This is to certify that the

thesis entitled

AN EMPIRICAL EXAMINATION OF THE EFFECTS OF
ENVIRONMENTAL DISCLOSURES ON INVESTORS
IN THE CAPITAL MARKET

presented by

Donald Walter Hicks

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Business - Accounting

Steven Dilley
Major professor

Date August 9, 1978

AN EMPIRICAL EXAMINATION OF THE EFFECTS OF ENVIRONMENTAL DISCLOSURES ON INVESTORS IN THE CAPITAL MARKET

by

Donald Walter Hicks

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Accounting and Financial Administration

1978

dis

sio

sta

The

538

inc

stat

upon

sure

was

stoc

10-K

annou

for a

of th

ABSTRACT

AN EMPIRICAL EXAMINATION OF THE EFFECTS OF ENVIRONMENTAL DISCLOSURES ON INVESTORS IN THE CAPITAL MARKET

by

Donald Walter Hicks

This research was conducted to see if environmental disclosures required by the Securities and Exchange Commission (SEC) in financial statements were associated with statistically significant differences in trading volume. The basis for the research was Securities Act Release No. 5386 issued in 1973, which amended SEC reporting forms to incorporate disclosure of the effects of compliance with statutory requirements respecting environmental quality upon the registrant. The largest block of initial disclosures came in 10-Ks for 1973 calendar year firms, and this was the critical event for the research.

Previous research had shown a volume reaction in the stock market to earnings announcements. A part of the 10-K is the income statement, which includes an earnings announcement. Therefore, the test procedure had to allow for a possible volume reaction for all firms at the time of the receipt of the 10-K. For that reason, a change

statistic was used. Specifically, the percentage change in the daily percentage of shares traded for corresponding two week blocks from periods surrounding the receipt of 1972 10-Ks to periods surrounding the receipt of 1973 10-Ks. In this way, any volume reaction to the earnings announcements would cancel out.

Three groups were tested. The test group consisted of firms initiating environmental statute compliance effect reporting in 1973 10-Ks. The first control group consisted of firms which began reporting the effects of compliance with environmental statutes before 1972 10-Ks. The second control group was made up of firms which as of 1973 10-Ks made no mention of the effects of compliance with environmental statutes. Firms with sources of known volume reaction in the periods from which data were gathered were eliminated, e.g. any firm with a dividend announcement in the six weeks surrounding the receipt of the 10-K for either 1972 or 1973 was excluded. Firms which initiated the environmental disclosure signal in 1972 reports had to be eliminated. If the market reacted to the signal, it would have been included in 1972 data for those firms.

There were three periods for test purposes. The two week period of the receipt of the 10-Ks was the test period. The two week periods on either side of the test period served as control periods. Using a Kruskal-Wallis ranking test, all three groups were tested to see if their change

in volume was the same in each of the periods. Results indicate that the change in volume was not different for the three groups in either control period surrounding receipt of the 10-K. In the test period, however, the test group was shown to have a statistically different percentage change in the daily percentage of shares traded than did the two control groups. The reactions of the control groups were still not different from each other.

Based on this evidence, the conclusion is drawn that there is a statistically significant volume reaction in the capital market associted with disclosure of the effects of compliance with environmental statutes on the firm. The data show that the reaction is less trading for the firms making the environmental disclosure.

This dissertation is dedicated to my Father and his people; especially Duane and Pat Milano.

ACKNOWLEDGMENTS

It is impossible to list everyone who has been of assistance during the Ph.D. program. To all the unnamed faculty, staff, and friends I express my gratitude.

Special thanks go to my dissertation committee, Professor Steven Dilley, chairman, and Professors Melvin O'Connor and Richard Simonds.

Great appreciation is due the Haskins & Sells Foundation for its financial assistance during my dissertation endeavor.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

BACKGROUND

Purpose

In July of 1971 the Securities and Exchange Commission (SEC) began requiring registrants to disclose the effects that compliance with statutory requirements concerning environmental quality may have had on the registrant's business. As public interest in ecology increased in the late nineteen sixties, some businesses revealed the effect that maintaining or recovering a clean environment would have on their firm in their annual reports. As a consequence of these disclosures, the question has arisen as to whether or not this data possessed informational content.

The Efficient Market Hypothesis (EMH) states that the securities market reacts instantaneously, or nearly so, and in an unbiased fashion to any new information. Hence, under the EMH, if disclosures about the effects that compliance with statutes regarding environmental quality may have had on a business have any informational content in the capital market, one would anticipate a reaction in the capital market associated with the disclosures. The purpose of this research is to examine the relevance of environmental disclosures in financial statements to individual participants

in

dis

ass

tra

su

te

ch

ne

th

te

Ge

pu

a

t

p

e

e

l

r

r

p

p

in the capital market. Specifically, are environmental disclosures required by the SEC in financial statements associated with statistically significant differences in trading volume?

In recent years the SEC has come under increasing pressure to enlarge its disclosure requirements regarding matters of ecological significance. The remainder of this chapter will examine evidence about a growing conscientiousness concerning ecology and the effects of human actions on the ecological system which was manifest in the late nineteen sixties and early seventies.

General Public Interest

Two fairly obvious ways to determine if the general public has any interest in something are (1) to ask them, and (2) to look for events evidencing interest in a particular area. This section will examine three surveys of public opinion on the environment and then mention some events evidencing such interest. Other events will be examined in subsequent sections.

In the spring of 1970 Arvin W. Murch surveyed people living in Durham, North Carolina.[1] A random sample of 300 residents was selected for the study, and 75% of the sample responded to the questionnaires. Of the respondents, 74%

---

[1]Arvin W. Murch, "Public Concern For Environmental Pollution," Public Opinion Quarterly, Spring 1971, pp. 100-105.

co
on
sp
na
fi
wi
in
on
ti
ne
bu
ti
an
of
to
vi
po
lo
in
th
34
ta
ag
an
93

considered pollution a serious problem in the U.S., yet only 13% considered it a problem in Durham. This was despite the fact that air pollution in Durham exceeded the national average. A possible explanation given for this finding was the national nature of news on the environment, with recent media reporting on the pollution problem, including local ratio, television, and newspapers, focusing on the national aspects rather than local aspects of pollution. When asked if they would favor the construction of a new industrial plant in Durham which would provide many jobs, but would also pollute the environment, 50% opposed construction and only 20% favored construction. (19% couldn't decide and 11% didn't answer the question). The important aspects of this study were that residents of Durham had been exposed to the problems of pollution via the media, chiefly television, newspaper and magazine articles, they considered pollution to be a problem, albeit a national rather than local problem, and they were opposed to the addition of an industry which would add to the local pollution.

Concurrently, Rita James Simon conducted a survey in the State of Illinois.[2] This was a telephone survey, with 345 names drawn from the directories for 60 counties. Contact was made with 265 people, and 65% of those (170 people) agreed to participate in the telephone interview. Over 90%

---

[2]Rita James Simon, "Public Attitudes Toward Population and Pollution," Public Opinion Quarterly, Spring 1971, pp. 93-99.

c
p
m
a
l
s
V
e
i
d

l
a
o
e
a
n
f
s
s
r
t

a

of the respondents in this survey stated that water and air pollution were a problem today. Yet when asked what the most important problem facing the country today was, before any particular problem was mentioned, only 13% answered pollution. Other frequent answers were racial, inner city, and student protests. (The question was worded to exclude the Vietnam War.) Only 50% approved of the high priority assigned to solving the pollution problem by President Nixon. It is apparent that this study revealed mixed results, yet it did indicate some public consiousness of pollution.

In 1973, Barnett A. Greenberg and Roy A. Herberger published the results of a survey of the Atlanta and Los Angeles areas.[3] The study checked for both concern for and knowledge of ecology, with concerned defined in terms of action taken, e.g. purchasing low phosphate detergents. Although both areas scored well in knowledge, Los Angeles showed a significantly higher concern for the environment. The authors felt this might have been because of the well publicized smog problem in Los Angeles. Young white-collar professionals scored highest in both knowledge and concern. These results indicate there is a segmentation of people willing to take overt action to alleviate pollution.

The opinions of business executives were surveyed in

---

[3]Barnett A. Greenberg and Roy A. Herberger, "Is There an Ecology-Conscious Market Segment?" Atlanta Economic Review, March-April 1973, pp. 42-44.

1970.[4] The results indicated that business leaders, like other citizens, thought protection of the environment was an important national problem. Surprisingly, over 50% of the executives favored government regulation and over 80% believed the environment should be protected even if it meant inhibiting the introduction of new products, foregoing an increase in production, or reducing profits.

The effects on business executives can be thought of as occurring because executives themselves are part of the general public, and therefore are included in any general public trends, or it is possible that the executive attitudes reflect reaction to the attitudes of the public at large. Legislation is more likely to be a response to public opinion. Among the major federal acts are the National Environmental Policy Act of 1969, the Clean Air Act of 1970, The Resource Recovery Act of 1970, the Federal Water Pollution Control Act Amendments of 1972, and the establishment of a national environmental data system in 1972 (HR 56). Other pieces of evidence for interest in ecological problems include special television broadcasts, numerous magazine and newspaper articles, and the establishment of funds for loans at preferred rates for cleaning up the environment by banks.[5] Other events will be examined in the remainder

---

[4]Robert S. Diamond, "What Business Thinks - The Fortune 500-Yankelovich Survey," Fortune, February 1970, pp. 118-119, 171-172.

[5]Fredrick R. Miller, "Environmental Investing," Journal of Commercial Bank Lending, May 1971, pp. 32-35.

of this chapter.

Social Accounting

The idea that financial reporting encompasses social responsibility is not entirely new. In 1944, A. C. Littleton wrote:

> Accounting for a long time has possessed a significance that extended beyond the boundaries of the business enterprise directly concerned. The possibilities of a wide serviceability are not new; but general recognition of the possibilities in accounting is recent.[6]

The statement is still appropriate today. Professor Littleton went on to talk about desired educational programs for business students in order to develop good citizens. Early social accounting dealt with GNP accounting. Recently social accounting has expanded its coverage. A workable current definition is provided by Lee Seidler:

> As a general guide, social accounting is the modification and application, by accountants, of the skills, techniques and discipline of conventional (managerial and financial) accounting, to the analysis and solution of problems of a social nature.[7]

In the seventies accountants began attacking social problems in earnest. Today the American Accounting Association regularly puts out committee reports on some aspect

---

[6] A. C. Littleton, "The Accounting Exchange," The Accounting Review, July 1944, pp. 315-323.

[7] Lynn L. Seidler and Lee J. Seidler, Social Accounting: Theory, Issues, and Cases (Los Angeles: Melville Publishing Company, 1975), p. ix.

of social accounting.[8] A frequent route taken involves the social audit. Social audits involve the matching of social benefits and social costs to arrive at a net social surplus or deficit. Relatively formal models have been proposed by Corcoran and Leininger,[9] Linowes,[10] Abt,[11] and Estes.[12] Less formal models come from Beams and Fertig,[13] Marlin,[14] Clausen,[15] Dilley and Weygandt,[16] and the American Accounting Association's Committee on Environmental Effects of

---

[8]For example "Report of the Committee on Measures of Effectiveness for Social Programs," The Accounting Review Supplement 1972, or "Report of the Committee on Environmental Effects of Organization Behavior," The Accounting Review Supplement 1973.

[9]Wayne A. Corcoran and Wayne E. Leininger, Jr., "Financial Statements - Who Needs Them?" Financial Executive, August 1970, pp. 34-38, 45-47.

[10]David F. Linowes, "An Approach to Socio-Economic Accounting," Conference Board Record, November 1972, pp. 58-61.

[11]Abt Associates Inc., 1972 Abt Associates Inc. Annual Report and Social Audit. Cambridge.

[12]Ralph W. Estes, "A Comprehensive Corporate Social Reporting Model," In Social Accounting: Theory, Issues, and Cases, Lee J. Seidler and Lynn L. Seidler (Melville Publishing Company, 1975), pp. 185-204.

[13]Floyd A. Beams and Paul E. Fertig, "Pollution Control Through Social Cost Conversion," The Journal of Accountancy, November 1971, pp. 37-42.

[14]John Tepper Marlin, "Accounting for Pollution," The Journal of Accountancy, February 1973, pp. 41-46.

[15]A. W. Clausen, "Toward an Arithmetic of Quality," The Conference Board Record, May 1971, pp. 9-13.

[16]Steven C. Dilley and Jerry J. Weygandt, "Measuring Social Responsibility: An Empirical Test," The Journal of Accountancy, September 1973, pp. 62-70.

Organization Behavior[17] among others. Social audits were concerned about environmental matters as a portion of overall social performance, yet many of the models concentrated on the environmental aspects. Beams and Fertig, for example, proposed an accrual accounting system for pollution, based on the view that:

> Accounting as an organized profession has the responsibility to transcend the internal viewpoint of a private firm and to develop information which portrays a private firm's role in and contribution to society.[18]

In order for data to possess informational content it must be useful. There are many potential uses and users of reported data. One such use is in the capital market. If it can be shown that investors respond to a type of social data, then it can be said that the data is information in the capital market. It should be noted that the inclusion of pollution control expenditures, or any new disclosures on financial statements, has a major impact on the auditor:

> ... auditors face a serious and imminent need to consider the impact of pollution control on financial statements. This author recommends that: (1) auditors should consider the adequacy of the pollution control of the firm under audit; (2) when no control exists, the auditor should consider his alternatives in light of possible adverse effects on the firm; (3) the auditor

---

[17]Committee on Environmental Effects of Organization Behavior, "Report of the Committee on Environmental Effects of Organization Behavior," The Accounting Review Supplement 1973, pp. 72-119.

[18]Floyd A. Beams and Paul E. Fertig, "Pollution Control Through Social Cost Conversion," The Journal of Accountancy, November 1971, p. 37.

> should determine that management has made appropriate disclosure of pollution control matters either in footnotes to the financial statements, or in monetary terms in the body of the financial statements, or both; and (4) the auditor should be prepared to modify his opinion when circumstances warrant. These circumstances could include the inapplicability of the going-concern assumption or the possibility that the firm has materially overstated its income by not accruing the cost of controlling pollution.[19]

It would, therefore, behoove the profession to investigate the usefulness of environmental disclosures before tacking them on to audited statements. That this is of concern to practitioners was brought out by Michael P. Cerisano, a partner in Elmer Fox & Company:

> A basic accounting concept is that information collected will be useful to an interested party for the purpose of forming judgments about the activities of an organization. Unfortunately, present-day accounting systems do not satisfy this fundamental requirement when applied to gauging social responsibility in the private or public sectors.[20]

The overriding importance of environmental factors in current social accounting is illustrated by the fact that in the Fortune 500 annual reports for 1977 pollution-control expenditures require more financial resources than any other social acconting area.[21]

---

[19]Thomas D. Wood, "A New Reporting Problem for Auditors - The Impact of Pollution Control on Financial Statements," The Journal of Accountancy, March 1972, p. 76.

[20]Michael P. Cerisano, "SMS: Social Measurement Systems for the Future - A Practitioner's Preview," CPA Journal, May 1974, p. 26.

[21]Ernst & Ernst, "Social Responsibility Disclosure: 1977 Survey of Fortune 500 Annual Reports," 1977, p. 13.

Economic Theory

Classic economic theory has presented pollution as an externality. If pollution is an externality, then expenditures to control pollution or to clean up pollution have no benefit for the firm making the expenditure, and ceteris paribus, would put the firm at a competitive disadvantage which in pure competition would drive the firm out of existence. Clearly, if this were the case, an investor upon reading about expenditures for pollution control would want to immediately sell any stock he had in such a firm if his incentive was economic. If all investors had the same economic incentive in pure competition, no one would buy the stock since no one would want to own stock in a firm destined to failure. If one assumed social consciousness on the part of investors and customers; then the stock might have some attraction. But in pure competition the only expenditure that would be beneficial to the firm would be made to the upstream or upwind firm to induce that firm to reduce its pollution and thereby reduce costs to the paying firm.

In 1969, William P. Gramm published an article in which he argued that the economic system may motivate firms to abate pollution in the absence of pure competition, if one assumed some social concern on the part of the public.[22]

---

[22]William P. Gramm, "A Theoretical Note on the Capacity of the Market System to Abate Pollution," Land Economics, August 1969, pp. 365-368.

He argued that if consumers are motivated enough to purchase on the basis of non-pollution, then corrective action against pollution can be a source of product differentiation. This argument would hold up best under an oligopolistic market structure. In pure competition the firm would lack the resources to fight pollution, but oligopolistic and monopolistic firms could have sufficient financial reserves and research capabilities. Due to a strong market position a monopoly might lack the motivation to abate pollution in response to consumer demands. Yet even in a monopoly potential competition or government regulation might force the firm into some pollution abatement. In such a situation pollution abatement expenditures of a firm would be a signal that investors would respond to since the firm will increase its share of the consumer market as a result. It would also be possible that the costs of fighting pollution would not increase costs to the firm, since advertising might be decreased thanks to product differentiation.

