BUSINESS FAILURES: PREDICTION AND THE INFORMATION CONTENT OF AUDITORS' OPINIONS

by

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B.A., Simon Fraser University, 1982

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Economics

SIMON FRASER UNIVERSITY

May, 1984

APPROVAL

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Degree: Master of Arts

Title of Thesis: Business Failures: Prediction and the Information Content of Auditors' Opinions

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Business Failures: Prediction and the Information Content of Auditors' Opinions

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ABSTRACT

One purpose of financial reporting is to assist readers in assessing the solvency of a firm. In the past the auditors would issue a "subject to" audit opinion when they had serious reservations as to the continuity of the firm. In Canada the auditing profession have discontinued the use of this "subject to" opinion and in the United States they are debating discontinuing it. This thesis concludes that the "subject to" opinion does have information content pertinent to the financial markets and questions the wisdom of discontinuing its use.

The methodological hurdle is that financial markets receive the auditor's report at about the same time they receive the financial data contained in the financial statements. An observed reaction in the financial markets cannot easily be ascribed to either the information in the auditor's report or to the information in the financial statements. It is likely the market reacts to both. Yet the task is to see whether or not it reacts uniquely to the "subject to" opinion of the auditor.

This study controls for the information in the financial statements by using a multiple discriminant analysis (MDA) bankruptcy prediction model. Sixteen financial ratios for twenty-two of the eighty-six firms were used as the independent variables in the analysis stage to determine the MDA prediction model. The remaining firms were used to test the predictive power of the MDA model in a subsequent period and to control for differential effects of the auditor's report.

Eight portfolios were then formed based on: (i) bankrupt versus non-bankrupt firms, (ii) whether the auditor's report contained a "subject to" opinion, and (iii) whether the firm was predicted bankrupt by the MDA model. The results of the market response to these portfolios suggested that there was information content in "subject to" opinions. It was also found that the MDA model performed better than the "subject to" opinions in predicting insolvency. Finally, the evidence indicates that the issue of a "subject to" qualification could be a self-fulfilling prophecy.

DEDICATION

To Chau Ting for her love, patience, understanding and encouragements during the past few years.

ACKNOWLEDGEMENTS

There are many who have helped, advised and encouraged me during the past few years. I will inevitably but unintentionally omit some of them. To each and everyone of them, I offer my thanks.

There are some debts too great not to mention. I am indebted to Dr. Daniel McDonald, my senior supervisor and mentor, whose help, support and encouragement were invaluable. This thesis could not have been written without him. I also credit him for my interest in accounting and finance. I am also indebted to Dr. Dennis Maki for his comments, suggestions and encouragements which he willingly accorded me throughout the writing of this thesis. A special debt is owed to Dr. Shiraz Adam who provided me with much computing assistance which I deeply appreciate. A debt of gratitude is also owed to Mr. C. S. Lum who provided detailed comments and suggestions. I have also benefitted from Dr. Irene Gordon, who first introduced me to Market Based Accounting Research. The Faculty of Business Administration provided me with financial assistance for which I am grateful.

Finally, I acknowledge a special and enormous debt to my parents who consistently encouraged and supported my educational aspirations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES AND PLOTS

I. Introduction

Statement of Financial Accounting Concept Number 1 states that one of the objectives of financial reporting is that it should provide information about factors that may affect an enterprise's liquidity or solvency.[1] Solvency evaluation by users of financial statements may come in two forms: explicitly through the auditor's opinion (a clean or a "subject to" (ST) opinion with respect to going concern[2]) and/or through the analysis of the financial statements (the most popular of which is the use of financial ratios, as in bankruptcy prediction models). [3]

The Cohen Commission on Auditors' Responsibilities (1977-78) recommended that the audit requirement for expression of a "subject to" qualification when material uncertainties exist be eliminated.[4] While this issue is still being considered by the American Institute of Certified Public Accountants (AICPA), the Canadian Institute of Chartered Accountants (CICA)

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[1] Financial Accounting Standards Board. Statement of Financial Accounting Concepts Number 1, "Objectives of Financial Reporting by Business Enterprise". November, 1978. Paragraph 49, page 24.

[2] See Appendix I for a sample of ST opinion.

[3] This includes footnote disclosures. See chapter 3 for elaboration and justification of this point.

[4] American Institute of Certified Public Accountants, Commission on Auditors' Responsibilities: Report, Conclusion and Recommendations. New York, (AICPA, 1978) pp.29.

in November 1980 has terminated the use of that qualification. [5] Since then, some research on the relevance of the ST opinion[6] has been performed. Some of these studies uses the Market Based Accounting Research (MBAR) method [7] while others uses the survey technique. However, these studies (especially those using the MBAR approach) may not be valid because of their research design. The financial markets receive the auditor's report at about the same time they receive the financial data contained in the financial statements. An observed reaction in the financial markets cannot easily be ascribed to either the information in the auditor's report or to the information in the financial statements. Yet, we need to see if the markets react uniquely to the auditor's report in order to infer the relevance of the ST opinions. As Bailey (1982) suggested (with respect to those studies that uses the MBAR method):

> To draw conclusions about the information content of audit results, one must isolate the effects of information conveyed specifically by the audit report components of the aggregate signals. To do so, the information conveyed by the aggregates must be controlled. (pp. 141)

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[5] CICA Handbook, section 5510.54.

[6] ST opinion will refer to only uncertainty qualifications with respect to going-concern, for the rest of this thesis.

[7] This method basically uses the ex-post returns of a security as the dependent variable and the market returns for the same time period as the independent variable. The parameters of this equation are then estimated. These parameters are then used to forecast the returns of the security subsequent to the period used earlier. The difference between the actual returns and the forecasted returns are then used to determine the effects, if any, of the event in question.

The studies done to date, using the MBAR approach, have not isolated the information content of the audit report from the financial statements.[8] To overcome this problem, Bailey suggested the use of a questionaire approach to elicit the information content of ST opinions, as was done by some studies. This technique is, however, subject to the problems of securing an acceptable response rate, and biases inherent in any hypothetical setting.

The primary purpose of this thesis is to attempt to overcome the problems of previous studies using the Market Based Accounting Research (MBAR) method to evaluate the information content of "subject to" audit reports. A new dimension is introduced to isolate the information content of "subject to" reports from the aggregate financial statements. This is done in the context of a bankruptcy prediction model which uses the information from the financial statements. Using the predictions of the model to control for the information content of financial statements, the information content of "subject to" report is then isolated from the overall contents of financial statements. The procedure in which this is done is summarized and explain in Table 1.

An assumption made in this thesis is that the financial market is efficient in the semi-strong form for the firms in the

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[8] Some authors attempt to isolate the information content of audit report from the financial statements by matching a sample of firms with the change in earnings [Elliot, 1982]. See chapter 2. This assumes that the only relevant information in the financial statement is the net income figure of a firm.

TABLE 1

MARKET RESPONSE TO "SUBJECT TO" REPORTS AND MODEL PREDICTIONS.

