989 State officials express frustration over Exxon's slowness in responding to the spill.
- 3 April 1989 Exxon's Chairman of the Board apologizes for the spill on national television. The US Secretary of the Interior compares the spill to the nuclear disaster at Three Mile Island. The Alaska Department of Fish and Game closes the Prince William Sound herring fishery.
- 4–5 April 1989 Alaska's governor requests the US Coast Guard to take over management of the cleanup and announces he will shut down the Valdez terminal if Alyeska's owners do not develop better oil spill response capabilities. Less than 4 percent of the oil has been recovered. Exxon refloats the Valdez and moves it to Naked Island for temporary repairs.
- 7 April 1989 US President George Bush orders military personnel to assist in the cleanup. Oil continues to flow into other areas.
- 2 April 1989 Workers shift their emphasis from protecting fish hatcheries to removing oil from the shoreline. The spill continues to move down the coast.

- 4 April 1989 Exxon agrees to pay \$15 million to help fund an assessment of the environmental damages from the spill.
- 17 April 1989 Oil reaches Seward, Alaska at the head of resurrection bay. Exxon's cleanup plan, involving 4,000 workers, is approved by the Commandant of the Coast Guard.
- 19 April 1989 The Soviet oil skimmer, Vaydaghubsky, arrives to assist in cleaning up the spill. No comparable US ships are in service.
- 3 May 1989 The Exxon beach clean-up plan is declared unacceptable. Captain Hazelwood enters an innocent plea on all charges brought against him.
- 19 May 1989 The Commissioner of Alaska's Department of Environmental Conservation testifies that Alyeska's and Exxon's inability to implement their own oil-spill contingency plan allowed oil to spread as far as it did.
- 9 September 1989 The Coalition for Environmentally Responsible Economies announces the Valdez Principles, an environmentally-responsible corporate code of conduct it urges firms to adopt.

Source: Baker, Campbell, Gist, Lowry, Nickerson, Schwartz and Stratton (1989).