For both the case of pure competition, and product differentiation under either oligopoly or monopoly, it was necessary to assume some form of general public interest in preserving the environment - an interest strong enough to result in some action which entailed a degree of economic sacrifice. If the externality of environmental protection can in some way be internalized, this assumption can be relaxed.

A method of internalizing environmental costs even in the case of pure competition would be government regulation. If the government required some level of environmental maintenance for all firms, the costs would be internalized and all firms would have to meet that level of ecology protection or go out of business. (Alternatively it might be possible, even prudent, to not meet the standards provided the noncompliance penalties were less than the cost to the firm of compliance and there was no general public interest in environmental protection.)

In this situation, disclosures about the effects of compliance with environmental protection statutes could be of interest to investors for economic reasons. If all firms would eventually have to meet the standards, then the costs to individual firms to comply would be meaningful information, since before the fact different firms might be in different situations regarding the environment. Some firms would have to commit more resources to meet the standards than others. For marginal firms with the high polluting characteristics the costs of compliance might be very great, while for others the costs could be minimal. Thus in this situation, investors with no concern for the environment per se, would be interested in the effects of compliance with environmental protection statutes on the firm.

If one assumed public interest, in all cases there would exist the potential for investor reaction to environmental

expenditures. If one didn't assume public interest, then the reaction could still occur if the expenditures were in response to government regulations, the case being tested in this research, provided the costs of pollution abatement were less than the penalty for noncompliance with the environmental protection statutes. Thus from an economic standpoint there is reason to anticipate investor reaction to disclosures about the effects of compliance with environmental protection statutes from both ecology-conscious investors for environmental reasons, and non ecology-conscious investors for economic reasons.

Mutual Funds

Four mutual funds have been set up with social objectives, and have met with limited success. The Dreyfus Third Century Fund was established in May of 1971. The fund evaluates prospective investments and portfolio companies for environmental protection and improvement, occupational health and safety, consumer protection, product purity, and equal employment opportunity. The initial offering of $24,300,000 was completed in 1972. The fund operates on the following premises:

(1) Private investment can be a positive force to to achieve social progress.

(2) By employing social as well as financial criteria, the Fund may encourage business enterprises to act with respect to social matters in such a way

that their securities will become eligible for purchase by the Fund; other investors may also be encouraged to employ similar portfolio evaluation techniques.

(3) Although application of social criteria will narrow the range of enterprises eligible for investment, there will be sufficient investment opportunities meeting the Fund's criteria to permit it to be fully invested.

(4) Business enterprises demonstrating concern for the social aspects of their activities, and leadership in dealing with them, are also likely to excel in profits and growth.

(5) Individual and Institutional investors will entrust substantial sums of money to the Fund on the basis of the foregoing premises.

The fund maintains a list of firms which are eligible for investment, but this list is not made public. The Dreyfus Third Century Fund is still active.

The Pax World Fund began offering shares in August of 1971. It is directed by Dr. Luther E. Tyson, a Methodist minister, and its major social objective is the promotion of world peace. It invests in firms whose business is non-military. The Department of Defense's 100 largest contractors are excluded from consideration. The fund also avoids firms in the liquor, tobacco, and gambling industries; and tries to favor firms with fair employment.

This fund is also still active.

The other two mutual funds with social objectives have been less successful. The First Spectrum Fund attempted to avoid enterprises which did not fully comply with existing laws relating to the protection of the environment, civil rights, and consumer protection. If companies whose shares were held by the fund subsequently violated full compliance, the fund would either sell the shares or try to bring about full compliance through persuasion and voting. The First Spectrum Fund waa deregistered on September 24, 1974.

Social Dimensions Funds never really got off the ground. Like the other funds it was to seek investments for social as well as economic purposes, but it has not acquired any assets. Of the four funds, The Dreyfus Third Century Fund had the advantage of financial experience and the backing through the Dreyfus Corporation. Yet the Pax World Fund has managed. First Spectrum Fund had no real backing, and Social Dimensions Fund stumbled at the starting gate. A major problem all the funds faced was that the kind of data they needed in order to pursue their goals was not readily available. Yet the success of two of the four indicates some investor interest in social data for investing decisions.

Shareholder Campaigns

One method in which interest in social aspects of corporate activity was evidenced in the late 60's and early

70's was in shareholder campaigns, also known as proxy actions. These actions were in contrast to the traditional "Wall Street Rule" which espoused the view that if one did not support management on issues put forth to stockholders, the natural course of action was to reduce holdings. Proxy actions did not supplant investment reduction, but rather supplemented that course of action.

The basic tactics of a shareholder campaign began with the identification of an area of social concern in which the campaign initiator believed the firm was deficient. Negotiation was often employed as a first means of improvement. If the negotiation process failed, the fight was carried to shareholders through proxy proposals.

The first such activity was the Kodak-FIGHT Campaign in 1967. This campaign was concerned with civil rights and the hiring of unskilled black ghetto workers in Rochester, New York. FIGHT was organized by Saul D. Alinsky and had the backing of several church groups that held Kodak stock. Although the campaign received only a minute number of actual votes, it nevertheless realized its goals of more black employment, and recognition as a bargaining agent by Kodak. The success of the Kodak-FIGHT Campaign in accomplishing its objectives inspired more proxy actions.

The most publicized proxy action was Campaign GM. This action included environmental considerations. It was financed for a little more than $30,000 and originally

offered nine proposals for inclusion in the proxy statement. However, GM was successful in blocking all but two of the proposals. One would have added three people elected by the public to the board of directors, and the other would have set up a committee on corporate responsibility. Neither proposal received 3% of the vote, but the action did produce some results.

GM ran an extensive campaign against the proxy action. Included in management's efforts were full-page advertisements in 150 newspapers which described among other things General Motors' progress in air pollution control. Some large investors voted for the proposals, and others while not actually voting for the proposals included statements of support for many of the objectives of Campaign GM along with their proxy statements.

After the apparently unsuccessful campaign, GM took steps to improve its performance in social areas including the following measures relating to environmental quality:

(1) A committee of six scientists was formed to advise the corporation on technical matters including the effects GM had on the environment.

(2) Professor Ernest S. Starkman from the University of California was appointed vice president in charge of environmental affairs.

(3) General Motors spend $188 million in the next year to fight pollution.[23]

---

[23]Bevis Longstreth and H. David Rosenbloom, Corporate Social Responsibility and the Institutional Investor, pp. 7-8.

Campaign GM made another effort the following year. As in the 1970 action, the Stern Foundation provided most of the funding with a $30,000 grant. There were only three proposals this time, and all were included in the proxy statement without resistance. The third proposal would have required GM to disclose data on anti-pollution control, auto-safety, minority hiring, and franchising practices in its annual report to stockholders.

Despite increased institutional support, the campaign received less overall support than the 1970 effort. Proposal three got the most votes, 2.36% of those cast. Various reasons have been given for the failure of Campaign GM - Round II. Foremost among them that GM had made considerable progress in social areas since the first campaign. As far as environmental matters are concerned, GM had reported on the effects of compliance with environmental statutes in its 1970 annual report.

Many other proxy contests have been waged seeking environmental disclosures,[24] but the ones discussed above illustrate the basic process. Proxy actions have been successful in accomplishing desired objectives without getting very many actual votes. Just what level of public support the ations illustrate is, therefore, not clear.

---

[24]For example Fidelity Trend Fund in 1971, Ford Motor Company in 1972.

Investors

This section deals with the existence of investors who would make investing decisions on the basis of social data. As a part of the research for their book, Longstreth and Rosenbloom surveyed institutional investors.[25] The initial sample consisted of 23 religious organizations, 28 universities, 44 foundations, 34 insurance companies, 40 banks, and 27 mutual funds; for a total of 196. The response rate was 58.7% (115 institutions).

42.6% of the respondents indicated a recent or in progress review of the social aspects of their investing policy. The remaining 57.4% said they already used social criteria in evaluating investments, with seventeen institutions indicating that a portion of their investments were made up of firms with a good social record, where economic factors were secondary.

Religious institutions referred to a moral obligation in investing. Many of them specifically included under the moral obligation the avoidance of polluting firms, e.g. the Central Conference of American Rabbis and the United Church of Christ. In this regard many expressed a willingness to accept a lower rate of return in exchange for a socially oriented investment:

> What the new guidelines mean, in essence, is that with unrestricted funds the church

---

[25] Bevis Longstreth and H. David Rosenbloom, Corporate Social Responsibility and the Institutional Investor, pp. 41-70.

> should be willing to accept a lower rate of return, and accept a higher degree of risk in some of our investments, in order to place our money where it will do the most social good. Ordinarily, one seeks the most interest for one's money, for example, but we shall be willing to accept less where a bank is investing in black real estate or black companies, or a company is battling pollution, or is accomplishing similar social improvements.[26]

The religious institutions employed ongoing evaluations of the social aspects, including environmental, of investments and potential investments.

Other institutional responses to the survey were similar. Universities were less likely to alter holdings in response to social revelations since they expressed a belief in an obligation to maximize returns. Banks believed that sound social and ecological policies were consistent with good management. Insurance companies were quite strong in their social responsiveness, while foundations were the least enthusiastic of the groups. Mutual funds tended to agree with banks that management of resources whether financial, ecological, or otherwise essentially involved the same expertise.

Donald L. Kyle and Fred A. Jacobs expressed in a commentary in 1972 that, "With the current interest in ecology, it is thought that some investors may be reluctant to consider investments in a farm that only appears profitable because of the omission of social costs from financial

---

[26]Robert V. Moss, President of the United Church of Christ, quoted in Longstreth and Rosenbloom, p. 46.

statements."[27] Evidence for this viewpoint was brought out in the SEC's public hearings on disclosure requirements for environmental and other social items. Some participants in the hearings indicated that they would refuse to purchase shares of offending firms.[28] In response to this type of interest, some brokerage houses employ specialists to isolate investments that are socially acceptable.[29] In 1971, Jonathan J. Prinz of CBWL-Hayden Stone Inc., submitted a list of eight stocks that were socially acceptable.[30] About the time of the publication of the list, however, one of the firms was accused by the Federal Trade Commission of false advertising and misusing confidential information from clients.[31] Thus although the data might be desired, it has not been easy to get.

The facts that 1) investors have indicated a desire for social data; 2) brokers have employed analysts to find socially conscious firms; and 3) some investors have indicated a willingness to alter holdings or not acquire shares from offending firms all indicate a degree of investor

---

[27]Fred A. Jacobs and Donald L. Kyle, "Social Cost Conversion - A Commentary," Journal of Accountancy, December 1972, p. 30.

[28]Securities and Exchange Commission, Securities Act of 1933 Release No. 5627, Securities Exchange Act of 1934 Release No. 11733, October 14, 1975.

[29]Walter Goodman, "Stocks Without Sin," Harper's Magazine, August 1971, p. 67.

[30]In Goodman, p. 67.

[31]Longstreth and Rosenbloom, p. 93.

interest in social data, including environmental disclosures.

Market Reaction to Environmental Data

In January of 1978, Barry H. Spicer published a study which evaluated the association of environmental performance and five measures of investment value for firms in the paper industry.[32] The study was made possible because of work done by the Council on Economic Priorities. The Council was formed by Alice Tepper Marlin in 1970 to research corporate activities in socially responsible areas. This group made two studies on the efficacy of water and air pollution control systems in mills owned by 24 firms in the pulp and paper industry. The studies were done in 1970 and 1972 and afforded a unique opportunity for testing pollution control effectiveness association with financial measures of the companies involved. Spicer used 18 of these firms in his study; four were excluded because less than 25% of their sales were in the paper industry, and two were omitted because they were not included on the COMPUSTAT tape from which financial data was gathered.

The study was designed to see if companies with better pollution control records had 1) higher profitability; 2) greater asset size; 3) lower total risk; 4) lower

---

[32]Barry H. Spicer, "Investors, Corporate Social Performance and Information Disclosure: An Empirical Study," The Accounting Review, January 1978, pp. 94-111.

systematic risk; and 5) higher price/earnings ratios than did companies with poorer pollution control records. This study was, therefore, not checking for a market reaction to an environmental signal, as no signal was given to the market. It was checking for market reactions to firms which had better pollution control.

Using a Spearman Rank Order Correlation Test, Spicer found significance at an alpha level of .05 in only 45% of the tests, and only 6% of the time when checking one of the risk variables. At an alpha of .10 for the one-tailed tests the percentages increased to 58% and 25% respectively. In all cases, however, the signs were in the hypothesized direction. A Mann-Whitney Test was also run, and yielded similar results. Spicer then concluded:

> Specifically, it was found that, for a sample drawn from the pulp and paper industry, companies with better pollution-control records tend to have higher profitability, larger size, lower total risk, lower systematic risk and higher price/earnings ratios than companies with poorer pollution-control records.[33]

Spicer's conclusions appear justified for profitability, size, and price/earnings ratios. For the risk variables a little caution seems in order. Although he got the hypothesized sign in all 16 cases he ran the correlation on one of the risk variables, it must be remembered that the tests were redundant in many cases, and the average alpha level for the tests on risk was only .239 with a high of .480.

---

[33]Spicer, p. 109.

Furthermore an interesting aspect of the association has not been tested. The question of whether or not the firms with the best indicators of investment value, as defined by the research, acquired that position before the acquisition of good pollution control was not addressed. There was no control in the study, therefore it is questionable if the disclosure of the environmental data was at all related to the market evaluation of the firms, as the title of the paper would seem to indicate.

Summary

This chapter has presented evidence of interest in environmental aspects of corporate behavior. Surveys have indicated that the public was concerned about the deteriorating environment. Accountants have responded to this area of public interest with social audits and attempts to measure costs. Economic theory has been advanced which indicated that in some cases there are sound economic reasons for firms to eliminate pollution of the air and water. Mutual funds have been formed with emphasis on the social aspects of firms, and have met with mixed success. Shareholders have taken the previously unheard of step of challenging management through proxy votes in areas of social responsibility. Investors have indicated that they would use environmental data in investing decisions. In the pulp and paper industry, an association has been shown to exist between good pollution control records and some

indicators of economic well being.

In no case, however, have environmental disclosures been studied in terms of capital market reaction. This research will examine whether the environmental disclosures required by the SEC were associated with statistically significant differences in trading volume. The following chapter will detail the development of SEC environmental disclosure requirements. Chapter three will explain the test procedure, and Chapter four will elaborate on the selection of a sample for testing. Results will be presented in Chapter five.

CHAPTER II

SECURITIES AND EXCHANGE COMMISSION

Background of SEC Requirements

The SEC has not been a compelling advocate for requiring environmental disclosures on registrants' reports. In June of 1971, speaking before the American Society of Corporate Secretaries in Los Angeles, Chairman William J. Casey said:

> I am going to have trouble justifying in my mind diverting our scarce SEC manpower from its statutory obligation to protect investors to kibitzing on the statutory obligation of other agencies to protect the environment. While I believe that management must look ahead and adopt its policies to the needs of the future, I take a dim view of efforts to force a corporation into new directions on a piece by piece application of social theory.
>
> I have serious doubts about shareholder proposals, which if carried, would force the investment of a single minority shareholder to be applied in a way which would not have the primary purpose of solid, long term economic benefit impliedly promised when he purchased his shares.[1]

In formulating requirements for reporting environmental items to the SEC, the Commission was reacting to two external pressures. They were pressures brought by environmentalists, which included court action, and the requirements of the National Environmental Policy Act of 1969 (NEPA). NEPA

---

[1] Securities and Exchange Commission News Digest, Issue 71-117, June 17, 1971.

mandated all federal agencies to include environmental responsibility among their areas of accountability. In this aspect the act was unique. The SEC responded by attempting to correlate environmental considerations with shareholder needs for economic enhancement. Accordingly, the SEC has restricted itself to requiring environmental disclosures which are essentially economic in nature.

Prior to any official statements by the Commission, The Natural Resources Defense Council, Inc., and the Project on Corporate Responsibility had requested the Commission to alter its reporting, registration, and proxy forms to include disclosures about environmental and civil rights matters. After the 1971 release discussed below, the SEC informed the petitioners that it was denying their request in order to study the disclosures it required with the 1971 release. The petitioners were not satisfied with the SEC's response, and the court action has been almost continuous since then. As the result of the court action many public hearings have been held, and environmental disclosure proposals have been made and withdrawn. Essentially the SEC requirements have not changed since the 1971 release which was incorporated into reporting forms in 1973. The next section reviews the SEC releases on environmental disclosure.