PORTFOLIOS OF SECURITIES	MARKET RESPONSE		NO MARKET RESPONSE	
	Warranted Bank. Firms (a)	Not warr. Non Bank. (b)	Warranted Non Bank. (b)	Not warr. Bank. Firms (a)
1 With "subject-to" reports and predicted to go bankrupt. (a) Bankrupt Firms (b) Non Bankrupt Firms	1.1 Market correctly responded to both and to other information	1.2 Market fooled by both the info.	1.3 Market uses other info. and was correct to ignore both the information	1.4 Market did not use the two info. when it should.
2 With "subject-to" reports and not predicted to go bankrupt. (a) Bankrupt Firms (b) Non Bankrupt Firms	2.1 Market correctly responded to audit reports and other info. and ignores the fin. statements predictions	2.2 Market was fooled by auditors' reports.	2.3 Market was correct to ignore the reports and uses the info. from the fin. statements and other information	2.4 Market did not use the auditors' reports when it should.
3 No "subject-to" report but predicted to go bankrupt. (a) Bankrupt Firms (b) Non Bankrupt Firms	3.1 Market correctly ignore the reports and uses fin. statements info. and other info.	3.2 Market fooled by fin. statement predictions. It was wrong to ignore the reports.	3.3 Market was correct to use the reports and other info. and ignores the predictions	3.4 Market misled by the absence of a "subject to" opinion.
4 No "subject-to" report and not predicted to go bankrupt. (a) Bankrupt Firms (b) Non Bankrupt Firms	4.1 Market correctly ignore both and uses other info.	4.2 Market responded incorrectly by ignoring the audit reports and fin. statements	4.3 Market responded correctly to both the info. and other available information	4.4 Market fooled by the auditors' reports and /or the financial statement predictions

Bank. refers to Bankrupt.

sample. The firms are either traded on the New York Stock Exchange or the American Stock Exchange and there is good evidence that these two markets are semi-strong efficient. Also, the information from the financial statements and the auditors' reports is a small component of the total information available to the financial market. Firms in portfolio 1 are expected to fall in cell 1.1 since it is expected that the predictions of the model and the indications in the auditors' reports are generally correct and the market is expected to react to it. Firms in portfolio 4 are likewise expected to fall in cell 4.3 for the same reason as above. Firms in portfolio 2 are expected to be in cell 2.1 or 2.3 depending on whether the prediction of the model or the indication of the auditors' reports is superior. Similarly for firms in portfolio 3, they are expected to fit into either cell 3.1 or 3.3. I have no prior beliefs as to which prediction is superior but if the paper by Altman and McGough (1974) is any indication, the prediction of the model could be expected to be superior. If the market is reacting to the model prediction as information, then cells 2.3 and 3.1 would be expected.

The role of accounting is to report relevant information for decision making to users of accounting information. If the indication that a firm is or might be in financial difficulty, as disclosed in the audit report, is relevant information, then such information should continue to be reported. On the other hand, if the financial market consistently ignores the "subject

to" opinions because they are misleading or inconsistent or because the market has other, superior, information, then auditing firms should not waste their resources determining if a "subject to" qualification is required. Although unlikely, it is possible that the market may ignore the "subject to" reports even when they are not misleading or inconsistent and can serve as a good predictor. Then it appears that the accounting profession may find it worthwhile to educate the public on the use and usefulness of their auditors' reports.

The following propositions are made in this thesis:

1. If the "subject to" reports generally predict correctly and are seen as relevant information to the financial market, then they are potentially beneficial and since the preparation of the report is not particularly costly, auditing firms should continue to provide this qualification when they deem necessary. Problems arise if the observed results were a self-fulfilling prophecy, that is, if the issue of the qualification itself causes a firm to go bankrupt. This possibility will be tested in chapter 4.
2. If the "subject to" reports predict at least as well as the prediction model, but are not seen as relevant information in the financial market, then this implies that investors do not understand the usefulness of auditors' "subject to" qualifications. Instead of eliminating the reports, the accounting profession should educate the public on their usefulness. It would be less costly to society for an

auditing firm to look into possible insolvency of a business and make the information public than for individuals and firms to carry out the task themselves for their private use.

3. If the "subject to" reports do not predict as well as the MDA prediction model, but are seen as relevant information in the financial market, then auditors should make use of the prediction model to help them decide if a qualification should be issued. This does not imply that auditors should issue the qualification depending on the outcome of the prediction model alone.

4. If the "subject to" reports do not predict as well as the prediction model and are not seen as relevant information in the financial market, then obviously the market has other information on the possibility of a firm becoming insolvent that is superior to the auditors' reports. Issuing the reports may be a waste of resources.

A word of caution is needed here. In order to determine if "subject to" reports should be eliminated, one must determine if they generate net positive social gains. However, the propositions above can be seen as a first approximation or rule of thumb regarding the usefulness of the "subject to" reports.

II. Literature Review

In March 1977, the Cohen Commission on Auditors' Responsibilities reached it's tentative conclusion that the requirement to express a "subject to" (ST) opinion be eliminated.[9] The following reasons were given to support their conclusion:

1. The responsibility of the auditor to include specific information on uncertainties in his report is inconsistent with his role in expressing an opinion on the presentation of other aspects of financial statements. Normally an auditor evaluates whether the financial information presented by management conforms with appropriate standards. But for uncertainties, the auditor is required to be a reporter and interpreter of financial information as well.
2. The meaning and significance of a "subject to" qualification are difficult to understand and confusing to users. The phrase "subject to" is ambigious and there is no way to tell if the auditor's intention is only to highlight information more fully disclosed elsewhere or to indicate a deficiency in the financial statement.
3. Some auditors are known to qualify their opinions for some material uncertainties and the absence of such qualification may lead financial statement users to believe a company

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[9]The same conclusion was made in the Commission's final report in 1978.

faces no uncertainties that could materially affect its financial condition. All companies, however, faces a variety of eccnomic risks.

4. The compliance with the requirement for qualifying an opinion because of an uncertainty provides little or no protection to the auditors when and if a firm liquidates.
5. There is no reason to believe independent auditors are able to predict accurately whether a company will liquidate.
6. A "subject to" opinion is not intended to be a prediction of liquidation, but many financial statement users apparently view it as such. Creditors often regard the "subject to" qualification as a separate reason for not granting a loan and thus the auditor's qualification tends to be a self-fulfilling prophecy.

A majority of the conclusions given above by the Commission were reached without any empirical evidence. That compliance with the requirement provided no legal protection was based on two legal cases. Altman and McGough's (1974) findings were used to support their conclusion that auditors are not better able to predict bankruptcy when compared to a bankruptcy prediction model.

Since then, a number of studies have provided some empirical evidence regarding points 2 and 5. The evidence as of today is however, not conclusive. These studies either use MBAR or survey techniques. The review of past studies in this chapter mainly deals with those studies that were at least partly

concerned with going-concern qualification. For a more thorough review of studies that were concerned with any or all different qualifications, see Estes (1982).

Market Based Accounting Research (MBAR) studies

Alderman (1977) :

Concluded that uncertainty qualification (he failed to differentiate the different types of qualifications) had little information value. His sample consists of 20 firms that received the qualification at least once during 1968-1971 and had clean opinions for the three years immediately preceding the initial qualification. A control sample of 20 firms that had only clean opinions during 1965-1974 were then chosen by a random process. The market model was used in this study, that is $R_{it} = a_i + b_i R_{mt} + u_t$ where R_{it} =return for security i at time t, R_{mt} =return for the market at time t and u_t=the residuals of the equation. The equation was run for the three year period preceding the first uncertainty qualification and the three year period subsequent to the initial qualification. The number of firms with a significant change [10] in the systematic risk component, or b, was two for both the experimental and the control sample. This led him to conclude that the ST qualification had little impact on market-assessed risk and therefore qualifications had little informational value. Besides the small sample size, it is unclear if he used daily, weekly or monthly returns data.

[10]At the 0.05 level.

Firth (1978) :

The impact of different qualifications on the market was studied using U.K. firms. Using the largest 1500 stock-exchange quoted firms, he found 247 firms with qualified opinions for the two year period 1974-1975. Of these, 35 were qualified for uncertainties with respect to going-concern. Using the market model and 60 monthly returns, ending one month prior to earnings announcement, the parameters of the model for each security were estimated. The residuals were then calculated for the period beginning 20 days prior to the release of the audit qualification and ending 20 days after the release. Since earnings and dividends announcements are made several weeks prior to the release of the published annual reports, the information on earnings (if any) will already be incorporated in the share price before the period studied. By assuming that this will isolate the information of the qualification itself apart from the aggregate financial statement, any market response subsequent to the date of release of the annual reports was attributed to the qualification. A control sample was formed where each qualified firm was paired with a "clean" firm in the same year, same industry and of approximately the same size in terms of market capitalization. For the experimental sample, there was a significant drop in the cumulative average residuals, which was almost instantaneous, while this was not the case for the control sample. This led him to conclude that there is significant price adjustment with respect to

"going-concern" qualifications. Significant price adjustments also took place for "asset valuation" qualifications but this was not the case for the other qualifications which were also examined.

Ball, Walker and Whittred (1979) :

They studied the market reaction to various forms of audit qualifications in Australia. Although they did not study "going-concern" qualifications separately, they found no significant[11] market reaction for their sample as a whole (that is, for all qualifications) using weekly returns. They also found no significant reduction in share prices when a valuation qualification is issued. Their sample consisted of 141 companies with 194 qualifications during the period 1961-1972. A point to note is that the sample excluded firms that were delisted prior to January 1973 as the firms were selected from the industrial lists of the Australian Associated Stock Exchange at January 1973. They argued that by selecting only firms that were not delisted during 1961-1972, they were attempting to control the information other than the opinion itself. Their sample is consistent with my Portfolio 2(b). However, by eliminating all firms that did fail during the period, they were eliminating firms where the ST opinion was correct but retained those where it was incorrect. They, therefore, could not address the issue as to whether the market reacts to those firms that did subsequently fail at the time the qualification was given.

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[11] At the 0.10 level.

Finally, I suspect few firms in their sample were qualified with respect to "going-concern". Firms that subsequently failed are more likely to be those that receive a qualification with respect to "going-concern", as is evident from my data [see Table 10, Chapter 4]. On top of this, only a small percentage of all qualified opinions are qualified with respect to "going concern". This percentage is merely 14% in Firth (1978) and 11% in Elliot (1982).[12] Even if there are a few firms that correspond to my Portfolio 2(b)[13], the use of weekly (instead of daily) security returns may not indicate any market reaction simply because the market readjusted after it had initially reacted. Remember again that this is a portfolio of firms that did not subsequently go bankrupt or become delisted. The results of my thesis indicate that the market corrected itself within a few days.[14]

Elliot (1982) :

A total of 145 firms with qualified opinions were selected, of which 16 were qualified with respect to going-concern and 46 with respect to asset realization. Factors other than the qualification itself that could affect security returns were controlled by using a matched sample. Firms were matched by

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[12]See Accounting Trends and Techniques where each year, the proportion of firms that received a ST opinion is small compared to firms that received other types of qualifications.

[13]Except that my analysis is based on prediction while theirs is based on actual bankruptcies.

[14]See chapter 4.

industry, the year each of the sample firms received a ST opinion and had the closest change in unexpected earnings. The measure used for unexpected earnings is that of Beaver, Clarke and Wright (1979). The unexpected earnings is the standardized forecast error (ESIT) defined as $ESIT=\Delta EPS-\overline{\Delta EPS}/\hat{\sigma}(\Delta EPS)$ where ΔEPS=year-to-year change in EPS (earnings per share) in the event year, $\overline{\Delta EPS}$=average change in EPS during prior years and $\hat{\sigma}(\Delta EPS)$=estimated standard deviation of the changes in EPS.[15] Elliot chose the date of disclosure of the ST qualification as the date the Wall Street Journal (WSJ) released the earnings of the firm in question.[16] This was done as information about a qualified opinion receives uneven distribution, depending on whether a particular case appears newsworthy to the news media. Explicit reference was made to the qualified opinion in WSJ in only 14 of the 145 firms that he checked. There were only two cases in which the announcement of the qualified opinion accompanied the earnings release. The cumulative average residuals (CAR) were then calculated for the samples using the market model. The t-test was used to determine if the residuals of the two samples were significantly different. With respect to going concern and asset realization qualifications, he found

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[15]The average and standard deviations were based on the prior 10 years of earnings if available. ESIT was calculated for all Compustat firms before they were matched.

[16]Observe that the choice of event date is the direct opposite of Firth (1978).

significant[17] market response prior to the issue of the qualifications but not on or after that date. No market reaction was found for qualifications with respect to pending litigation. He interpreted his result as suggesting that certain uncertainties have economic significance, but market participants learn of them and assess their implications before the auditor's opinion is available. His result also suggests that the litigation qualifications are associated with less substantial economic events than either going-concern or asset realization qualifications. Perhaps rightly, Elliot suggested that his paper did not resolve the question of the information content of ST opinions. This was because he found that he could not determine the actual event date when the ST opinions were first disclosed.[18] He, however, concluded that since ST opinions receive little attention from the financial press, it implies that they are of modest information value.[19]

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[17] At the 0.01 level.

[18] Observe that the event date used by Elliot was correct only in 2 cases out of 145 firms, or less than 1.4%.

[19] This argument may be a tautology and it assumes the financial press knows what is useful or relevant information.

Survey Studies

Fess and Ziegler (1977) :

Their survey covered 118 responses from financial analysts, 214 from bankers and 188 from individual shareholders. They asked two questions concerning readership of the auditor's report and one question concerning understanding of it. The questions and answers were as follows:

TABLE 2

READERSHIP AND UNDERSTANDING OF THE AUDITOR'S REPORT.

	Financial Analysts	Bankers	Shareholders
(a) "How often do you look for the auditor's report when examining the annual report of corporations?"			
Always	55.1%	87.4%	40.4%
Often	23.7	7.5	22.9
Sometimes	16.1	3.7	21.8
Almost Never	5.1	1.4	14.9
(b) "How carefully do you read the auditor's report?"			
Carefully	28.0%	69.2%	27.3%
Hurriedly	70.3	30.8	56.9
Note that it is there	1.7	0.0	15.8
(c) "How well do you believe you understand the auditor's report?"			
Completely	41.9%	49.3%	33.3%
Most of it	53.0	49.3	52.0
Much of it	4.3	1.4	12.6
Do not understand it	0.8	0.0	2.1

It is difficult to interpret the above results and one must depend on prior belief and expections. The only clear conclusion is that the respondents do look at or look for the auditor's report.