SEC Environmental Pronouncements

The SEC first entered the environmental field with a speech made to the New York Financial Writers Association by Chairman William J. Casey on June 7, 1971. Discussing disclosures a company would be required to make in light of increasing public concern about the environment Mr. Casey said:

> We will require disclosure of any material litigation against a user under the various air, water and other antipollution laws. More than that, in the examination of filings made with the Commission, we will look to the nature and character of the business to see if significant capital outlays are likely to be required in order to eliminate pollution of streams or atmosphere or if significant product redesign seems likely to be called for to meet anti-pollution standards. The same kind of inquiry will be made with respect to the impact of safety standards on a company's product line.[2]

The first Securities Act Release (SAR 5170) on environmental disclosures was issued on July 19, 1971. (See Table 2-1.) This initial response to growing public concern about pollution defined the Commission's views on its role in environmental report requirements as being essentially economic in nature. This release added to the requirements for describing a registrant's business. It required the disclosure of compliance with statutory requirements concerning environmental quality which 1) may necessitate significant capital outlays, 2) may materially affect the

---

[2] Securities and Exchange Commission News Digest, Issue 71-110, June 8, 1971.

TABLE 2-1

Chronological List of Securities Act Releases (SARs) on Environmental Disclosures

July 19, 1971 SAR 5170
Required registrants to disclose effects of compliance with statutory requirements respecting environmental quality.

February 16, 1972 SAR 5235
Proposed amendments to reporting forms incorporating disclosure of effects of compliance with statutory requirements respecting environmental quality.

April 20, 1973 SAR 5386
Adoption of amendments to reporting forms incorporating disclosure of effects of compliance with statutory requirements respecting environmental quality.

February 11, 1975 SAR 5569
Notice of proceedings for possible expansion of environmental disclosure requirements.

April 4, 1975 SAR 5577
Supplemental information regarding proceedings for possible expansion of environmental disclosure requirements.

October 14, 1975 SAR 5627
Notice of Commission conclusions and rule-making proposal for listing of reports of noncompliance with environmental protection statutes.

December 10, 1975 SAR 5653
Supplemental information regarding request for public comment on proposed listing rule.

May 6, 1976 SAR 5704
Proposed listing of noncompliance reports withdrawn.

May 18, 1976 SAR 5707
Solicitation of public comments by Advisory Committee on Corporate Disclosure, issues include SEC requirements on information regarding environmental matters.

February 15, 1978 SAR 5906
Preliminary response of the Commission to the recommendations of the Advisory Committee on Corporate Disclosures - no new environmental disclosures needed.

earning power of the business, or 3) cause material changes in the registrant's business done or intended to be done. Legal proceedings enforcing environmental laws pending or known to be contemplated and certain matters involving civil rights also had to be disclosed. The requirement for disclosure of legal proceedings was nothing new, and neither it nor the civil rights matters are pertinent to this research.

SAR 5170 was issued as a clarification or interpretation of existing requirements, and not as an amendment. Therefore, it went into effect immediately and should have been incorporated in 1971 10-K reports. However, there was no general reporting of environmental matters as the result of this release. A few companies responded in various locations on Form 10-K, e.g. under item 1 description of business, or item 5 legal proceedings. However most firms made no mention whatsoever of compliance with statutory requirements. Noting the lack of response, and still feeling the pressures discussed above, in February of 1972 the Commission began correcting the deficiencies of the earlier release.

SAR 5235, released on February 16, 1972, proposed amendments to forms filed with the Commission which would formalize the requirements of SAR 5170. The forms to be affected were Securities Act Forms S-1, S-7, and S-9 and Exchange Act Forms 10, 10-K and 8-K. The proposal would require disclosure of the effect of federal, state, and

local environmental protection laws and regulations upon capital expenditures, earnings and competitive position. Views and comments on the proposed amendments were required on or before March 28, 1972.

On April 20, 1973 with SAR 5386 the Commission formally adopted amendments to its reporting forms S-1, S-7, S-9, 10, 10-K and 8-K that would in the opinion of the Commission jointly promote investor protection and the purposes of NEPA. The amendments involved both legal proceedings and the description of a registrant's business. This research is only concerned with the description of business portion. The legal proceedings disclosure requirement was not essentially new, since the SEC already required disclosure of material legal proceedings on 8-Ks. The business description amendment for the 10-K was:

> VIII. Item 1(b) of Form 10-K is amended by adding thereto a new paragraph reading as follows:
>
> > (7) The material effects that compliance with Federal, State and local provisions which have been enacted or adopted regulating the discharge of materials into the environment, or otherwise relating to the protection of the environment, may have upon the capital expenditures, earnings and competitive position of the registrant and its subsidiaries.

The description of business part of the amendments was the same for all forms. Form 10-K was specifically shown since it is required annually and in most cases represented the first report from a registrant encompassing

the environmental disclosures. The amendments were effective for reports and registration statements filed on or after July 3, 1973. Therefore, the first 10-K reports affected for calendar year firms were those for the year ended on December 31, 1973. (See Figure 2-1.) The requirement specified was obviously economic and, therefore was in keeping with the SEC's avowed purpose of incorporating environmental considerations required under NEPA with the Commission's primary responsibility of providing information which they perceive as being useful to shareholders concerned about economic well-being.

On December 9, 1974 Judge Charles R. Richey ruled in Natural Resources Defense Council, Inc. versus Securities and Exchange Commission[3] that the Commission should resolve two issues. The first was the extent of investor interest in issues of a social nature, including environmental considerations. The second was what avenues are available to investors who seek to eliminate practices that are detrimental to the environment and equal employment opportunity. Judge Richey also charged the SEC not to limit itself to these two questions, but to use its expertise in attacking the social issues question.

The Commission responded to Judge Richey's order on February 11, 1975 when it, somewhat reluctantly,[4] issued

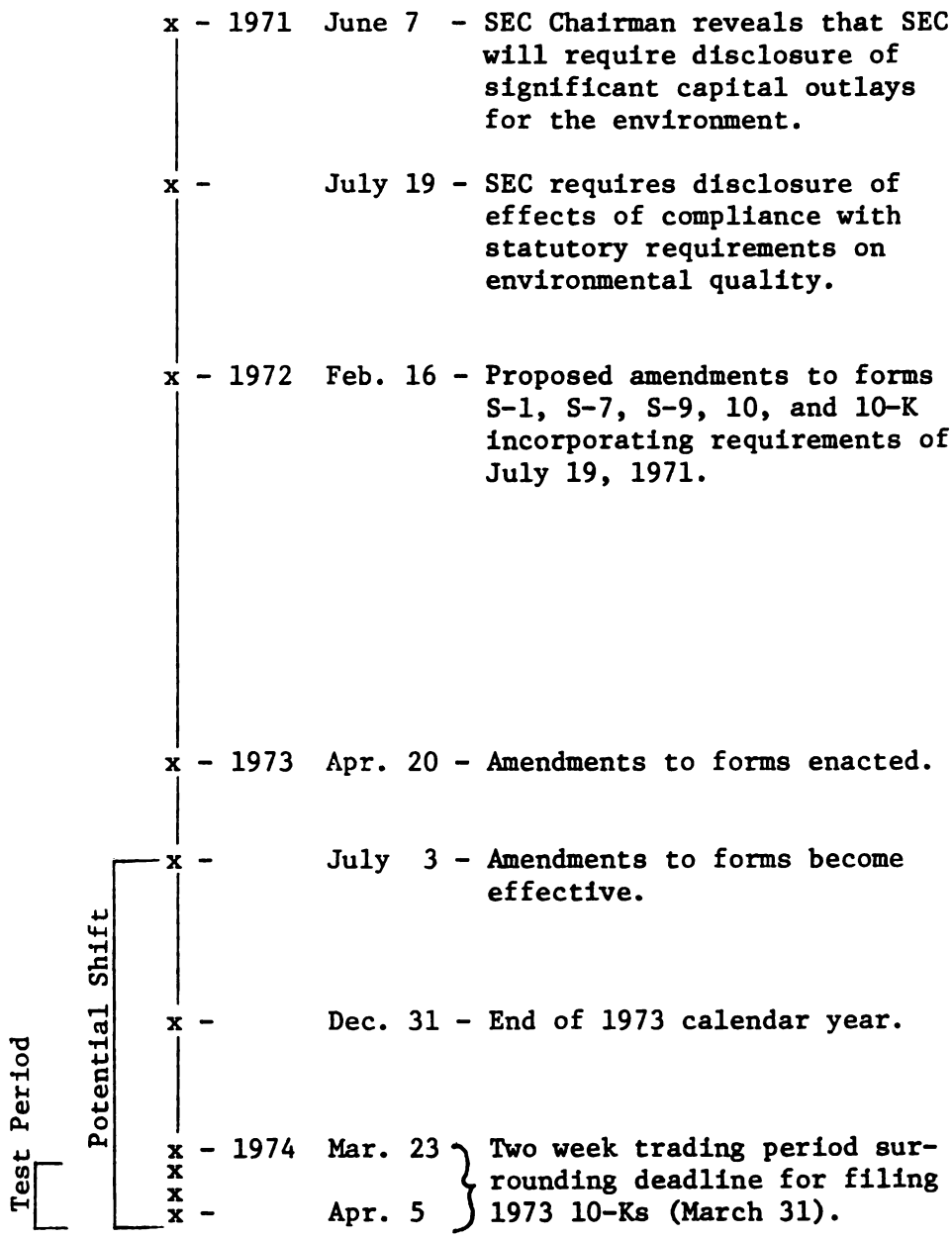
---

[3]Natural Resources Defense Council, Inc., et al., v. Securities and Exchange Commission, et al., No. 409-73 (D.D.C., December 9, 1974).

[4]Judge Richey ordered the Commission to take further rulemaking action in conformity with the procedural

FIGURE 2-1

Time Continuum of Critical Events in the Development of SEC Ecological Reporting



SAR 5569 announcing public proceedings regarding possible disclosure in filings made with the SEC of corporate environmental practices and other social, rather than financial matters. The Commission was interested in comments from interested persons regarding possible modification of its disclosure requirements in light of NEPA, and with regard to equal employment practices and other matters of social significance. Written comments were to be submitted prior to May 14, 1975 and public hearings were scheduled to begin on April 14, 1975. The Release included a statement of existing reporting requirements and listed the following possible additional requirements.

> (1) the nature and extent, quantified to the degree feasible, of the resulting environmental pollution or injury to natural resources;
>
> (2) the feasibility of reducing such pollution or injury under existing technology, including a description of alternatives and the cost of each;
>
> (3) the prospects for improving that technology;

---

requirements of the Administrative Procedure Act, which he found had not been fully complied with when the Commission's forms were amended on April 20, 1973, pursuant to NEPA. While the Commission does not agree with Judge Richey that it did not satisfy the procedural requirements of the Administrative Procedure Act, it is herewith attempting fully to comply with his order.

"The fact that the Commission is conducting these proceedings should not be taken to indicate any view as to its authority to assist members of the investing public in matters of primarily social rather than financial concern." Securities and Exchange Commission, Securities Act of 1933 Release No. 5569, Securities Exchange Act of 1934 Release No. 11236, February 11, 1975, footnote two.

> (4) existing and projected expenditures for reducing such pollution or injury;
>
> (5) legal requirements affecting the impact of the registrant's activities on the environment, including requirements for licenses and permits and outstanding court or administrative orders; and
>
> (6) pending or threatened judicial or agency proceedings, whether initiated by private or governmental bodies, challenging registrant's compliance with environmental protection standards.
>
> It has further been proposed that the Commission require disclosure concerning whether a registrant has changed its products, projects, production methods, policies, investments or advertising to advance environmental values and a general statement of the registrant's policy towards environmental issues and concerns.

In SAR 5577 dated April 4, 1975 the Commission announced that a limited number of copies of SAR 5569 would be available, upon request, to groups or organizations whose membership might be interested in commenting on the matters contained therein.

The SEC's conclusions on the public hearings and further rulemaking proposals were announced in SAR 5627 issued on October 14, 1975. The release was a fairly long one in which the Commission explained the basis for its conclusions. The SEC stated that its statutory obligation under the '33 and '34 Acts was to provide for the protection of investors:

> Specifically, insofar as is relevant here, the Commission may require disclosure by registrants under the Securities Act and the Securities Exchange Act if it believes that the information would be necessary or appropriate for the protection of investors or the furtherance of fair, orderly and informed securities markets or for fair opportunity for corporate suffrage. Although disclosure requirements may

> have some indirect effect on corporate conduct, the Commission may not require disclosure solely for this purpose.[5]

The release then discussed the relation of NEPA to the SEC's primary statutory obligation:

> NEPA is unique in that Congress, in this single enactment, supplemented the mandate of all federal agencies to include consideration of environmental values within agency responsibility.[6]
>
> NEPA's effect on the Commission's authority to require disclosure appears to turn on the meaning of Section 102(1), which requires the Commission "to the fullest extent possible" to interpret and administer the federal securities laws "in accordance with the policies set forth in (NEPA)."
> ...We believe that ... Section 102(1) was intended to permit and require agencies such as this Commission to consider environmental values in the performance of the functions authorized under their organic statutes.[7]

The release then explains the reasons why the various alternatives for environmental reporting were rejected. The only alternative accepted was a requirement for a registrant to provide a list of its most recently filed environmental compliance reports which indicate that the registrant has not satisfied within the last twelve months environmental standards established by federal statute. In addition, the proposed amendments would require registrants to provide investors copies of the reports for a reasonable

---

[5]SAR 5627, Section II(B).

[6]SAR 5627, Section III(A).

[7]SAR 5627, Section III(B).

fee upon written request. Also proposed was a requirement for registrants to estimate and disclose capital expenditures for environmental control purposes for at least the remaining portion of the current year and the succeeding year.

In SAR 5653 on December 10, 1975 the Commission announced that it would not extend the comment deadline for the proposals given in SAR 5627 beyond the announced January 12, 1976 date. There followed SAR 5704 on May 6, 1976 in which the Commission rejected the proposed listing amendment and accepted the amendment calling for disclosure of material estimated capital expenditures for environmental control facilities for the remainder of the current fiscal year and the succeeding fiscal year, and any further periods deemed material. The effective date was July 1, 1976. While the specification of estimates of future expenditures was new, the reporting of them had in many cases been done before. (See disclosure examples, Chapter IV.)

SAR's 5707 and 5906 issued on May 18, 1976 and February 15, 1978 respectively deal with proceedings and recommendations of the Advisory Committee on Corporate Disclosure which included on its agenda the disclosure of environmental matters. The Commission proposed no new environmental disclosure requirements as the result of the work of the Committee.

Disclosure Requirements & the Research Question

The SEC has claimed that investors are interested in economic data for investing decisions. One result of a growing public interest in environmental matters was NEPA. NEPA increased pressure on the Commission for environmental disclosures in financial statements. Accordingly, the SEC required registrants to disclose the effects of compliance with federal, state and local statutory requirements respecting environmental quality on capital expenditures, earnings and competitive position. This requirement was first made on July 19, 1971 and should have been reported in 10-Ks for 1971. Noting a lack of response, the SEC formalized the requirement into an amendment of reporting forms effective July 3, 1973. The requirements have been challenged by environmentalists hoping to get the SEC to enlarge its environmental disclosures.

This has led to two questions. Do the economic environmental disclosures required by the SEC in SARs 5170 and 5386 have informational value as recognized by investor reaction to the signals? Would additional environmental disclosures, which may or may not be economic in nature, be useful to investors in the capital market? This research addresses the first question and not the second.

The time frame for testing was selected as the two week period surrounding the deadline for receipt of the 1973 10-K reports. (See Figure 2-1.) Receipt of 1973 10-Ks was the critical event for testing since 1973 10-Ks

represent the largest single block of initial responses to the SEC requirement. Most 10-Ks are received by the SEC within one or two days of the filing deadline. The reports are available for public inspection within three days of receipt. Thus a two week period surrounding the filing deadline would be sufficient to make any data in the reports available to the public through the SEC. Many people check through SEC material and data is disseminated from the Commission files:

> Each year, many thousands of requests for copies of and information from the public files of the Commission are received by the Public Reference Section in Washington, D.C. During the 1970 fiscal year, 12,496 persons examined material on file in Washington and several thousand others examined files in the New York, Chicago, and other regional offices. More than 31,424 searches were made for information requested by individuals and approximately 13,320 letters were written with respect to information requested.[8]

It would not be necessary for every investor to inspect the files in order to get the data, as large brokers frequently have people check the files and pass the findings on to customers. The data can also be made available to the public directly from the firms filing the reports. Once the report is prepared and sent to the SEC, where it becomes public information, many firms will supply directly the data contained in the filing. The exact form of the test and data collecting technique will be explained in the next chapters.