Shank, Dillard and Murdock (1978 and 1979);

Shank, Dillard and Bylinski (1979):

In these three studies, the same approach was used except that

the people surveyed differ in each case. The three studies together produced 304 responses from bank loan officers, 207 from chartered financial analysts and 307 from corporate financial officers.

A questionnaire with 8 contingency situations taken from actual annual reports was mailed to the participants. They were provided with 5 options for disclosing the contingency. These were:

1. no reference,
2. disclosure in the unaudited section of the annual report,
3. footnote disclosure,
4. footnote disclosure plus a three-paragraph ST audit opinion, and
5. disclaimer.

Among other things, the respondents were asked to state their preferred disclosure and to indicate how the several contingencies should be disclosed. The results of these studies are in Table 3. They interpreted the result as indicating that ST opinions provide useful information and hence are valuable extensions of the auditor's attest function. However, they noted that the respondents in their survey do not understand the way auditors handle contingency situation. They argued that this confusion among users of financial statement does not warrant the elimination of ST opinions. Instead, they argued for a program to educate financial statement readers.

TABLE 3

PREFERRED DISCLOSURE FOR SEVERAL CONTINGENCIES.

Preferred Disclosure: Percentage of responses specifying a qualified opinion or disclaimer of opinion should be used.

	Bank Loan Officers		Financial Analysts		Corp.Finan. Officers	
Cases	Qual. Opin.	Discl.	Qual. Opin.	Discl.	Qual. Opin.	Discl.
Asset Realization	51.4%	13.5%	48.1%	11.4%	44.0%	N.A.
Litigation	53.9	26.0	53.6	21.9	68.0	N.A.
Going Concern	57.7	25.3	59.5	22.7	73.0	N.A.
Less Severe	47.6	14.1	42.2	10.5	39.0	N.A.

A comparison of how disclosure should be provided from the respondents with the actual disclosure used in the annual report provided the following results.

Respondent	Bank Loan Officers	Financial Analysts	Corp.Finan. Officers
preferred a higher level of disclosure	46.2%	40.1%	31.5%
choice agreed with actual level	39.3	44.2	48.1
preferred a lower level of disclosure	14.4	15.7	20.4

Estes (1982):

Subjects were given the financial statements of a hypothetical company. For each of the financial statements, they were provided with either no auditor's opinion, a standard or various forms of nonstandard audit-report. The audit qualifications when provided relate to a pending lawsuit. The subjects in this study came from a wide variety of backgrounds; institutional investors, analysts, shareholders and students totalling 1,359 respondents (about 41% of which are students). The survey method used is the Post-test-Only-Control-Group Experimental Design. It has the following form:

R X O1

R X O2

where R represents random assignment of subjects

X represents the experimental treatment

O represents the observation on the subjects.

Since responses by the subjects may not be due only to the stimulus in question, control variables were used. Estes uses a total of 14 control variables, such as age, business experience, years of college work, actual wealth invested in the different financial markets and so on.[20] The subjects were also asked to make decisions on the following:

1. Income projection for the firm
2. Share-price estimate

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[20]See Elias (1972) and Hendricks (1976) who used similar control variables in their survey studies.

3. Company evaluation

4. Management evaluation

5. Investment decision

6. Confidence rating

7. Assessment of fraud

Multiple regression analysis was used. The control variables along with a dummy variable denoting the audit form were used as the independent variables with the decision variables as the dependent variables. He found that the audit report has little effect on investor decisions and attitudes. The results were also not significantly different for the various forms of nonstandard audit reports. His finding, that the audit report has little effect on investor decisions, may not be of much interest in this study as this thesis addresses going-concern qualification. His other findings that different forms of nonstandard audit opinions have no significant effect on investor's decisions should be of much interest. This will be elaborated later in this chapter.

Predictive Ability of ST opinion studies

Altman and McGough (1974) and

Altman (1982)

The same approach was used in both of these studies. In Altman and McGough's paper, 34 companies that entered bankruptcy proceedings during 1970-1973 were used, while 37 companies that failed during 1974-1978 and 44 companies that went bankrupt

during 1979-1982 were used in Altman's study. The annual reports for the two years prior to the date of bankruptcy were examined to determine the nature of the auditors' opinions. The predictions using the ST opinions, that is, whether or not the company received a ST opinion, were then compared to the predictions using a MDA model. The results are presented in Table 4.

General Comments

In order to address the policy issue as to whether the ST opinions should be eliminated, one must come up with some general propositions that are reasonable and generally accepted by researchers in this area.[21] Otherwise, it would be like ten blind men describing various parts of an elephant. No conclusion can ever be achieved. I believe the framework for analysis regarding elimination of ST opinions has been set by the Cohen Commission. Their reasons for elimination of ST opinions should be addressed by any study that prescribe a rejection or acceptance of the Commission's conclusion. The studies cited earlier have not done this. They have neither put forward general propositions nor have they systematically tested the reasons of the Commission. The contribution of the studies to date is more in their methodology than in their results. The studies have refined the various research methods, and may shed some light on the most appropriate method for each situation. It

[21] Short of coming up with a social welfare function.

TABLE 4

COMPARISON OF THE MDA MODEL TO THE AUDITORS' OPINIONS.

Samples	1 year prior to Bankruptcy: Number of Firms	1 year prior to Bankruptcy: %	2 years prior to Bankruptcy: Number of Firms	2 years prior to Bankruptcy: %
1970-1973 sample:				
Predicted Bankrupt	23	82.1	19	57.6
ST opinion	13	46.4	7	21.2
Total	28		33	
1974-1978 sample:				
Predicted Bankrupt	30	81.1	27	73.0
ST opinion	22	59.5	5	13.5
Total	37		37	
1979-1982 sample:				
Predicted Bankrupt*	41	93.0	34	76.0
ST opinion	17	40.0	9	21.0
Total	44		43	

*it is not clear if ex-ante prediction was used in this case.

is also clear from those studies that all uncertainty qualifications should not be treated in the same way. Rather it is necessary to test them separately.

There is no reason why the use of the MBAR method should preclude the use of survey techniques or vice-versa. In fact, the two should be used as complements, as each of these methods is most appropriate in different situations.

The problems of using the MBAR method are as follows:

1. The date of impact is difficult to identify.
2. It is restricted to analysis of aggregate data.
3. Only a limited number of opinion forms are generally released. As such, some forms are issued too infrequently to provide an adequate basis for statistical analysis.
4. It cannot study the differential effect of an audit and the auditor's standard opinion on users of financial statements. To do this, a control group of unaudited statements would be needed. Yet all listed companies must produce audited statements.
5. The observation of a market reaction could be due to other information that occurs at about the same point in time. The converse is also true. If no market reaction is observed, it does not necessarily mean that the event in question has no information content. An event which causes the market to react in the opposite direction may occur at about the same period.

Likewise, the survey techniques are not without problems. The main ones are:

1. The difficulty in securing a respectable number of respondents.
2. The lack of real economic incentives and
3. One can never know with any degree of certainty whether the observed behaviour is a result of the experimental treatment or other factors. Estes (1982) and Elias (1972) tried to control for these "other factors", but there are innumerable possible "other factors" to account for.

The MBAR studies to date have failed to isolate the information content of the ST opinion from the aggregate financial statement, as correctly pointed out by Bailey (1982). Using only earnings as a control is clearly not appropriate. We are dealing with the possibility of insolvency, and not profitability.[22] The research method proposed and used in this thesis has, for the first time, makes a real attempt to overcome the above problem. The proposed method does not, however, overcome all problems with MBAR studies. It is almost impossible to study the effects of different forms of nonstandard audit reports on investment decisions using the MBAR method. Here is where a survey technique like that of Estes should be used. On the other hand, the usefulness or information content of ST opinions can be judged only by looking at the real decisions

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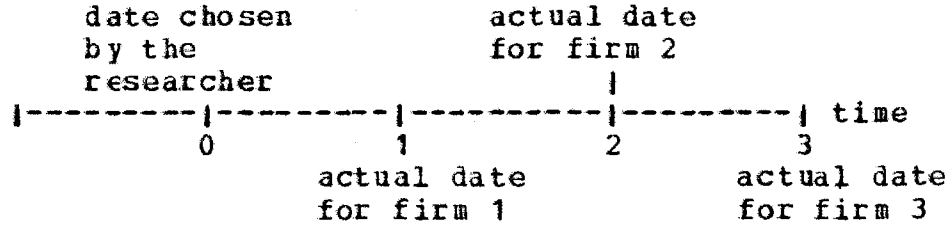
[22] I realise profitability affects solvency in the long-run but they are not the same in the short-run.

taken by the users of financial statements, and this is an almost impossible task for survey techniques. Even the MBAR method could not study individual users' reactions. Finally, there is the problem with identifying the date of impact in MBAR studies. This problem is however not an impossible one to handle. All we need to know is the approximate date of impact. An example could perhaps best illustrate this point.

FIGURE 1

USING THE APPROXIMATE DATE OF IMPACT IN MBAR STUDIES.



Firms 1 to 3 make up the experimental sample.

For simplicity, let's assume that the actual impact causes

a -0.2 residuals on the day of impact

a -0.1 residuals on the day after the impact and

a 0.0 residuals prior to and subsequent to the above mentioned days.

What would our average and cumulative average residuals be?

DAY	AVERAGE RESIDUALS	CUMULATIVE AVERAGE RESIDUALS
-1	0.0	0.0
0	0.0	0.0
1	-0.067	-0.067
2	-0.1	-0.167
3	-0.1	-0.267
4	-0.033	-0.3
5	0.0	-0.3
6	0.0	-0.3

Is the above result statistically significant? The answer surely depends on the time period we chose to use (which of course depends on how well we can approximate the actual date). In this example, we approximated the date of impact at t=0. The result is clearly significant at α=0.025.[23] Note that in this example, the "predicted" date of impact is incorrect for all cases. However, the results are statistically significant, as would be expected if we knew the exact date of impact. This example also illustrates another important point in MBAR studies. By looking at the results above, one would likely interpret that the market has a lag in response to the event in question. The market response begins at either t=1 or t=2 when the "predicted" event date is t=0. Also, the market appears to take 3 or 4 days to fully adjust to this new information. Conclusions such as that above are clearly not warranted unless the researcher can fully demonstrate that the correct date of impact has been identified. This is impossible in most research. Bear in mind that the impact date need not be the day certain users receive that

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[23] Where the observations t=0 to t=4 are used. It has a mean of -0.06 and a standard deviation of 0.0435. The t value is -3.0848 with 4 degrees of freedom.

information in the mail. They may take two days to open their mail. Short of identifying the exact date, the results should be interpreted as an indication of the direction of market response, if any, around the researcher's "predicted" date of impact.

Prediction versus Classification

Classification or ex-post discrimination in MDA refers to cross validation. Prediction means to foretell the future. This can be illustrated as follows:

FIGURE 2

PREDICTION VERSUS CLASSIFICATION.

PAST	t=0	FUTURE	time
Models are built in this period using ex-post data. The relevant variables and their coefficients are established. A different sample from this period could be used to determine the classification accuracy of the models.		at t=0 (now), the researcher can use the models already created at t<0 to predict the future, t>0. Keep in mind that at t=0, the dependent variable (the event being predicted) is not yet known. Only the independent variables are known at t=0. Comparing the prediction at t=0 with actual events at t>0 gives the predictive accuracy of the models.	

Past studies using MDA models have not recognized this point. An example is Altman's 1968 study. Using a sample of firms (sample A1) from 1946-1965, a discriminant function was estimated. A new sample of firms (sample A2) obtained from the same period, 1946-1965, was used to cross validate. Altman concluded that he had successfully predicted bankruptcy based on

the cross validation results.

An immediate question that comes to mind is, how can predictive accuracy ever be known except in the future? The approach used in this thesis is to make use of a research time frame.[24] This will be discussed in Chapter 3. A point to note is when "prediction" is used in this thesis, it always refers to ex-ante prediction using the MDA model and "classification" refers to ex-post discrimination or cross validation. For convenience, the notation P(B) is used to refer to ex-ante prediction of bankruptcy using the MDA model and P(NB) refers to ex-ante prediction of non-bankruptcy.

Prediction of Bankruptcies using MDA studies

The study by Altman (1968) pioneered the used of MDA in solvency evaluation. Beginning with a total of 22 financial ratios, 5 of these were selected as doing the best overall job in the ex-post validation of bankruptcies. These ratios, together with the classification accuracy of the model are shown in Table 5. Meyer and Pifer (1970) introduced financial data from more than one period prior to failure by regressing each financial ratio on time and determining the trend and shift away from the trend in the period prior to failure. Although the Meyer and Pifer model was more complex, it performed worse in ex-post classification of bankruptcies than Altman's simpler

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[24] See McDonald (1977) for a discussion of prediction in research time.

TABLE 5

A SUMMARY OF PAST STUDIES THAT USES MDA MODELS.

Fraction of sample that is misclassified:

Years before Failure	Study: Altman (1968)	Deakin (1972)	Sinkey (1975)	Altman (1977)
1	0.16	0.22	0.25	0.09
3	0.52	0.12	0.35	0.18
5	0.64	0.15	n.a.	0.2
sample size	66	64	110	111

The misclassification error is for the holdout sample.

Ratios used in the studies above:

Beaver	:Cash flow/TD
Altman	:EBIT/TA,Sales/TA,Stock/TD,RE/TA,WC/TA.
Deakin	:WC/TA,CA/CL,TD/TA,QA/Sales,QA/TA,Cash/TA, :Cash/TA,CA/TA,Cash/CL,NI/TA,CA/Sales,Cash flow/TD.
Sinkey	:Other expenses as %R,Loan as %R,OE/Operating :income,Loans/(capital+reserve),state and local :obligations as %R,(cash+U.S.treasury securities)/ :TA,Loans/TA,Provision for loan losses/OE,U.S. :treasury securities as %R,interest paid on :deposit as %R.
Altman et al.	:RE/TA,Standard deviation of EBIT/TA around a ten :year trend,Stock/TC,CA/CL,log of TA,EBIT/TA, :log of EBIT/Total interest payments.