---

[8]Securities and Exchange Commission, Securities and Exchange Commission Annual Report: 1970.

CHAPTER III

TEST DESIGN

Test Variable

The purpose of this research, as previously stated, is to examine the relevance of environmental disclosures in financial statements to individual participants in the capital market. To the extent environmental disclosures alter expectations of future cash flows, the disclosures are of interest to the market in general. The market, in aggregate, may perceive informational content in data that individual investors do not. Likewise, a piece of data might be informative to some individual investors, and informational neutral to the market in aggregate. The SEC's required environmental disclosures are economic in nature and may alter expectations about future cash flows of the firms making the disclosures. Individual investors may perceive informational content in the environmental disclosures for that reason. The SEC's required environmental disclosures may also be informative to the extent that they reveal firm behavior with regard to protecting the environment. The degree of the effect on the firm of complaince with statutes for protecting the environment may indirectly reveal some aspect of how much the firm

was damaging the environment. To this extent the disclosures are important to investors who are concerned with environmental protection in addition to maximizing expected future cash flows.

This research focuses on individual reactions in the stock market. These reactions could be caused by the economic or social aspect of the SEC disclosures. Since this research is checking for a reaction, and not isolating reasons for a reaction, the actual motive behind the informative nature of the disclosure is not critical. Individual reactions include persuasion, proxy actions and trading decisions. (See Chapter one.) Of these, trading decisions are the easiest to test, since they affect market volume:

> An important distinction between the price and volume tests is that the former reflects changes in the expectations of the market as a whole while the latter reflects changes in the expectations of individual investors. A piece of information may be neutral in the sense of not changing the expectations of the market as a whole but it may greatly alter the expectations of individuals. In this situation, there would be no price reaction, but there would be shifts in portfolio positions reflected in the volume.[1]

Since this study focuses on individual reactions a volume statistic will be employed. Although not as prevalent as price or beta studies there have been some market based studies performed using volume data. William H.

---

[1]William H. Beaver, "The Information Content of Annual Earnings Announcements," Empirical Research in Accounting: Selected Studies 1968, pp. 69-70.

Beaver published a study using volume as a variable in the 1968 supplement to the Journal of Accounting Research (JAR).[2] This was followed by a publication by Jack Kiger in the JAR in 1972,[3] and one by George Foster in 1973, also in the JAR.[4] These three studies are reviewed below.

Previous Volume Studies

Beaver tested annual earnings announcements for informational content. He used weekly data with the week the earnings announcement was made in the Wall Street Journal (WSJ) as the test week. Beaver's test was positive. He checked to see if investors reacted to the annual earnings announcements made in the WSJ. He did not attempt a normative test, which requires the specification of a model for the expectations of investors and testing to see if the model properly specifies actual investor actions.

Data for Beaver's study was collected for the years 1961 through 1965 inclusive. There were six criteria a firm had to meet in order to be included in the research. (1) The firm had to be included on the Compustat tapes. (2) The firm had to be a member of the New York Stock

---

[2]Beaver, pp. 67-92.

[3]Jack E. Kiger, "An Empirical Investigation of NYSE Volume and Price Reactions to the Announcement of Quarterly Earnings," Journal of Accounting Research, 10, No. 1 (Spring 1972), pp. 113-128.

[4]George Foster, "Stock Market Reaction to Estimates of Earnings per Share by Company Officials," Journal of Accounting Research, 11, No. 1 (Spring 1973), pp. 25-37.

Exchange (NYSE). These two criteria were for ease of data gathering. (3) The firm had to have a fiscal year different than the calendar year. This was done to avoid a clustering of announcement dates since Beaver was interested in cross-sectional analysis, and Compustat firms are 67% calendar year firms. (4) No firm with a dividend announcement in the week of the earnings announcement was included. Also, (5) no firm which announced a stock split during the seventeen week period surrounding the earnings announcement date was included. Without these two exclusions there would have been alternative explanations for any observed reactions in the market. Beaver ran a pilot study without excluding dividend announcements and found the volume reaction to be approximately double what it was when the announcement firms were excluded. The seventeen weeks was the period surrounding the earnings announcement dates for which market data was gathered and tested. Finally, (6) only firms with less than twenty news items a year in the WSJ were included in the study. This was done to reduce noise. Since the study compared volume traded in the seventeen weeks surrounding the earnings announcement with volume traded in the week of the earnings announcement, other news items announced in the surrounding seventeen weeks served only to impair the test. Obviously criterion six was a compromise between eliminating too many firms from the sample to conduct a meaningful test and maintaining internal validity.

The net result of this sampling procedure was 143 firms

and 506 annual earnings announcements. A firm only needed to satisfy the criteria for one year in order to be included in the sample, therefore not every firm in the sample was included in each of the years 1961 through 1965. The volume variables used in the study were:

$$V_{it} = \frac{\text{no. of shares of firm i traded in week t}}{\text{no. of shares outstanding for firm i in week t}} \times \frac{1}{\text{no. of trading days in week t}}$$

$$V_{Mt} = \frac{\text{no. of shares traded for all NYSE firms in week t}}{\text{no. of shares outstanding for all NYSE firms in week t}} \times \frac{1}{\text{no. of trading days in week t}}$$

V_{it} is the weekly average of the daily percentage of shares traded, and V_{Mt} is an index reflecting the level of volume for all NYSE firms. The data was first analyzed unadjusted for market influences. For each of the 506 annual earnings announcements V_{it} was computed seventeen times - once for the week of the actual announcement in the WSJ, and once for each of the eight weeks on each side of the announcement week. These figures were then averaged across announcements for the seventeen weeks resulting in seventeen data points. Analysis of these data points revealed that mean volume during the week of the announcement was 33% greater than mean volume for the other sixteen weeks in the study. It also constituted by far the largest

value observed during the entire seventeen weeks. Furthermore the upward shift in volume was very dramatic, with almost all of the above normal activity occurring in the week of the announcement. This was taken as evidence that the annual earnings announcement had informational content without the use of any statistical test.

The analysis was then repeated, adjusted for market influences. Market wide influences were removed using a linear regression model:

$$V_{it} = a_i + b_i V_{Mt} + e_{it}$$

The estimates of a_i and b_i were made from observations from the nonannouncement weeks using ordinary least squares. The average correlation coefficient was low, with a positive sign for 139 of the firms and negative for only 4 firms. This suggests that although the relation is significantly different from zero, the magnitude is quite small. As expected from the minuteness of the market-wide effects, the analysis was almost identical to the analysis unadjusted for market influences. The mean volume during the announcement week was approximately 30% greater than the mean volume for the other sixteen weeks in the study. It was by far the largest value observed, with almost all of the above normal activity occurring in the week of the announcement. Again, this sudden strong change in volume activity was taken as evidence for the informational content of the annual earnings announcement without any statistical testing.

The main problems with the Beaver study were that he did not do any statistical testing and did not employ a control group. The study did make use of control periods - the eight weeks on either side of the announcement week. With cross-sectional data the need for a control group is reduced since there is no one point in time being tested for volume shifts. Still the use of a control group would add strength to the results. The lack of statistical testing means one cannot tell to what extent the observed shift in volume can be attributed to mere chance.

Jack Kiger's study was concerned with the informational content of quarterly earnings announcements. In order to be included in the study a firm had to be a member of the NYSE and had to have reported quarterly earnings for the years 1966 through 1969. Also excluded were firms with stock split, dividend, or other news announcements near the date of the interim report. These exclusions allowed Kiger to more effectively isolate the cause of any shift in volume his study ascertained. The exclusion of firms with other news items revealed near the date of the interim report, like Beaver's exclusion of firms with twenty or more news items in the year, tended to remove some of the more prominent or larger NYSE firms from the sample.

In order to minimize the potential for information leaks actual inclusion in the sample in any period was based on the proximity of the date of the announcement of interim earnings to the close of the accounting period.

Firms were selected from the earliest five day period in WSJ listings after the close of the quarter during which thirty companies met all of the requirements for inclusion in the study. This had a twofold effect. First, the sample for each quarter studied was different. The samples were not completely independent since the factors which resulted in a firm being in the five day period at the end of one quarter could very well repeat in other quarters. Nevertheless, although there was some repetition, the quarterly samples were not comprised of the same firms. Second, although Kiger does not tell in the article, it is quite likely that the time lag between the end of the accounting period and the period of the earnings announcements is not the same for each quarter being tested. The actual quarters tested were the second and third quarters of 1968 and the second and third quarters of 1969. No reason was given for the choice of quarters for the tests.

Two measures were made for testing in the study - (1) average adjusted trading volume for three days, with the middle day being the day the earnings announcement was made in the WSJ; (2) average adjusted trading volume for five days, again centered around the date the earnings announcement was made in the WSJ. The adjustment made to the data were two. First, block shares of over twenty thousand that were traded were removed from the data. This was done on the premise that block trades were probably planned prior to the release of the earnings

announcement and did not accurately reflect trading decisions made at the time of the release. Second the data were adjusted by a market index designed to remove general market movements. The market index was constructed by dividing total trading volume of the NYSE on the first day of the month in which the analysis was made by total market sales on each day during the period of analysis. As a control period Kiger used average adjusted trading volume for the same firms in the five day period beginning eight days prior to the announcement of the interim earnings.

Two statistical tests were used to evaluate the data, the sign test and the Wilcoxon's Matched-Pairs Signed-Rank Test. Each test was run twice, comparing the control period average adjusted trading volume with average adjusted trading volume for the three day test period and the five day test period. This was done for the second and third quarters of 1968, the second and third quarters of 1969, and the total of all four of the above quarters.

With an alpha of .10, results of the sign test were identical for both the three day and the five day test period. There were statistically significant differences in the control period and the test period in the second quarter of '68, the second quarter of '69, and the total. With the same alpha level, the Wilcoxon results showed significance for all but the third quarter of '69 on the three day test period, and all except the third quarter of '68 using the five day test period. Although the

results were mixed, they tended to substantiate that quarterly earnings announcements did contain informational content for investors.

The obvious improvement of the Kiger study over the Beaver study was the use of statistical testing. The tests showed only partial significance, while the raw data indicated volume differences between the control and the test period every time. Like Beaver, Kiger did not employ a control group. Since his data were temporal, the omission of a control group is a fair criticism. Any event contiguous with the earnings announcements could just as validly be credited with imparting the information on which the investors acted. Multiple testing such as Kiger employed would tend to reduce the possible competing hypotheses, but would not eliminate them entirely.

George Foster studied stock market reaction to estimates of earnings per share (EPS) which were made by company officials. In order to study investor reaction Foster sought out firms where estimates of EPS were made by a company official after the end of the fiscal year, and before the release of either preliminary earnings announcements or audited earnings. Initially he used the WSJ index for the years 1968 through 1970 to identify firms which had a company official make an estimate of EPS before the release of preliminary earnings announcements.

Once identified in the WSJ index a firm had to meet four criteria in order to actually be included in the

sample. (1) The firm had to have a calendar year basis for reporting. (2) The firm had to be included on the CRSP tape. These first two criteria were for ease of data gathering. (3) The firm could not have made a dividend announcement in the week the EPS estimate was made or the week of the preliminary earnings announcement. Nor was the firm allowed to have a stock split announcement in either the EPS estimate week or the preliminary earnings announcement week, or any of the sixteen weeks surrounding the week of either announcement. This was to maintain the integrity of the event being tested since both dividend and stock split announcements could cause a volume reaction. (4) The estimate of EPS had to be precise and had to be made by a company official. Again, this was to insure a concise specification of what was actually being tested. With this criterion broad range estimates and estimates made unofficially or by people without inside access to financial records were eliminated.

This selection process resulted in a sample of sixty-eight firms. Usually the company official making the EPS estimate was either the president or the chairman. For a control group, Foster selected the next firm in the WSJ index after a sample firm to satisfy criteria one through three. The variable used was:

$$V_{it} = \frac{\text{number of shares in firm i traded in week t}}{\text{number of shares outstanding for firm i in week t}} \times \frac{1}{\text{number of trading days in week t}}$$

V_{it} was then computed for each of seventeen weeks, the week of the announcement (either EPS estimate or preliminary earnings), defined as week zero, and the eight weeks on either side of week zero. For the test group this procedure was followed twice, first with the week of the EPS estimate as week zero, and then with the week of the preliminary earnings announcement as week zero. Since there was no EPS estimate for the control group, V_{it} was only computed surrounding the week of the preliminary earnings announcement for the control group.

A review of the raw data showed the greatest average V_{it} for any of the seventeen week periods to be in week zero in all three cases. In addition, for the test group, average weekly V_{it} was greater in week zero of the EPS announcement than it was in week zero of the preliminary earnings announcement. Since EPS was announced before preliminary earnings this showed that market reaction was greatest associated with the earliest announcement. A Kolmogorov-Smirnov One Sample Test was then used. For the control group the test showed statistically significant differences in average weekly volume between week zero and the other sixteen weeks at an alpha level of .01. For the test group differences between zero week and the other weeks showed up at an alpha of .01 for the EPS estimate week, but only at an alpha of .20 for the preliminary earnings announcement week. As with the raw data, the tests indicated reaction to both announcements, but the

reaction was stronger for the earliest announcement (the EPS estimate) when there were two announcements. This was interpreted as showing that EPS estimates by company officials had informational content for individual participants in the capital market.

Foster's study, like Beaver's, centered around a zero week which was not the same for all firms. He also used control periods around the announcement week, and checked for increased volume in week zero as compared to the other weeks. Like Kiger, he used statistical testing to see if the volume change was likely to be due to chance. Foster also incorporated a control group into his methodology and found that for the test group the change in volume during the later preliminary earnings announcement week was less significant than for the control group, presumably because investors in part acquired some of the information received in a preliminary earnings announcement in the estimate of EPS. Two things done previously were not repeated in Foster's study. Unlike either of the two previous works general market trends were not removed from the data. This is not surprising since general trends were not shown to be significant. Large block trades were not removed from the data in this study as they were in Kiger's. Although no reason was given for not removing the large blocks, one can speculate that Foster did not accept Kiger's premise that large block trades were likely to be planned in advance and hence not reflect reactions to information received in

association with the trading date.

The three studies had commonalities. First they all examined some aspect of earnings. This feature does not carry over into this study. The three studies also eliminated from consideration firms which announced stock splits or dividends during the time frame under consideration. This was done because the dividend and stock split announcements cause increased trading and would therefore impair the internal validity of the research. These exclusions obviously apply to this research as well. Additional considerations revealed in one or more of these three papers concern control periods, which all three employed, a control group, used only by Foster, and statistical testing, used by both Kiger and Foster.