CA =current assets
CL =current liabilities
EBIT =earnings before interest and taxes
NI =net income
QE =operating expenses
QA =quick assets
as %R =as a % of revenue
RE =retained earnings
Stock =total market value of common stock in Altman et.all and common plus preferred stock in Altman
TA =total assets
TC =total capital
TD =total debt
WC =working capital

1968 model when tested on the same data set by Collins (1980). Edmister (1972) used a linear MDA model to classify small business failure, and he introduced industrial classification and trends in financial ratios as discriminating variables. It is difficult to determine the success of the model since his use of dummy variables as the descriptive variables clearly violates the multivariate normality assumption [Ohlson, 1980, p.112], and the hypothesis that the variance-covariance matrix are the same for the two groups will most likely always be rejected [Eisenbeis, 1977, p.881]. The effect of this violation may bias the test of significance and the estimated error rates [Eisenbeis, 1977]. The predictive ability of his model is unclear as no ex-ante predictions of bankruptcy were made in his paper.

Moyer (1977) compared Altman's 1968 model with an alternative MDA model which uses Beaver's (1968) cash flow/total debt and Lev's (1971, 1974) balance sheet decomposition measure. He found that Altman's model outperforms his alternative MDA model in classification accuracy. However, he also found that better explanatory power could be achieved if two of the variables, namely market value of equity/book value of debt and sales/total assets were eliminated from Altman's model. Altman et al. (1977) using a number of different variables from Altman's original study, found their new model outperforms Altman's original in terms of expected cost criteria using prior probabilities of group membership and expected cost of error

estimates derived from commercial bank lending errors. That is, it takes into account the fact that only a small percentage of all firms actually fail and the cost of Type I (bankrupt firms predicted to be solvent) and Type II errors (solvent firms predicted bankrupt) are not equal. This comparison was again based on ex-post classification accuracy.[25] Finally, Dambolena and Khoury (1980) found that variability or standard deviations are important descriptive variables in their ex-post classification of bankrupt and non-bankrupt firms.

Among the most important criticisms of the studies above is that of Joy and Tollefson (1975), who argued that most of the studies do not perform ex-ante validation. Johnson (1970) also pointed to the fact that the models are static while bankruptcy is dynamic in nature.[26] General criticisms of the application of MDA and the effects of violating its assumptions are discussed in Eisenbeis (1977) and Richardson and Davidson (1983). This study will attempt to overcome the above criticisms, in part, by using ex-ante prediction in research time, as stated above. Other steps taken to overcome the above criticisms include testing for the equality of the variance-covariance matrices, before a linear MDA model is used.

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[25]Comparison was also made by Altman et al. using a mixture of predictive and classification accuracy. As this does not really make sense, it is ignored in this thesis.

[26]It is argued in this thesis that the use of variances and trends of financial ratios is dynamic in a sense. For inter-temporal models, see Tinsley (1970), Wilcox (1971, 1973) Santemero and Vinso (1977), Vinso (1979) and Scott (1976, 1977, 1981).

Although the model continues to be static in nature, the variance of (net income/total asset) is used as a dynamic component. Furthermore, inter-temporal models have so far proven to be less effective than static models. Finally, Ohlson (1982) complained that some researchers have used data subsequent to a firm filing Chapter X or Chapter XI of the Bankruptcy Act. This causes a bias in their results. The daily returns data from CRSP were used in this thesis to check for delisting of the sampled firms, which avoids using data for firms after they have technically failed.

Brief Summary

From the survey of the literature in this Chapter, the following seems to have been established:

1. The market response to the different types of qualifications differs significantly. The greatest response, if any, is with respect to going-concern reservations in the audit opinions.
2. The predictions of MDA models outperform those of ST opinions in predicting solvency.
3. The MDA model has been successful in ex-post classification and ex-ante prediction[27] of business failures. It, therefore, appears to be an effective method of using information from the financial statements to predict

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[27]Although it is true that few studies so far have performed ex-ante predictions.

solvency of companies.

The information content of ST opinions is uncertain. Contradictory evidence has been reported, irrespective of whether the MBAR or the survey technique was used. This could, in part, be due to the use of inappropriate research designs.

Finally, the self-fulfilling prophecy of issuing a ST opinion seems never to have been tested. It had been mentioned, even assumed to exist, in some studies [example, Altman (1983) and Cohen Commission (1977-1978)] and implied not to be present by others [example, Libby (1979) and Estes and Reimer (1977)] but it has not yet been explicitly tested.

The contribution of this thesis is mainly in two areas. Firstly, it represents the first real attempt to study the information content of ST opinions in isolation from the information in the financial statements, the methodological failure of past studies using the MBAR approach. Secondly, a clarification is also made on the methodological issue of ex-post classification and ex-ante prediction. A simple statistical test is also performed on the validity of the self-fulfilling prophecy.

III. Research Design

This chapter discusses the sampling procedure and the research method employed in this thesis. When necessary, the justification for using a particular analysis will be discussed.

The sample

An initial sample of 46 firms which met the following criteria was obtained from the Compustat Annual Research tapes: The firms were all

1. listed as liquidated,
2. classified as a manufacturing firm,
3. issued their last financial statement from 1971 to 1980, [28] and
4. listed in the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) before liquadation. [29]

These firms were then cross-checked with the Centre for Research in Security Prices (CRSP) tapes which indicated that the daily security return data for 3 of the firms in the sample were not available. This was followed by selecting a matched sample of 43 non-bankrupt firms, obtained from the Compustat Annual

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[28] The firms actually went bankrupt from 1972 to early 1983. This period was used in order to have sufficient observations to calculate the variance of certain financial ratios, noting that Compustat only provide 20 years of annual data.

[29] The Compustat research tape have data only for firms that were listed in these exchanges before they liquidate.

Industrial Tape.[30] The matching was performed in the following manner:

1. The firms are all manufacturing firms.
2. Individual firms were matched up to the 4 digit Standard Industrial Classification (SIC) code whenever possible.
3. Within the same industrial classification, firms were randomly selected.[31]
4. The firms must also be listed on the NYSE or the AMEX and daily security return data must be available in the CRSP tapes.
5. Once the matched firm has been found, the data used were for the same year as that for the failed firm.

A point that should be emphasized is that firms were not matched by asset size, as this might turn out to be an important predictor of business failures as observed by Altman et al. (1977) and Ohlson (1980).[32]

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[30] See Appendix A for the firms in the two samples.

[31] One assumption of using sample data with discriminant analysis (MDA) is that each group is drawn at random from independent samples [Deakin, 1972, p.172].

[32] That is, asset size may be a significant factor for predicting business failures and may therefore be used as an independent variable.

The Statistical Method

Multiple discriminant analysis (MDA) is a statistical technique [33] and is introduced in this thesis as a control for the information content of financial statements. MDA does not use a single figure from the financial statements, but instead uses a combination of figures (more precisely, financial ratios) that could discriminate between firms that are going concerns and those potentially insolvent. It uses not just the profitability, but also the leverage, liquidity and activity ratios. In other words, an entire profile of characteristics common to the sample firms, as well as the interaction of these characteristics, is taken into account. By using the predictions of this model to control for the information content of financial statements, the market response to firms that receive a ST opinion but P(NB) can be used as an indication of the information content of the ST opinion, isolated from the information content of the financial statements. The assumptions of MDA are as follows: [Eisenbeis and Avery, 1972]

1. The groups under investigation (bankrupt and non-bankrupt firms) are discrete and identifiable.
2. Any observation in any group is susceptible to description by a combined set of measurements of several variables.
3. These descriptive variables have multivariate normal distributions in each population.

To use a linear MDA model, an additional assumption is that the

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[33] See Appendix H for the theory of MDA.

population dispersion matrices be equal. The Box-M test will be used to test the hypothesis of equal dispersion matrices (variance-covariance matrices). If this hypothesis is rejected and the sample size is large, a quadratic rule should be used [Eisenbeis and Avery (1972) and Eisenbeis (1977)].

Although the use of financial ratios will most likely violate the multivariate normality assumption, [Eisenbeis, 1977, p.877], Gilbert (1968) found that there is only a small loss in predictive accuracy.[34]

Footnotes Disclosure

An important point stated in chapter 1 that should be elaborated, is the inclusion of footnote information as part of the analysis of financial statements, and not as a separate category. An immediate question arises, does the market respond differently for firms that receive a ST opinion and some or all of the reasons stated in the footnotes, as compared to a firm where only a ST opinion is issued without the footnotes disclosure, or as compared to a firm that did not receive a ST opinion but with similar information disclosed in the footnotes? In other words, if the information is already stated in the footnotes to the financial statements, is there any additional

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[34]One could take logarithms to transform the variables, but this restricts one to the use of positive values only. Furthermore, logarithmic transformations may change the interrelationships among the variables, and give less weight to equal percentage changes in a variable when the values are larger than when they are smaller [Eisenbeis, 1977].

information content by issuing a ST opinion? A going-concern qualification is not issued for a single factor or a few factors independent of each other (as is the case for litigation qualification for example) but rather, it is issued for a combination of these factors. Factors that tend to contradict the going concern assumption (that is, factors that could cause a going concern qualification) and those that mitigate against these factors are stated in the Statement on Auditing Standards Number 34. It is the evaluation and trade-offs of all these factors that are relevant for the auditor in his decision to issue a ST opinion. Thus, the disclosure of some of these factors in the footnotes is but one piece of relevant information. This information in itself, such as current year's net loss, is no cause for believing that a firm will become bankrupt. Of course it is possible that if all the reasons used by the auditors are stated in the footnotes, it may make the ST opinion by itself irrelevant. Also, note that ST opinions are sometimes given without any reference to a footnote, that is, none of the reasons are disclosed in the footnotes of the financial statements. This study does not control for the footnote information itself, believing that much of that information, like ability to pay interest, is well captured by the MDA Model used in this study. It is also believed that there is a difference in the degree of uncertainty, at least as perceived by that particular auditor, when a ST opinion is issued rather than just disclosing the factors in the footnotes.

There is some evidence in this thesis that the financial market may react differently to the different forms of disclosure. In Chapter 4, the results indicate that the market reacts only in portfolios where the firms were issued a ST opinion. No market reaction was observed for firms that were P(B) and had no ST opinions, even for those firms that actually went bankrupt (Portfolio 3A). It is reasonable to assume that many of these firms in Portfolio 3A may receive some footnote disclosures on the possibility of the firm not being able to meet its obligations, or that the assets do not reflect realizable value because of going-concern uncertainties. A tentative conclusion can, therefore, be reached that the market may react differently to the different forms of disclosure. This is likely due to the fact that they are perceived to reflect different degrees of uncertainty.[35]

Building a bankruptcy prediction model

Keeping in mind the difference between ex-post classification and ex-ante prediction discussed in last chapter, the model used in this thesis is a prediction model. Past observations of the independent and dependent variables are

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[35]It is unfortunate that such a test could not be carried out by identifying exactly the firms that received the equivalent or almost equivalent footnote disclosures for the going-concern uncertainties, as the entire financial statements of these firms are not readily available. Only the auditor's reports for each of the firms in the sample were photocopied, from the Public Reference Room of the Securities and Exchange Commission at Washington D.C.

first used to create a prediction model. The researcher is then placed at research time t=0 (where t=0 is subsequent to the time period where the model was built). At t=0, the independent variables of some firms are observed. Say for example, Firm A's financial statements became publicly available at December 31, 1975 (t=0). At this point, the researcher predicts the dependent variable (that is, P(B) or P(NB)) using the model already created. The actual outcome of the dependent variable is of course not known at December 31, 1975. The actual time for the researcher could be May, 1984 but this is no longer relevant. Only subsequent to t=0 (Dec. 1975 in this case) will the dependent variable be known. Otherwise, the model will not be a prediction model. This is shown in Table 6 below:

TABLE 6

MODEL BUILDING

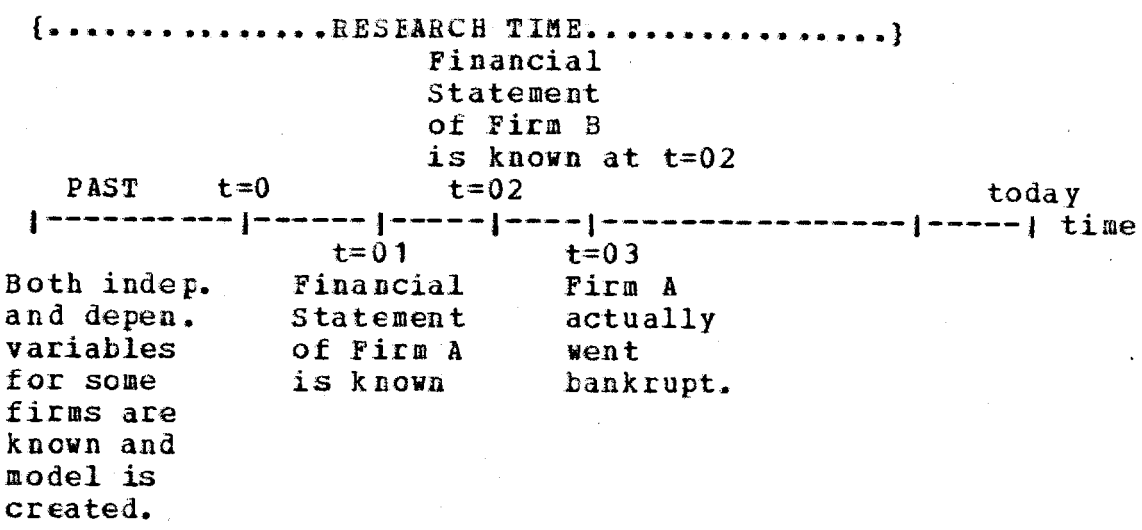
INDEPENDENT VARIABLES OBSERVED AT	DEPENDENT VARIABLE OBSERVED AT	
	t<0	t>0
t<0	Classification Model	Predictive Model
t>0	NULL	Classification Model

If the researcher is at actual time May 1984, he would know the outcome of the dependent variable given the benefit of hindsight. The predictive accuracy of the model can, therefore, be determined. It is still a predictive model given that the predictions were made at t=0 based on only the information that was available at that point in time. The above is duplicated over and over again for each firm by simply shifting the

research time t=0 forward. This is illustrated below:

FIGURE 3

AN ILLUSTRATION ON THE USE OF RESEARCH TIME.