Test Design

Specific Volume Variable

In all of the above tests the volume variable was computed over a period not to exceed one week or five trading days. This is consistent with the EMH, which states that the capital market reacts instantaneously and in an unbiased fashion to any new information.[5] In this case, however, it

---

[5]Kiger comments that the adjustment is in fact not instaneous "...Lengthening the time period had little effect on the findings, which suggests that without regard to price changes, instantaneous adjustment does not occur with respect to individual investors. In fact, the slight difference between the two measures of trading volume suggests that increased trading volume may occur for a period of time longer than the two days following the announcement of quarterly earnings." Kiger, p. 123.

is not possible to isolate the week of the environmental disclosure release from the SEC reporting requirements, and a two week period had to be utilized. The two week period was used because most 10-Ks were received by the SEC in the two week period surrounding the filing deadline, which came on the weekend for both 1972 and 1973 reports. In the cited studies the item of interest was a form of earnings announcement. In this research a disclosure made in conjunction with an earnings announcement is being tested. For this reason a volume reaction can be expected during the period of the disclosure as the result of the earnings release. To the extent the SEC's required environmental disclosures alter expectations about future cash flows they are of interest to the capital market in general. Additionally, the information the disclosures reveal about firm behavior with regard to protecting the environment will be of interest to a subset of investors, the ecology conscious investors. For these reasons the volume variable used is a change variable from one year to the corresponding period of the next year. This should allow a smaller absolute change in volume associated with the SEC environmental disclosure to be statistically manifested. It should also tend to cancel out volume effects associated with any announcements made in both of the two years, e.g. the earnings announcement. The variable is computed as follows:

$$(1)\quad v^{*}_{i,j,y} = \frac{\text{no. of shares of firm i traded in two week period j in year y}}{\text{no. of shares outstanding for firm i in two week period j in year y}} \times \frac{1}{\text{no. of trading days in two week period j in year y}}$$

Where "j" varies among -1, 0, and 1, with two week period 0 being the period surrounding the filing deadline for Form 10-K, and periods -1 and 1, respectively, being the two week period before period 0 and the two week period immediately after period 0. Year y will be either 1973, or 1974 corresponding to SEC filings of data for 1972 and 1973 respectively. The change variable is:

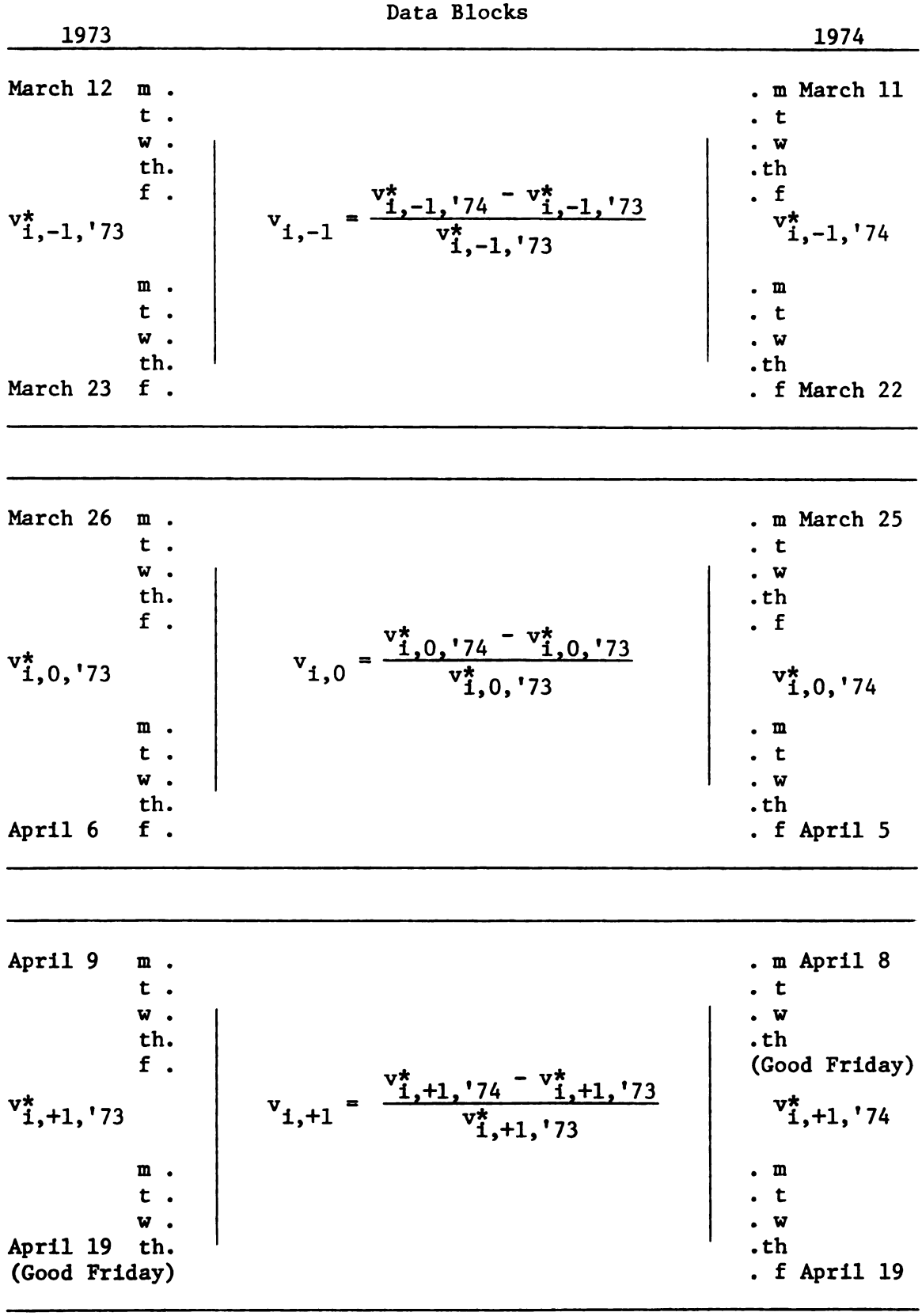
$$(2)\quad v_{i,j} = \frac{v_{i,j,\,1974} - v^{*}_{i,j,1973}}{v^{*}_{i,j,1973}}$$

v_{ij} thus represents the percentage change in the daily percentage of shares traded from the corresponding period in the previous year. As Good Friday falls in the third week in April in 1973, and in the second week in April in 1974, periods -1 and 0 have 10 trading days in both years and period 1 has nine. (See Figure 3-1.)

Block trades of twenty or more shares are not eliminated from the data as they were in Kiger's study. Kiger's basis for removal of the large block trades was that he felt they represented decisions made prior to the trade, and therefore prior to the receipt of any information contiguous to the trade. However, in Kiger's case he was

FIGURE 3

Data Blocks



working with test periods of as short as three days. Foster did not repeat Kiger's procedure and he used weekly trading with a minimum of four trading days if there was a holiday. In this study two week periods are used with a minimum of nine trading days in any period. Thus some of the basis for the exclusion of block trades is not present even if one accepts the basic premise that block trades are planned in advance. Furthermore, it seems illogical to assert that the market reacts instantaneously to any new information (EMH) and from this assertion test for a change in volume associated with the release of data to determine if the data signal has informational content; and then to eliminate a portion of the market's volume activity on the basis that it represents a delayed reaction. In addition many potential users of environmental data are organizations, like the Church of Christ, and large organizations are likely to deal in large blocks. Thus if large block trades were eliminated a valuable portion of the market reaction might be removed from the study.

Test

In the following chapter on sample selection the procedure for isolating the environmental disclosure from other disclosures that might lead to a volume reaction will be amplified. The sample selection leads to three distinct groups:

1. Those firms which reported the effects of compliance with environment protection statutes prior to 1972.

2. Those firms which reported the effects of compliance with environment protection statutes beginning with 1973 10-Ks.

3. Those firms which made no disclosure of the effects of compliance with environment protection statutes through 1973 reports.

Group two is the group of interest, or the test group. Groups one and three are control groups. The three groups will be tested over three periods, the test period (period 0) which is the two week period surrounding receipt of the 10-K by the SEC, and both of the two week periods on either side of the test period (periods -1 and 1), which will serve as control periods. Period -1 will be tested first to determine if there is any difference in the three sample groups in the percentage change in the daily percentage of shares traded from the two week period prior to the receipt of the Form 10-Ks from 1972 to 1973. Due to the speed of volume responses ascertained in previous studies no significant differences are anticipated for this time frame. The same test will then be run for periods 0 and 1. If the tests are able to pick up differences in the random variable, it is expected, a priori, that these differences will exist only in the two week period surrounding receipt of the forms by the SEC.

The nonparametric Kruskal-Wallis Test is employed in this study. This test uses a ranking over the sample variables in the period being tested. The smallest value in each period is assigned the rank of 1, and rankings continue all the way to N, the total number of variables being

ranked, which in this case is equal to the total number of firms in the study. Average ranks are assigned to ties, but since the variable being ranked is continuous from minus one to plus infinity ties are not expected to be a factor. The test statistic is computed as follows:

$$R_k = \Sigma_i \; R(v_{i,j,k})$$

Where "k" refers to the sample group (one, two, or three), and $R(v_{i,j,k})$ is the rank assigned to $v_{i,j,k}$

It follows that R_k is the sum of the ranks assigned to group k. The test statistic is:

$$T = \frac{12}{N\ (N+1)} \quad \Sigma_k \; \frac{R_k^2}{n_k} \; - 3\ (N+1)$$

Where n_k refers to the number of firms in group k.

$T \sim \chi^2_{K-1}$ (T approximates a chi-square distribution with K-1, in this case, two, degrees of freedom.)

The hypotheses to be tested are:

$H_0 : E(\bar{R}_1) = E(\bar{R}_2) = E(\bar{R}_3)$

$H_1 : -(E(\bar{R}_1) = E(\bar{R}_2) = E(\bar{R}_3))$

Assumptions:

1. The samples are independent.
2. The random variables are continuous (some ties are allowed).
3. The measurement scale is at least ordinal.

The null hypothesis simply states that the average ranks of the three groups are expected to be equal, or that all the k population distribution functions are identical. The alternative hypothesis is a denial of the null, at least one of the populations tend to yield larger observations than at least one of the other populations. Obviously, if the null is denied it would be of interest to know which of the groups were not the same. If all three are the same for the two control periods but not the test period, then different interpretations can be made of the results depending on which groups differ, and which groups, if any, do not differ.

The decision rule is to reject H_0 at the level α if T exceeds the $1 - \alpha$ quantile of a chi-square random variable with $K - 1$ degrees of freedom. The chi-square approximation results in a conservative test, meaning that the true level of significance is smaller than the stated level of significance associated with the chi-square distribution. However, the approximation is quite good even if the sample sizes are small.

Should the null hypothesis be rejected, Scheffe´ post hoc comparisons will be employed to isolate where the null failed. The advantage of the Scheffe´ technique is that it accepts unequal cell sizes. Confidence intervals for the technique are constructed as follows. First contrasts of interest are drawn up. The simple contrasts are:

$$W_1 = \bar{R}_1 - \bar{R}_2$$

$$W_2 = \bar{R}_1 - \bar{R}_3$$

$$W_3 = \bar{R}_2 - \bar{R}_3$$

The complex contrasts are:

$$W_4 = \bar{R}_1 - (\tfrac{1}{2}\ (\bar{R}_2 + \bar{R}_3)$$

$$W_5 = \bar{R}_2 - (\tfrac{1}{2}\ (\bar{R}_1 + \bar{R}_3)$$

$$W_6 = \bar{R}_3 - (\tfrac{1}{2}\ (\bar{R}_1 + \bar{R}_2)$$

The actual confidence intervals for the contrasts are:

$$W_i \pm (\chi^2_{K-1}\ (1-\alpha))^{\frac{1}{2}}\ (\mathrm{Var}(W_i))^{\frac{1}{2}}$$

$$\text{Where } \mathrm{Var}(W_i) = \frac{N(N+1)}{12}\ \Sigma_k\ \frac{a_k^2}{n_k}$$

Where "a" is the weight assigned to the mean rank of group k in the contrast.

Ninety percent confidence intervals will be used with the Scheffé technique as needed.

Summary

The signal this research is examining is the reporting of the effects of compliance with environment protection statutes in 1973 10-Ks. If that signal can be associated with statistically significant volume reactions in the capital market, it will be said to possess informational content. The volume variable being tested is the percentage change in the daily percentage of shares traded from

the date of the receipt of the 10-K for 1972 by the SEC to the date of the receipt of the 10-K for 1973 by the SEC. Therefore data will be gathered from both periods. Three groups are segregated for testing. The test group consists of those firms initiating the disclosure in the 1973 10-K. The two control groups are those firms that began the disclosure prior to 1972, and those firms that had not as of 1973 10-Ks made the disclosure.

The test consists of two control periods surrounding the test period when the 10-Ks were received. The actual test is the nonparametric Kruskal-Wallis Test with Scheffe' post hoc ninety percent confidence intervals. The post hoc procedures will isolate the difference which show up in the Kruskal-Wallis Test and facilitate interpretation of the results.

CHAPTER IV

SAMPLE SELECTION

Initial Sample

The objective of the sample selecting process was to isolate a group of firms which made initial disclosures conforming to the SEC requirement for reporting the effects of compliance with environmental quality statutes in a period of time small enough for effective testing. This group would be the test group. Other firms would be designated as control groups. The first control group would be those firms which had previously been reporting the statutory compliance effects. The second control group would be other firms, specifically those which, as of the test period, had not made disclosure of the statutory compliance effects. The problems the SEC had with this disclosure requirement facilitated the sample selecting process. (See Chapter two for a more complete discussion of the SEC requirements.) Securities Act Release No. 5170 in 1971 induced some firms to make the desired disclosures, but many did not. The SEC then altered reporting forms to incorporate the requirement for reporting the effects of compliance with statutes respecting environmental quality. This was done with Securities Act Release No. 5386 on

April 20, 1973. The Form 10-K which is used for annual reports to the SEC is the form on which most firms responding to Release No. 5386 would have made their initial disclosure to the SEC. This would have occurred near the end of March in 1974, with data being reported for the 1973 calendar year. Firms which began reporting in 1971 in response to Release No. 5170 would form the group which began reporting the effects of compliance to statutes for protecting the environment prior to the test period surrounding the end of March in 1974. Subsequent checking of disclosures revealed some firms still did not respond to the disclosure requirement in 10-Ks for 1973, and this group of firms formed the third group for test purposes.

In addition to SEC reports, firms may have made initial disclosure of the effects of compliance with statutes on environmental quality in the annual reports to stockholders. Therefore, it was also necessary to check annual reports in the sample selection. The initial sample was taken from a list of firms surveyed by Accounting Trends & Techniques (ATT) for the years 1969 through 1973. This was done in order to utilize summary data sheets from ATT which identified firms making disclosures. The choice of 1969 as the beginning point for the search of annual reports was arbitrary. 1969 was before the SEC requirement came out, and in the period when ecology maintenance was becoming an area of national interest. The summary data sheets were spot checked against annual reports on hand in the

library. ATT altered their categorization of environmental disclosures in 1971 to more closely correspond to the SEC requirements, and it was found that the summary data sheets for 1969 and 1970 were not useful. At this time the sample was enlarged to include firms surveyed by ATT for the years 1971 through 1973, when the summary data sheets proved useful. There were 364 calendar year firms surveyed by ATT for 1971 through 1973. The annual reports for these firms in 1969 and 1970 were checked individually.

Next micro-fiche copies of annual 10-K reports beginning with the year ending on December 31, 1970 were individually checked for disclosure of the effects on the firm of compliance with statutory requirements concerning environmental quality. 1970 was chosen as the year to begin the search since it represents the year just prior to the initial requirement of environmental statute compliance effect reporting by the SEC. Subsequent analysis revealed that few firms began reporting the effects in 1971. The single year in which the largest number of firms began reporting the effects was 1973. This was the year in which forms were altered to facilitate the reporting. The period when 1973 10-K reports were received was selected as the test period corresponding to the critical event of the SEC's altering forms for environmental statute compliance effect reporting.

Disclosure Samples

It was necessary to categorize disclosures for test purposes. The desired disclosure addressed the effect of compliance with federal, state and local statutes concerning environmental quality. The disclosures made on 10-Ks were more concise than those found in annual reports to stockholders. Some annual report statements on environmental aspects of the company did not directly reveal the effects of environmental statute compliance. For example, occasionally a firm would say in its annual report that it was conducting an environmental study, or that it was forming a committee on environmental matters. Neither of these statements were taken as addressing the compliance effect question.

The 10-K disclosures usually focused on the effects of compliance with environmental statutes. The most frequent form was either a statement of the materiality of the effect on the firm (see 10-K disclosure example no. 2), or an indication of the monetary effect of compliance (see 10-K example 4). A few 10-K disclosures were thrown out as they responded to the requirement by indicating the data requested was not applicable to the firm (10-K examples 1 & 3). There were only two or three of these, and it was felt that they represented a different signal to the market than the other disclosures. For that reason they were not included in the study. Below are examples of disclosures distinguished as to whether they were found in 10-Ks or annual reports to stockholders.

Disclosures from Annual Reports to Stockholders

1) United States Gypsum Company, 1970, p. 15 (Included in the test)

Pollution control involves extensive installations made by U.S.G. at its plants. As early as 1929 the Company began purifying air emissions at its operating locations, and has been correcting water pollution problems for the past years. No U.S.G. plant is built without a thorough study of possible air and water contamination and employing the latest technology available to control emissions.

Experts correlate all anti-pollution activities, meeting with governmental agencies concerned with pollution problems and studying technical advances in equipment. Consulting engineers are employed to develop methods of control and to assist plant managers in administering a stringent program of correction and inspection.

Since 1965, some 45 pollution control installations have been made at U.S.G. plants. The cost of such equipment in the last three years has exceeded $5 million.

A.P. Green Refractories Co. maintains a full-time antipollution department, believed to be the first in the refractories industry. Pollution control equipment is now being engineered or installed in six of Green's manufacturing divisions. Included are electrostatic precipitators, cyclone dust collectors, bag type collectors, wet scrubbers, settling chambers, afterburners and noise abatement equipment. An in-plant dust sampling program is being developed jointly by Green and U.S.G. divisions.

Both U.S.G. and A.P. Green have undertaken positive steps in another aspect of environmental protection - land reclamation of quarry areas following extraction of mineral deposits. By planning reclamation, quarry sites can be restored to a useful and scenic condition.

2) Pfizer, 1971, p. 21 (Included in the test)

THE ENVIRONMENT. New, advanced technology in pollution control was a subject of intense study and action at Pfizer plants throughout the world in 1971. In the United States approximately 10 per cent of total capital expenditures was committed to improving further the Company's performance in controlling emissions and wastes arising from the production of its products. At Pfizer International's ten basic manufacturing locations abroad, increasing emphasis is being placed on improving systems to minimize the effects of waste disposal on the environment through enlightened and appropriate measures for dealing with the complex problem.

3)

By
to

at
ar
co

bo
De
In
th

pi
pr
op
po
be
th

wi
fr

wa
ar

La
la

wo
de

ar
P
f

4

C

#

3) The Goodyear Tire & Rubber Company, 1970, p. 33 (Included in the test)

Environment - 1970
Challenge, Committment,
Progress

By the end of 1970, Goodyear had committed over $12 million to environmental control projects since 1966.

Antipollution projects have been completed or initiated at 13 older domestic plants, and newly built plants are designed to meet high standards of environmental control.

Goodyear's ecological concern goes beyond corporate boundaries. This is reflected in Board Chairman Russell DeYoung's heading the Rubber Sub-Council of the National Industrial Pollution Control Council. He was named to this post by President Nixon.

Some dramatic accomplishments in 1970 include the pilot use of scrap tires to produce carbon black. The process - pioneered by the Cities Service Company in cooperation with Goodyear - offers a key to old tire disposal. However, there are economic problems that have to be solved, including the cost of collecting and processing the tires.

Work is under way on an Akron chemical project that will cap objectionable fumes and wring marketable sulfur from them.

Major water treatment projects are completed or under way in Akron; Gadsden, Ala.; Houston, Tex.; Beaumont, Tex.; and Point Pleasant, W.Va.

Air-cleaning systems are being installed at Jackson, Lansing and Ypsilanti, Mich.; Niagara Falls, N.Y.; Cumberland, Md.; Jackson, Ohio, and Conshohocken, Pa.

Goodyear Research is accelerating product recycling work and efforts to develop new environmental control devices and processes.

Finally, a number of Goodyear products are finding antipollution applications, such as huge rubberized Pillow tanks used for auxiliary sewage systems and as floating containers to siphon oil from disabled ships.

4) Allegheny Ludlum, 1969, p. 17 (Included in the test)

Concern for Environment at all A-L plants

In keeping with Allegheny Ludlum's concern for its neighbors and for the quality of the total environment, new equipment for improving the quality of water and air continues to be installed - at substantial cost. Of anticipated capital spending throughout the Corporation,

it
fa
mo

5)

p.

re
ma
pl
co
in
fo
be
pr
ne
re

p.

me
pu
of
wa
me
to
BC
me
tu
vi
or
a-
er
be

6

it is estimated that almost 10 per cent will go for facilities for controlling the quality of water and air moving through the plants in the next two years.

5) Alan Wood Steel Company, 1970 (Not included in the test because the stock is traded on the American Exchange instead of the New York Stock Exchange.)

p. 2 (From the President's Letter)

Control of air and water pollution continued to receive a great deal of time and attention from your management in 1970. During the year much was accomplished in the planning and implementing of necessary controls. Our projected expenditures through 1974 now include over $5,000,000 for new or improved facilities for environmental control, and this amount will no doubt be increased as more technology is developed to meet the problems. We are aware of our responsibility to our neighbors and intend to meet or exceed all established regulations for environmental control.

p. 11 (Under Operations)

High on the list of priorities for 1970 was environmental control. Alan Wood responded rapidly to growing public concern by accelerating its long-standing program of environmental improvement. Approximately $1,250,000 was appropriated for construction of a new water treatment plant at the blast furnaces, and three contracts totalling $454,000 were let for cleaning devices at the BOF. In 1971 efforts are being concentrated on control measures in our coke plant. The training department turned its attention to making our employees aware of the vital part they can play in environmental control, and an ongoing program of research and development is underway at the coke plant. A pilot scrubber program to control emissions from the sinter plant was completed shortly before year-end with encouraging results.

6) Alpha Portland Cement Company, 1970, p. 4 (From the President's letter; Included in the test)

Capital expenditures in 1970 were again kept to a relatively low level, but our continuing efforts to comply with air pollution standards at the Jamesville and Birmingham plants will require the expenditure of about $2 million between now and 1973.

1)

l b
not
tra

2)

Ite

mer
its
tiv

3)

l

4)

l

ca
no
t
t
q
$
W

5

I

e

Disclosures from 10-Ks filed with the SEC

1) La Maur Inc., 1973, p. 2 (Not included in the test as it was one of three which indicated that the item was not applicable - in this particular case it was not possible to tell if the item was not applicable or not material)

1 b (2) (3) (5) (7) (9) - The information requested is not applicable or material to an understanding of Registrant's business.

2) Sterling Drug Inc., 1973, p. 2 (included in the test)

Item 1 - Business

The Registrant believes that compliance with environmental regulations will not have a material effect upon its program of capital expenditures, earnings or competitive position.

3) Zenith Radio Corporation, 1973 (Not included in the test as it was one of three that indicated that the item was not applicable)

1 b 7 - Not applicable.

4) Sundstrand Corporation, 1973, p. 6 (Included in the test)

1 Business - Regulations

Registrant believes its facilities comply with applicable emission control regulations. While Registrant does not believe that continuing compliance with such regulations will have a material effect on its competitive position, capital expenditures and other expenses may be required. In 1972 and 1973, Registrant spent approximately $3 million at its steel foundry located in Milwaukee, Wisconsin in order to comply with such regulations.

5) Koppers Co., Inc., 1971, pp. 3-4 (Included in the test)

Item 1 - Business

Environmental Pollution Regulation

The Company is subject to regulation with regard to environmental quality, including air and water quality,

by various Federal, State and local authorities. The Company cannot accurately forecast the long-term effects of present and future regulations upon its existing and proposed facilities and operations. During 1971, investments in pollution control equipment were about 13% of the Company's total 1971 capital expenditures. At year end, projects were under way at 71 plants to enable those facilities to meet air and water quality standards. Based on present regulations, 10 to 15% of the Company's capital expenditures during 1972 are expected to be devoted to pollution control facilities. Although environmental regulations have not yet had a material adverse effect on operations, future government action may require the Company to modify, supplement, replace or abandon equipment and facilities and may delay or impede construction and operation of new facilities at costs which could be substantial.

6) Harsco Corporation, 1973, p. 2 (Included in the test)

1 b 7

The company has become subject, as have others, to more stringent air and water quality control legislation at the Federal, State and local levels. In general, Harsco has not experienced substantial difficulty in complying with these environmental regulations in the past and believes that they have not had a material adverse effect on capital expenditures, earnings and the competitive position of the Company.

7) General Refractories Co., 1971, pp. 9-10 (Included in the test)

1 Business

Recent Developments

The Registrant is presently studying the material effects which compliance with applicable federal, state and local provisions relating to the protection of the environment will have on the Registrant's business. During 1971, the Registrant charged approximately $2,000,000 against income, in connection with land reclamation and pollution control studies. The Registrant anticipates that additional charges for such items in presently undetermined amounts, will be required in future years. Such expenditures will reduce the Registrant's future earnings, although its competitive position may be largely unaffected, since the Registrant's primary competitors will presumably be faced with similar

exp
pos
thr
cor

8)

1 h

mer
to
whi
cha
rel
had
cap

9)

It

ac
to
ma
Sp
St
en
in
fo
wa

l

I

p

M
p
t
v

expenditures. The Registrant is currently studying the possibility of profitably utilizing materials reclaimed through, and new products generated by, its pollution control efforts.

8) Fansteel Inc., 1973, p. 1 (Included in the test)

1 b 7

Fansteel has taken steps to conform with all environmental standards which are defined. Expenditures related to compliance with federal, state and local provisions which have been enacted or adopted regulating the discharge of materials into the environment, or otherwise relating to the protection of the environment, have not had and are not expected to have a material effect on capital expenditures, earnings, and competitive position.

9) Easco Corporation, 1972, p. 9 (Not included in the test since the initial disclosure was made in 1972)

Item 3 - Properties

Environmental Controls

New laws and regulations and increased governmental action to enforce existing laws and regulations relating to environmental controls have affected some of the above manufacturing facilities. At the forging facility in Springfield, Massachusetts, following a citation by the State of Massachusetts, the Moore Company engaged-in engineering surveys at a cost of approximately $12,500 in 1972, and will expend approximately $300,000 in 1973 for improvements necessary for compliance with certain water and air pollution standards.

10) Sears Industries Inc., 1973 (Not included in the test because the stock is traded on the American Exchange instead of the New York Stock Exchange)

Item 1 - Business

p. 4 (Under The Consolidated Laundries Division)

Consolidated does not have, or anticipate, any material problems complying with Federal, State and local provisions which have been enacted or adopted, regulating the discharge of materials into the environment, or otherwise relating to the protection of the environment.

p.

mat
Loc
req
mer
env

ll

It

fi
re
va
co
du
is
ma
ca
in

l2

l

r
h
o
t

l

p. 6 (Under The Highlander Division)

The Highlander Division does not anticipate any material problems complying with Federal, State and Local provisions which have been enacted or adopted, regulating the discharge of materials into the environment, or otherwise relating to the protection of the environment.

11) Carborundum Co., 1971, p. 2 (Included in the test)

Item 1 - Business

The amount spent on capital projects during the last fiscal year with respect to compliance with statutory requirements concerning environmental quality, e.g., various air, water and other antipollution laws, is not considered material. The amount programmed to be spent during 1972 is approximately 2.3 million dollars which is slightly higher than in previous years but will not materially affect the earning power of the business or cause material changes in the Company's business done or intended to be done.

12) Bliss & Laughlin Industries Inc., 1973, p. 4 (Included in the test)

1 b 7

Compliance with current Federal, State and local regulations relative to the protection of the environment has not had and is not expected to have a material effect on the capital expenditures, earnings or competitive position of the company.

13) Allied Chemical Corporation, 1970, p. 5 (Included in the test)

Pollution Control

In 1970 the Company expended about $6,000,000 on pollution control installations and estimates that it will spend about $40,000,000 on additional pollution control installations in the three year period starting in 1971.

Sam

ref
pre
eli
sto
fir
mor
Thi
cri
the
th
ne
of
th

ca
si
pl
g
w
p
l
p
a

Sample Refinement

Once the initial sample was selected, it had to be refined. The only two refinements made by all three previous studies which used volume as a variable were the elimination of firms with a dividend announcement or a stock split in the period for which the test was run. The first study (Beaver) also excluded firms with twenty or more news announcements in the WSJ for the previous year. This criterion has not been subsequently used. The major criticism of its use has been that it tended to eliminate the larger firms from the sample thus creating a bias for the smaller companies. Also, there is no evidence that a news announcement, per se, affects market volume. The loss of the large firms has been judged as a greater loss than the potential of reaction to the WSJ news announcements.

This study started out with 364 firms. These were calendar year firms surveyed by ATT for 1971-1973 inclusive. General refinements were made to the sample to completely separate the sample into the desired three categories. Other refinements were made to eliminate firms with other possible causes of a volume shift for the periods surrounding receipt of either the 1972 or 1973 10-K. Table 4-1 shows the results of the sample refining process. All the refinements anticipated for this research are discussed below. Some of the points were not actually used to eliminate any firms. This does not necessarily mean that they did not occur in the 364 firms. Once a firm was

Elimi

TABLE 4-1

SAMPLE REFINEMENT

Eliminations:		
1.	Isolated disclosure in annual report.	64
2.	Declared dividend in six week period surrounding receipt of 10-K for 1972 or 1973. . . .	47
3.	Traded on American Exchange	20
4.	Initial disclosure in 1972 annual report or 10-K	17
5.	Data not available in Commercial and Financial Chronicle, or Financial World	17
6.	Stock split during six week period surrounding receipt of 10-K for 1972 or 1973. . . .	13
7.	Initial disclosure on 1973 annual report, or both 1973 annual report and 10-K	13
8.	Initial disclosure on other reports to SEC, received between 1972 10-K and 1973 10-K . . .	12
9.	10-K received outside of two week period surrounding deadline for 1972 or 1973	4
10.	Three or more 8-K disclosures of pollution litigation prior to 10-K disclosure for 1973. . . .	3
11.	Other	16
Total Eliminations		226
Ending Sample:		
	Group 1 64	
	Group 2 28	
	Group 3 46	
	Total Sample.	138
1971-1973 ATT Calendar Year Firms.		364

eli
che
fir
ate
for
not

stu
sha
yea
use
sur
tec
Se
cl
re

tw
ef
er
th
l(
F
l
o
w
w

eliminated from the sample for one reason, it was not checked against other criteria. In general, firms were first categorized into one of the three groups, or eliminated as not fitting the categories. Then firms were checked for other causes of volume reactions. This sequence was not followed 100% of the time, however.

Due to the nature of the change variable used in the study, the percent change in the daily percentage of shares traded from the corresponding period in the previous year, a group of firms had no niche in the three groups used for test purposes. If a firm made its initial disclosure of the effects of compliance with environmental protection statutes in its 1972 reports, it had to be excluded. Seventeen firms were eliminated because their initial disclosure was in either the 1972 10-K or the 1972 annual report to stockholders.

Certain refinements had to be made for firms in group two, those that made their initial disclosures of the effects of compliance with statutory regulations about environmental quality in 1973 reports, in order to insure that the initial disclosure was in fact made with the 1973 10-K report. Three criteria were applied to this group. First, those firms which made the initial disclosure in 1973, but made it in the annual report to stockholders, or in both the 10-K and the annual report to stockholders were eliminated since the disclosure was not contemporaneous with the straight 10-K disclosure. This resulted in the

deletion of thirteen firms. Secondly, those firms which made the initial environmental disclosure in other Forms filed with the SEC which were received prior to the 10-K were excluded. Since SAR No. 5386 took effect on July 3, 1973, other reports filed after that date which also included the environmental statute compliance effects disclosure could have preceded the 10-K. (See Figure 2-1) There were twelve firms in this group. Finally, firms which had three or more pollution litigation cases filed in Form 8-Ks prior to the 10-K were eliminated. It was felt that the 8-Ks might have foreshadowed part of the 10-K disclosure. Only three firms were affected by this criterion.

There were cases of isolated disclosures on annual reports to stockholders. These sixty-four firms were not included in the sample. When firms made the disclosures on 10-Ks, they continued the disclosure into the future. Frequently if the disclosure was begun on the report to stockholders, it was also continued either on the 10-K, or on the annual stockholder report, or both. Sometimes, however, a firm would make the disclosure for one year on the stockholder report and it would not be continued into the following year. When continuation was not in effect by 1971, the firm was eliminated because of the isolated disclosure.

Twenty firms were eliminated because they were traded on the American Stock Exchange. Originally, the sample was not confined to NYSE firms. However, there were only

twer

were

NYS

not

Chr

Wor

on

the

app

the

si

we

di

me

we

we

l

w

s

twenty firms that were not NYSE, and at least half of these were not included in the data sources. Another seventeen NYSE firms were eliminated because their volume data were not included in Financial World or Commercial and Financial Chronicle. Data on stock outstanding came from Financial World. Commercial and Financial Chronicle provided data on shares traded and dividend announcements.

Two disclosure problems which led to elimination were the unclear disclosure and the "not applicable". "Not applicables" were eliminated because there were so few of them (two or three), and they were a different type of signal than the other disclosures. Unclear disclosures were questionable as to whether or not they had in fact disclosed the effects of compliance with statutory requirements regarding environmental quality. Fortunately, there were very few unclear disclosures either.

Several selection criteria were applied to the six week period surrounding the deadline for receipt of the 10-K for both 1972 and 1973. The most important of these were the dividend announcements and stock splits. Previous studies had shown that these were associated with a volume reaction in the stock market. Forty-seven firms were eliminated because they made a dividend announcement in one or both of the six week periods surrounding the 10-K receipt for 1972 or 1973. An additional thirteen firms were eliminated because of stock splits. These thirteen included firms which had a shift in outstanding stock of 10% or more

from the 1972 receipt period to the 1973 receipt period.

The test was designed around an environmental signal in the two weeks surrounding the deadline for filing of 10-Ks for 1972 and 1973. Obviously, if the 10-K was not received in that time frame for one of the two years, the test is invalid. Four firms were eliminated from the sample because their 10-Ks were not received by the SEC within the designated two week period for 1972 or 1973.

There were two a priori standards which were found to be ineffective. The first of these was a change in significant ownership. This could have affected the pool of stock likely to be traded. The second criterion was a merger or announced merger. Both of these criteria were applied for 1972 and 1973 time frames. Neither resulted in firm eliminations. (Significant ownership is reported in the 10-K)

Other events which led to the elimination of firms from the sample include amended 10-Ks for 1972 or 1973 reporting the environmental compliance effects, financial problems by the firm in the time of the tests, and unavailability of 10-Ks on micro-fiche at Michigan State University or the University of Michigan. None of these resulted in more than two firms being removed from the sample.

The Sample

The sampling process resulted in a sample of 138 firms divided into three groups as follows:

1. Those firms which reported the effects of compliance with environmental protection

statutes prior to 1972 and continued disclosure thereafter - 64 firms.

2. Those firms which reported the effects of compliance with environmental protection statutes beginning with 1973 10-Ks - 28 firms.

3. Those firms which made no disclosure of the effects of compliance with environmental protection statutes through 1973 - 46 firms.

The second group is the test group, with the other two serving as control groups. A spot check was made on later 10-Ks for some firms in group three, and it revealed that some of them reported in later years the effects of compliance. Some of the later disclosures were applicable to 1973, for example, when a firm listed in its 1974 10-K the money spent over the last few years to comply. In general, however, no claim is made about the firms in group three except that they were other ATT firms, subject to the refinements in the selection process.

Although group two is the smallest group in the sample, it represents the time-frame when the largest number of new firms began making the disclosures. Group two is sufficiently large for the statistical testing procedure, which is in fact used when sample sizes are in excess of five.[1]

Due to the sample sizes, insividual industry comparisons are not feasible, however over 91% of each sample group is composed of manufacturing firms according to SIC Codes, with most of the rest classified in wholesale and retail

---

[1]W. J. Conover, Practical Nonparametric Statistics, p. 258.

trade. There were firty-eight industries represented. Only one industry reached double digit size. That industry, iron and steel, was represented by thirteen firms, four in group two and nine in group one. Due to the wide industry divergence, no systematic industry bias is likely. Previous volume research has not used industry classification. For a complete list of firms in each group and their industry classification see Appendix I.

CHAPTER V

RESULTS

The Kruskal-Wallis Test

Trading volume data were gathered from Commercial and Financial Chronicle. Data on shares outstanding came from Financial World. The volume change variable, $v_{i,j}$, computed from the data, is bordered by -1 on the lower end, and unrestricted on the upper end. Variables between zero and minus one indicate a reduction in volume from the previous year.

The market, in general, experienced a decline in volume in the test period and control period two from 1973 to 1974. For control period one volume was almost stationary over the two years. The sample reflected this general volume trend, with slightly more than half the firms showing decreases.

$v_{i,j}$ was computed for the 138 firms in each of the three periods. The change variable was then ranked from 1 to 138 over all firms in each period. The highest positive $v_{i,j}$ in each period received the rank of "1", and the most negative $v_{i,j}$ was ranked "138".

The three groups segregated for test purposes were:

1. Those firms which reported the effects of compliance with environmental protection statutes prior to 1972 reports.

2. Those firms which reported the effects of compliance with environmental protection statutes beginning with 1973 10-Ks.

3. Those firms which made no disclosure of the effects of compliance with environmental protection statutes through 1973 10-Ks.

Group two is the primary test group, since it is the group initiating the compliance effect signal in the time frame of the statistical tests. The ranks were tested in each of the periods to see if they differed for the three groups. The hypothesis to be tested each period under the nonparametric Kruskal-Wallis Test is:

$$H_0 : E(\bar{R}_1) = E(\bar{R}_2) = E(\bar{R}_3)$$

$$H_1 : - (E(\bar{R}_1) = E(\bar{R}_2) = E(\bar{R}_3))$$

The null hypothesis states that the mean ranks, in terms of $v_{i,j}$, are expected to be equal for the three groups. A more general statement of the null is that all three $v_{i,j}$ distribution functions are equal. The alternative is that at least one of the three populations tends to yield larger observations than at least one of the other populations. The ranks for each period are separated by groups and tested using the following statistic:

$$T = \frac{12}{N(N+1)} \quad \Sigma_k \quad \frac{R_k^2}{n_k} \quad - 3(N+1)$$

T approximates a chi-square distribution with two degrees of freedom for three groups. The decision rule was to reject H_0 in favor of H_1 at the level alpha if T exceeded

the one minus alpha quantile of a chi-square random variable with two degrees of freedom. "N" is the total sample, 138 firms. "R_k^2" is the square of the sum of the ranks for group "k". "n_k" is the number of firms in the respective groups: 64 for control group one, 28 for the test group, and 46 for group three, also a control group.

The test was conducted three times. Period "-1" was the control period consisting of the change in volume in the two week trading period before the 10-K signal from the corresponding two week trading period of the previous year. Period "0" covered the change in volume in the two week period of receipt of the 10-Ks, and period "+1" was the change in volume in the two week period after the 10-K receipt period. Test results are shown in Table 5-1.

TABLE 5-1

Kruskal-Wallis Test

Period	-1	0	+1
T	2.665	7.836	1.467
	(not significant at $\alpha = .25$)	(significant at $\alpha = .025$)	(not significant at $\alpha = .25$)

The table shows a T of 2.665 for control period "-1". This value is not statistically significant. Accordingly, the null hypothesis of equal population distribution functions can not be rejected for the first control period.

For the test period (period "0") T is 7.836, which is significant at an alpha level of .025. Therefore the null is rejected for the test period in favor of the alternative hypothesis of unequal population distribution functions. For control period two (period "+1") T is 1.467; again not significant at an alpha level of .25 and the null cannot be rejected.

The results of the main tests show the population functions to differ only in the period during which the environmental statute compliance effect signal was received. It would be useful to see what caused the rejection of the null. If the sample ranks for the test period are divided into sixths, it can be seen that the test group ranks are more clustered toward the bottom of the ranks (high ranks). Table 5-2 shows the test period rank clustering.

TABLE 5-2

TEST PERIOD RANK CLUSTERS

Group	Ranks					
	1-23	24-46	47-69	70-92	93-115	116-138
I	12	8	16	11	9	8
II	2	4	3	4	6	9
III	9	11	4	8	8	6

The Table shows that two-thirds of the test group ranks are in the second half of the Table. This fact is further substantiated by examination of summary statistics on the test period ranks. (See Table 5-3). The summary

TABLE 5-3

TEST PERIOD RANK SUMMARY STATISTICS

	Group I	Group II	Group III
Mean Rank	65.05	88.46	64.13
Standard Deviation	37.02	38.03	41.18

statistics show the mean rank of the test group to be 88.46, while the mean ranks of the control groups are almost identical at around 65. The standard deviations for all three groups are very close, 37.02 to 41.18. This indicates that no group ranks were polarized. The two Tables together indicate the significant difference in the test period was less trading in group two, the firms initiating the environmental statute effect compliance signal. Scheffe´ post hoc procedures give a formal basis for that conclusion which shows up informally in Tables 5-2 and 5-3.

Scheffe´ Post Hoc Results

The Scheffe´ post hoc technique allows direct comparisons to be made on the three groups. The ideal test result

would be for group two to be different from groups one and three, and for groups one and three to not differ. This would verify the apparent differences shown in Tables 5-2 and 5-3. Since all three groups are alike in both control periods, if the only differences in the test period are between the test group and the control groups, it would indicate that the initial environmental statute compliance effect signal caused a volume reaction in the stock market. To test for this condition, simple contrasts are constructed for the test period:

$$(1)\ W_1 = \bar{R}_2 - \bar{R}_1$$
$$= 88.46 - 65.05$$
$$= 23.41$$

$$(2)\ W_2 = \bar{R}_2 - \bar{R}_3$$
$$= 88.46 - 64.13$$
$$= 24.33$$

$$(3)\ W_3 = \bar{R}_1 - \bar{R}_3$$
$$= 65.05 - 64.13$$
$$= 0.92$$

In each case the null is that the expected contrast equals zero, and the alternative is a denial of the null:

$$H_0: E(W_i) = 0$$

$$H_1: E(W_i) \neq 0$$

In order to test the null hypotheses, ninety percent confidence intervals are constructed around the contrasts. The decision rule is to reject the null if the confidence interval does not include zero. The intervals are constructed as follows:

$$W_i \pm (\chi^2_{K-1} \quad (1-\alpha)\ )^{\frac{1}{2}} \ (VAR(W_i)\ )^{\frac{1}{2}}$$

$$VAR(W_i) = \frac{N(N+1)}{12} \quad \Sigma_k \quad \frac{a^2_k}{n_k}$$

Where "a" is the weight assigned to the mean rank of group k in the contrast.

For the simple contrasts "a" is equal to one. The confidence intervals are:

$$(1)\ W_1 \pm (\chi^2_{K-1} \quad (1-\alpha)\ )^{\frac{1}{2}} \quad (VAR\ (W_1)\ )^{\frac{1}{2}}$$

$$= 23.41 \pm (4.605)^{\frac{1}{2}} \quad (82.066)^{\frac{1}{2}}$$

$$= 23.41 \pm 19.44$$

$$(2)\ W_2 \pm (\chi^2_{K-1} \quad (1-\alpha)\ )^{\frac{1}{2}} \quad (VAR\ (W_2)\ )^{\frac{1}{2}}$$

$$= 24.33 \pm (4.605)^{\frac{1}{2}} \quad (91.839)^{\frac{1}{2}}$$

$$= 24.33 \pm 20.57$$

$$(3)\ W_3 \pm (\chi^2_{K-1} \quad (1-\alpha)\ )^{\frac{1}{2}} \quad (VAR\ (W_3)\ )^{\frac{1}{2}}$$

$$= 0.92 \pm (4.605)^{\frac{1}{2}} \quad (59.727)^{\frac{1}{2}}$$

$$= 0.92 \pm 16.58$$

The null is rejected for contrasts one and two, but not for contrast three. Thus the simple comparisons indicate that the volume change for the test group differs from the

volume change for each of the control groups in the test period. Furthermore, the volume changes for the control groups do not differ from each other in the test period.[1] For further evidence, a complex comparison is constructed comparing the test group to the two control groups in the test period:

$$(4) \quad W_4 = \bar{R}_2 - \tfrac{1}{2}(\bar{R}_3 + \bar{R}_1)$$

$$= 88.46 - \tfrac{1}{2}(64.13) + 65.05$$

$$= 23.87$$

Again, the null hypothesis is that the expected contrast equaled zero; with the alternative hypothesis that the expected value of the contrast is not zero:

$$H_0: E(W_4) = 0$$

$$H_1: E(W_4) \neq 0$$

The decision rule is to reject the null if the confidence interval did not include zero. The confidence interval is constructed the same way as for the simple contrasts, except that "a" is equal to ½ for groups one and three.

$$(4) \quad W_4 \pm (\chi^2_{K-1} \ (1 - \alpha))^{\frac{1}{2}} \quad (VAR(W_4))^{\frac{1}{2}}$$

$$= 23.87 \pm (46.605)^{\frac{1}{2}} \quad (72.02)^{\frac{1}{2}}$$

$$= 23.87 \pm 18.21$$

---

[1] These results were at an alpha level of .10. Had the confidence intervals been set up with an alpha level of .05 the decisions would have been identical. 95% confidence intervals are:

(1) 23.41 ± 22.17
(2) 24.33 ± 23.45
(3) 0.92 ± 18.92

Since the ninety percent confidence interval does not contain zero, the null hypothesis is rejected at an alpha level of .10.[2] The Scheffe' post hoc tests show that the volume reaction of the test group in the test period was statistically different from the volume reactions of the control groups.

Conclusions

The purpose of this research was to see if environmental disclosures required by the SEC in financial statements were associated with statistically significant differences in trading volume. The basis for the research was SAR 5386 issued in 1973. SAR 5386 amended SEC reporting forms to incorporate disclosure of the effects of compliance with statutory requirements respecting environmental quality upon the registrant. The largest block of initial disclosures came in 10-Ks for 1973 calendar year firms, and this was the critical event for the research.

Previous research had shown a volume reaction in the stock market to earnings announcements. A part of the 10-K is the income statement, which includes an earnings announcement. Therefore, the test procedure had to allow for a possible volume reaction for all firms at the time of the receipt of the 10-K. For that reason, a change statistic

---

[2]The same decision would have been made at alpha levels of .05 and .025. Those confidence intervals are:

95% C.I. 23.87 ± 20.77
97.5% C.I. 23.87 ± 23.05

was used. Specifically, the percentage change in the daily percentage of shares traded for corresponding two week blocks from periods surrounding the receipt of 1972 10-Ks to periods surrounding the receipt of 1973 10-Ks. In this way, any volume reaction to the earnings announcements would cancel out.

Three groups were tested. The test group consisted of firms initiating environmental statute compliance effect reporting in 1973 10-Ks. The first control group consisted of firms which began reporting the effects of compliance with environmental statutes before 1972 10-Ks. The second control group was made up of firms which as of 1973 10-Ks made no mention of the effects of compliance with environmental statutes. Firms with sources of known volume reaction in the periods from which data were gathered were eliminated, e.g. any firm with a dividend announcement in the six weeks surrounding the receipt of the 10-K for either 1972 or 1973 was excluded. Firms which initiated the environmental disclosure signal in 1972 reports had to be eliminated. If the market reacted to the signal, it would have been included in 1972 data for those firms.

There were three periods for test purposes. The two week period of the receipt of the 10-Ks was the test period. The two week periods on either side of the test period served as control periods. Using a Kruskal-Wallis ranking test, all three groups were tested to see if their change in volume was the same in each of the periods.

Results indicate that the change in volume was not different for the three groups in either control period surrounding receipt of the 10-K. In the test period, however, the test group was shown to have a statistically different percentage change in the daily percentage of shares traded than did the two control groups. The reactions of the control groups were still not different from each other.

Based on this evidence, the conclusion is drawn that there is a statistically significant volume reaction in the capital market associated with disclosure of the effects of compliance with environmental statutes on the firm. The data show that the reaction is less trading for the firms making the environmental disclosure. This could be because of a reduction of potential buyers, sellers, or both. The exact causes of the reduction in trading are not ascertainable from the data. Still, of one assumes market efficiency, the disclosure signal, which was associated with a statistically significant volume reaction, can be said to have informational content under the EMH.

Limitations & Suggestions for Further Research

The fact that the market reacted to a signal does not mean that the signal is optimal. Less costly means of disseminating the information may exist. The costs of disclosure may be greater than the benefits derived from the disclosure. This research did not attempt any value judgements on the disclosure. It merely tested for a volume reaction.

External validity is always a consideration for this type of research. Any time a selection criterion is applied, strictly speaking, the generalizability of the results is reduced. The main restrictions imposed on firms selected for this study were: 1) The initial sample came from Accounting Trends and Techniques, and was not a random sample of the population of firms. 2) Non-calendar year firms were not included. 3) Only firms whose stocks were traded on the New York Stock Exchange were tested. A general tradeoff always exists between narrowing the sample to isolate the item being tested, and broadening the sample to increase generalizability.

A strict interpretation of the external validity is not necessary. As long as no reason exists to suspect a systematic difference in the population being discussed and the population which was researched, the results of the research can be generalized with reasonable confidence.

Many possibilities for further research have been suggested by this study. The study tested for a volume reaction to the disclosure requirement. Price and risk reactions are other possibilities, especially in light of the economic nature of the SEC required environmental disclosure. Study of these variables might help in interpreting the results of the volume reaction. A price decrease, for instance, could mean that no one wanted to buy the stock. As mentioned above, the cost/benefit and optimality of the disclosure were not part of this research.

Research could be undertaken to ascertain the differences, if any, between small and large investor reaction to the disclosures. Other social disclosures, whether economic, environmental, or otherwise, could be tested for reaction. This type of test design lends itself to checking for investor reaction to noneconomic signals, provided such signals can be isolated.

The test was positive, not normative. No priors were used to predict investor reactions. The results indicated that the reaction was one of less trading on firms that made the initial disclosure than on other firms in the sample. No attempt was made to ascertain the rational for less trading, although in Chapter one it was mentioned that some investors indicated that nontrading was one action they might take based on disclosures. A possibility for future research would be to seek to discover why this particular signal resulted in a systematic reduction in trading. This study provided evidence on the question of whether or not there was a reaction to the disclosure. The question of why the reaction was a reduction in trading volume remains for other research.

APPENDIX I

SAMPLE FIRMS

Group 1

No.	Name	Industry Code
1	AMF, Inc.	394
2	Allegheny Ludlum Industries, Inc.	331
3	Allied Chemical Corp.	281
4	Alpha Portland Industries, Inc.	324
5	Anaconda Co.	333
6	Armco Steel Corp.	331
7	Bemis Co., Inc.	264
8	Borden, Inc.	202
9	Carborundum Co.	327
10	Cities Service Co.	291
11	Cleveland-Cliffs Iron Co.	101
12	Continental Can Co., Inc.	341
13	Cyclops Corp.	331
14	Diamond International Corp.	262
15	Diamond Shamrock Corp.	281
16	Dictaphone Corp.	357
17	E. I. duPont de Nemours & Co.	281
18	Englehard Minerals & Chemicals Corp.	509
19	Foote Mineral Co.	333
20	GAF Corp.	383
21	General Motors Corp.	371
22	General Refractories Co.	325
23	Getty Oil Co.	291
24	B. F. Goodrich Co.	301
25	Goodyear Tire & Rubber Co.	301
26	Gulf Oil Corp.	291
27	Inland Steel Co.	331
28	Interlake, Inc.	331
29	International Telephone & Telegraph Corp.	366
30	Kaiser Aluminum & Chemical Corp.	333
31	Kennecott Copper Corp.	333
32	Kimberly-Clark Corp.	262
33	Koppers Co., Inc.	281
34	L.T.V. Corp.	201
35	Lone Star Industries, Inc.	324
36	Marathon Oil Co.	291
37	Martin Marietta Corp.	372
38	Mead Co.	262

Group 1 (con't)

No.	Name	Industry Code
39	Merck & Co., Inc.	283
40	Minnesota Mining & Manufacturing Corp.	383
41	Molybdenum Corp. of America	331
42	Monsanto Co.	281
43	N. L. Industries, Inc.	285
44	National Distillers and Chemical Corp.	208
45	Occidential Petroleum Corp.	139
46	PPG Industries, Inc.	321
47	Pfizer Inc.	283
48	Phelps Dodge Corp.	333
49	Polaroid Corp.	383
50	Quaker State Oil Refining Corp.	291
51	Republic Steel Corp.	331
52	Reynolds Metals Co.	333
53	Rohm & Haas Co.	281
54	Standard Brands Inc.	203
55	Standard Oil Co. (Indiana)	291
56	Sun Oil Co.	291
57	Texaco, Inc.	291
58	Textron, Inc.	372
59	Timken Co.	356
60	Union Camp Corp.	264
61	Union Carbide Corp.	281
62	United States Gypsum Co.	326
63	United States Steel Corp.	331
64	Wheeling-Pittsburgh Steel Corp.	331

Group 2

No.	Name	Industry Code
1	American Standard, Inc.	343
2	Armada Corp.	208
3	Bliss & Laughlin Ind., Inc.	331
4	Brown & Sharpe Manufacturing Co.	354
5	Dan River, Inc.	221
6	Fansteel Inc.	333
7	General Signal Corp.	366
8	Grumman Corp.	372
9	Harsco Corp.	331
10	Hoffman Electronics Corp.	366
11	Houdaille Industries, Inc.	371
12	Libbey-Owens-Ford Co.	321
13	Lockheed Aircraft Corp.	372
14	MSL Industries, Inc.	345
15	National Presto Ind., Inc.	349
16	Ogden Corp.	509
17	Portec, Inc.	331

Group 2 (con't)

No.	Name	Industry Code
18	Robertson, H.H. Co.	349
19	Safeway Stores, Inc.	541
20	Signode Corp.	331
21	Square D Co.	361
22	Standard Pressed Steel Co.	345
23	Sterling Drug, Inc.	283
24	Studebaker-Worthington, Inc.	371
25	Sundstrand Corp.	354
26	Sybron Corp.	384
27	United States Tobacco Co.	213
28	Vendo Co.	358

Group 3

No.	Name	Industry Code
1	ACF Industries, Inc.	374
2	American Chain & Cable Co., Inc.	349
3	American Hospital Supply Corp.	508
4	American Seating Co.	251
5	Arvin Industries, Inc.	371
6	Bates Manufacturing Co., Inc.	221
7	Bath Industries, Inc.	373
8	Bausch & Lomb, Inc.	383
9	Belden Corp.	335
10	Belding Heminway Co., Inc.	221
11	Bell & Howell Co.	383
12	Cluett, Peabody & Co., Inc.	231
13	Coca-Cola Co.	209
14	Colonial Stores, Inc.	541
15	Columbia Broadcasting System, Inc.	483
16	Combustion Engineering, Inc.	349
17	Control Data Corporation	357
18	Crown Corp & Seal Co., Inc.	341
19	Emhart Corp.	342
20	Fairchild Camera and Instrument Corp.	366
21	General American Transportation Corp.	374
22	General Cigar Co., Inc.	212
23	General Host Corp.	201
24	Gillette Co.	342
25	Hobart Co.	355
26	Interstate Brands Corp.	205
27	Kraftco Corp.	202
28	Magnavoc Co.	366
29	Maremont Corp.	371
30	Maytag Co.	363
31	McGraw-Hill, Inc.	271
32	Midland-Ross Corp.	355

Group 3 (con't)

No.	Name	Industry Code
33	Munsinger, Inc.	231
34	Nabisco, Inc.	205
35	Neptune Meter Co.	381
36	Northrop Corp.	372
37	Purolator, Inc.	371
38	RCA Corp.	365
39	Reynolds, R. J. Industries, Inc.	211
40	Rucker Co.	352
41	Singer Co.	363
42	Sprague Electric Co.	366
43	Triangle Industries, Inc.	335
44	Twentieth Century-Fox Film Corp.	781
45	U.S. Industries, Inc.	354
46	Xerox Corp.	383

BIBLIOGRAPHY

AAA Committee on Accounting for Social Performance, "Report of the Committee on Accounting for Social Performance," The Accounting Review Supplement 1976, LI, Supplement (1976), pp. 38-69.

AAA Committee on Environmental Effects of Organization Behavior, "Report of Committee on Environmental Effects of Organization Behavior," The Accounting Review Supplement 1973, XLVIII, Supplement (1973), pp. 72-119.

AAA Committee on Measurement of Social Costs, "Report of the Committee on Measurement of Social Costs," The Accounting Review Supplement 1974, XLIX, Supplement (1974), pp. 98-113.

AAA Committee on Measures of Effectiveness for Social Programs, "Report of the Committee on Measures of Effectiveness for Social Programs," The Accounting Review Supplement 1972, XLVII, Supplement (1972), pp. 336-396.

AAA Committee on Social Costs, "Report of the Committee on Social Costs," The Accounting Review Supplement 1975, L, Supplement (1975), pp. 50-89.

Abt Associates Inc., 1972 Abt Associates Inc. Annual Report and Social Audit, Cambridge.

American Institute of Certified Public Accountants, Accounting Trends and Techniques, New York: AICPA.

Axelson, Kenneth S., "A Businessman's Views on Disclosure," The Journal of Accountancy, July 1975, pp. 42-46.

Barnett, Andrew H. and James C. Caldwell, "Accounting for Corporate Social Performance: A Survey," Management Accounting, November 1974, pp. 23-26.

Beams, Floyd A. and Paul E. Fertig, "Pollution Control Through Social Cost Conversion," The Journal of Accountancy, November 1971, pp. 37-43.

_____. "Social Cost Conversion - A Commentary,"

The Journal of Accountancy, December 1972, pp. 32, 34.

Bowman, James S., "Business and the Environment: Corporate Attitudes, Actions in Energy-Rich States," MSU Business Topics, 25, No. 1 (Winter 1977), pp. 37-49.

Bragdon, Joseph H., Jr. and John A. T. Marlin, "Is Pollution Profitable?" Risk Management, April 1972, pp. 8-18.

Brummet, R. L., "Total Performance Management," Management Accounting, November 1973, pp. 11-15.

Calusen, A. W., "Toward an Arithmetic of Quality," The Conference Board Record, May 1971, pp. 9-13.

Cerisano, Michael P., "SMS: Social Measurement Systems for the Future - A Practitioners Preview," CPA Journal, May 1974, pp. 25-30.

Charnes, A., W. W. Cooper and G. Kozmetsky, "Measuring, Monitoring and Modeling Quality of Life," Management Science, June 1973, pp. 1172-1188.

Chastain, Clark E., "Environmental Accounting," Accountancy, December 1973, pp. 10-13.

Churchman, C. West, "On the Facility, Felicity, and Morality of Measuring Social Change," The Accounting Review, XLVI, No. 1 (January 1971), pp. 30-35.

Conover, W. J., Practical Nonparametric Statistics (John Wiley & Sons, Inc., 1971).

Converse, A. O., "On the Extension of Input-Output Analysis to Account for Environmental Externalities," American Economic Review, March 1971, pp. 197-198.

Corcoran, Wayne A. and Wayne E. Leininger, Jr., "Financial Statements - Who Needs Them?" Financial Executive, August 1970, pp. 34-38, 45-47.

Crouch, Robert L., "The Volume of Transactions and Price Changes on the New York Stock Exchange," Financial Analysts Journal, July-August 1970, pp. 104-109.

Diamond, Robert S., "What Business Thinks - The Fortune 500-Yankelovich Survey," Fortune, February 1970, pp. 118-119, 171-172.

Dilley, Steven C., "What Is Social Responsibility: Some Definitions for Doing the Corporate Social Audit," Canadian Chartered Accountant, November 1974, pp. 24-28.

Dilley, Steven C. and Jerry J. Weygandt, "Measuring Social Responsibility: An Empirical Test," The Journal of Accountancy, September 1973, pp. 62-70.

Dixon, Lynwood J. and John M. Thornton, Jr., "The Costs of Cleaning up Pollution," Management Accounting, November 1972, pp. 13-22.

Dyckman, Thomas R., David H. Downes and Robert P. Magee, Efficient Capital Markets and Accounting: A Critical Analysis (Prentice-Hall, 1975).

Ernst & Ernst, Social Responsibility Disclosure: 1977 Survey of Fortune 500 Annual Reports (Ernst & Ernst, 1977).

Estes, Ralph W., "Socio-Economic Accounting and External Diseconomies," The Accounting Review, XLVII, No. 2 (April 1972), pp. 284-290.

Fisher, Anthony C., John V. Krutilla and Charles J. Cicchetti, "The Economics of Environmental Preservation: A Theoretical and Empirical Analysis," American Economic Review, September 1972, pp. 605-619.

Foster, George, "Stock Market Reaction to Estimates of Earnings per Share by Company Officials," Journal of Accounting Research, 11, No. 1 (Spring 1973), pp. 25-37.

Godfrey, M.D., C. W. J. Granger and O. Morgenstern, "The Random Walk Hypothesis of Stock Market Behavior," Kyklos, XVII, 1964, Fasc. 1, pp. 1-25.

Goodman, Walter, "Stocks Without Sin," Harper's Magazine, August 1971, pp. 61-67.

Grady, Paul, "The Increasing Emphasis on Accounting as a Social Force," The Accounting Review, XXIII, No. 3 (July 1948), pp. 266-275.

Gramm, William P., "A Theoretical Note on the Capacity of the Market System to Abate Pollution," Land Economics, August 1969, pp. 365-368.

_____, "A Theoretical Note on the Capacity of the Market System to Abate Pollution: Rejoinder," Land Economics, August 1972, pp. 306-308.

Granger, C. W. J. and O. Morgenstern, "Spectral Analysis of New York Stock Market Prices," Kyklos, XVI, 1963, Fasc, 1, pp. 1-29.

Greenberg, Barnett A. and Roy A. Herberger, "Is There an Ecology-Conscious Market Segment?" Atlanta Economic Review, March-April 1973, pp. 42-44.

Grier, Paul C. and Peter S. Albin, "Nonrandom Price Changes in Association with Trading in Large Blocks," Journal of Business of the University of Chicago, 46, No. 3 (July 1973), pp. 425-433.

Hollander, Myles and Douglas A. Wolfe, Nonparametric Statistical Methods (John Wiley & Sons, Inc., 1973).

Jacobs, Fred A. and Donald L. Kyle, "Social Cost Conversion - A Commentary," The Journal of Accountancy, December 1972, pp. 30, 32.

Jensen, Robert E., Phantasmagoric Accounting: Research and Analysis of Economic, Social and Environmental Impact of Corporate Business (American Accounting Association, 1976).

Kiger, Jack E., "An Empirical Investigation of NYSE Volume and Price Reactions to the Announcement of Quarterly Earnings," Journal of Accounting Research, 10, No. 1 (Spring 1972), pp. 113-128.

Linowes, David F., "An Approach to Socio-Economic Accounting," The Conference Board Record, November 1972, pp. 58-61.

_____, "The Accounting Profession and Social Progress," The Journal of Accountancy, July 1973, pp. 32-40.

Littleton, A. C., "The Accounting Exchange," The Accounting Review, XIX, No. 3 (July 1944), pp. 315-323.

Longstreth, Bevis and H. David Rosenbloom, Corporate Social Responsibility and the Institutional Investor (Praeger Publishers, 1973).

Marlin, John Tepper, "Accounting for Pollution," The Journal of Accountancy, February 1973, pp. 41-46.

Miller, Fredrick R., "Environmental Investing," Journal of Commercial Bank Lending, May 1971, pp. 32-35.

Murch, Arvin W., "Public Concern for Environmental Pollution," Public Opinion Quarterly, Spring 1971, pp. 100-105.

NAA Committee on Accounting for Corporate Social Performance, "Accounting for Corporate Social Performance," Management Accounting, February 1974, pp. 39-41.

Ramanathan, Kavasseri V., "Toward a Theory of Corporate Social Accounting," The Accounting Review, LI, No. 3 (July 1976), pp. 516-528.

Sawin, Henry S., "The CPA's Role in Restoring the Ecological Balance," Management Adviser, March-April 1971, pp. 23-29.

Securities and Exchange Commission, Form 10-K.

_____, SEC Docket.

_____, Securities Act of 1933 Release No. 5170; Securities Exchange Act of 1934 Release No. 9252.

_____, Securities Act of 1933 Release No. 5235; Securities Exchange Act of 1934 Release No. 9498.

_____, Securities Act of 1933 Release No. 5386; Securities Exchange Act of 1934 Release No. 10116.

_____, Securities Act of 1933 Release No. 5569; Securities Exchange Act of 1934 Release No. 11236.

_____, Securities Act of 1933 Release No. 5577; Securities Exchange Act of 1934 Release No. 11339.

_____, Securities Act of 1933 Release No. 5627; Securities Exchange Act of 1934 Release No. 11733.

_____, Securities Act of 1933 Release No. 5653; Securities Exchange Act of 1934 Release No. 11914.

_____, Securities Act of 1933 Release No. 5704; Securities Exchange Act of 1934 Release No. 12414.

_____, Securities Act of 1933 Release No. 5707; Securities Exchange Act of 1934 Release No. 12454.

_____, Securities Act of 1933 Release No. 5906; Securities Exchange Act of 1934 Release No. 14471.

_____, Securities and Exchange Commission Annual Reports.

_____, Securities and Exchange Commission News Digest.

Seidler, Lee J. and Lynn L. Seidler, Social Accounting: Theory, Issues, and Cases (Melville Publishing Company, 1975).

Sihler, William W. and Charles O. Meiburg, "The War on Pollution," Business Horizons, August 1971, pp. 19-30.

Simon, Rita James, "Public Attitudes Toward Population and Pollution," Public Opinion Quarterly, Spring 1971, pp. 93-99.

Spicer, Barry H., "Investors, Corporate Social Performance and Information Disclosure: An Empirical Study," The Accounting Review, LIII, No. 1 (January 1978), pp. 94-111.

Stans, Maurice H., "How New Standards of Financial Reporting Grow From Social Responsibility of Accountants," The Journal of Accountancy, August 1948, pp. 98-106.

Stephens, J. Kirker, "A Theoretical Note on the Capacity of the Market System to Abate Pollution: A Reply," Land Economics, August 1972, pp. 304-305.

Thomas, Arthur L., "Evaluating the Effectiveness of Social Programs," The Journal of Accountancy, June 1976, pp. 65-71.

Toan, A. B., Jr., "Progress Report of the Committee on Social Measurement," The Journal of Accountancy, July 1973, pp. 78-79.

Ward, Barbara and Rene' Dubos, "The Price of Pollution," The Journal of Accountancy, July 1973, pp. 62-68.

Weinrich, John E., "Strategic Cost-benefit Factors in Environmental Performance," Public Utilities Fortnightly, February 1968, pp. 32-38.

Weinrobe, Maurice, "Accounting for Pollution: Pollution Abatement and the National Product," Land Economics, May 1973, pp. 115-121.

Wood, Thomas D., "A New Reporting Problem for Auditors - the Impact of Pollution Control on Financial Statements," The Journal of Accountancy, March 1972, pp. 75-77.

Ying, Charles C., "Stock Market Prices and Volumes of Sales," Econometrica, 34, No. 3 (July 1966), pp. 676-685.