At t=01, the independent variables for Firm A are known. A prediction is made at this point to predict the dependent variable of Firm A which is as yet unknown. The information used is the information provided at t=01 and all past information. The model used is the model created before t=01, that is, the variables plus the coefficients of the model must already be estimated before t=01, and the information at t=01 cannot be used to update the model to predict Firm A. The information at t=01 can, however, be used to update the model but, only to predict the dependent variable subsequent to t=01. Following the rationale above, a prediction of the dependent variable of Firm B is made at t=02. That is, the researcher is now at t=02. At t=03, the actual outcome of the dependent variable for Firm A is known and a comparison can be made with the prediction at t=01. Given our hindsight in actual time, we know that Firm B did not

fail and a similar comparison is made with the prediction at t=02. Thus, the predictive accuracy, in an ex-ante sense, of a model can be determined.

A total of sixteen descriptive variables, found relevant in past studies, were formed from the financial statements data for each firm. They are listed in Appendix B. From the total sample of 86 firms, 22 were used for analysis (those firms that published their last financial statement during the period 1971 to 1973 and their matched pair) and 64 used for prediction (those firms that published their last financial statement during the period 1974 to 1980 and their matched pair). This is as shown below:

FIGURE 4

A SUMMARY OF THE ANALYSIS AND PREDICTION STAGE.

Jan. 1971	ANALYSIS STAGE	June 1974 t=0	PREDICTION STAGE	Dec. 1983	Real Time
	11 firms that failed during Jan. 1971 to June 1974 and their matched pair were used in the analysis stage to build the model. Both the independent and the dependent variables are known.		32 firms that failed during July 1974 to Dec. 1983 and their matched pair were used in the prediction stage. Once the model was built at t=0, t=0 is then moved forward to the time when the financial statements of these 64 firms are available. Once the statements are available, a prediction is made. Information subsequent to that date is not used in the prediction.		

To summarize, the discriminant function[36] built in the analysis stage is applied to the prediction sample.

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[36]There is only one function since I have only two groups: solvent and insolvent firms.

Analysis Stage

The Statistical Packages for the Social Sciences (SPSSX) computing program was used to perform the discriminant analysis. The Wilks' step-wise method was initiated to reduce the number of descriptive variables. This is necessary since accounting ratios are expected to be multicollinear, as they come from a common set of financial accounts [Edmister, 1972]. The effect of applying highly multicollinear independent variables generally results in parameter estimates that are markedly sensitive to changes in model specification and sample coverage. Forecasting successfully with multicollinear variables requires not only the perpetuation of a stable dependency relationship between the dependent and the independent variables but also the perpetuation of a stable interdependency relationship within the independent variables [Farrar and Glauber, 1967]. The criterion is therefore to select a set of variables that minimizes the overall Wilks' lambda (which is an F and χ^2 test of the significance of group mean differences). The effect is to maximize the separation of the groups.

The results of the Box-M test support the hypothesis that the variance-covariance matrices of the two groups are not significantly different [37] and therefore, a linear MDA model will be used. Using the 22 cases, the following variables were

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[37] At the 0.01 significant level.

found to be relevant: (i) Quick Ratio, which is a measure of the firm's liquidity, (ii) Debt-Equity Ratio, which is a measure of the firm's leverage, (iii) Net Income to Total Debt, which is a measure of the firm's profitability, and (iv) Total Assets which is use to measure the firm's size. The precise specification is given in Appendix B. The unstandardized and the standardized discriminant function coefficients and the group centroids (that is, the discriminant function evaluated at the group means) are given in Table 7.

TABLE 7

DISCRIMINANT FUNCTION COEFFICIENTS:

VARIABLES	STANDARDIZED	UNSTANDARDIZED	EXPECTED SIGNS
1.Quick Ratio	0.35496	0.8594176	(+)
2.TD/TA	-0.54843	-3.572309	(-)
3.NI/TD	0.48133	1.533873	(+)
4.T.A.	0.41870	0.002404785	(+)
Constant	N.A.	0.4651458	N.A.

GROUP CENTROIDS:

Group 1	(Bankrupt firms)	-1.48730
2	(Solvent firms)	1.48730

where
TD/TA = Total Debt to Total Assets
NI/TD = Net Income to Total Debt
TA = Total Assets
See Appendix B for a precise specification of these ratios.

The coefficients of the function all have the expected signs. Greater liquidity implies less risk while greater leverage has the opposite effect on risk. Higher profitability helps the firm to keep solvent, especially in the long run. Finally, firms that are large face less risk of becoming insolvent. Governments and banks are more reluctant to let such a firm fail (Chrysler is a perfect example) for political reasons as well as the amount of

loans that have already been made. As such, they usually have more avenues to raise capital, and historically, fewer of them failed.

Prediction Stage

Table 8 presents the accuracy of the model using the last, second last and third last financial statements before failure as well as the Type I and Type II errors in each of the predictions. The results do not explicitly incorporate the cost of Type I and Type II errors and assume equal probability of failure and non-failure for firms. One could correct for this by setting a new cut-off discriminant score which separate the two groups taking into account the differential cost of Type I and Type II errors as well as incorporating prior probabilities of failure or non-failure rates. This new cut-off score or Z^{38} is equal to $\log (P1)(C1)/(P2)(C2)$ where P1 and P2 are the probabilities that a firm belong to group 1 (bankrupt) or group 2 (non-bankrupt) respectively. C1 is the explicit cost of Type I error or investing in (lending to) a firm that went bankrupt and C2 is the cost of Type II error or cost to the investor (lender) of predicting that a firm will go bankrupt when it remains solvent. The variables P1, P2, C1 and C2 will be different depending on the time, the industry being considered, individual tastes and preferences and so on. Following Altman et al.

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[38]See Appendix H for further explanation and mathematical proof.

TABLE 8

THE RESULTS OF THE PREDICTION:

(A) USING THE LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	32	27 (84.4%)	5 (15.6%)
Non-Bankrupt	32	4 (12.5%)	28 (87.5%)

Percent of cases predicted correctly:85.95%

(B) USING THE SECOND LAST FINANCIAL STATEMENT BEFORE FAILURE.*

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	25	18 (72.0%)	7 (28.0%)
Non-Bankrupt	26	0 (0.0%)	26 (100%)

Percent of cases predicted correctly:86.27%

(C) USING THE THIRD LAST FINANCIAL STATEMENT BEFORE FAILURE.*

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	22	12 (54.55%)	10 (45.45%)
Non-Bankrupt	24	0 (0.0%)	24 (100%)

Percent of cases predicted correctly:78.26%

*The number of total firms is less than in (A) because 13 of the firms issued their 2nd last financial statements during 1973 and 18 firms issued their 3rd last financial statements during 1972.

(1977), we use estimates of P1=0.02 and P2=0.98. Altman et al. estimated that C1=0.7 and C2=0.02 for commercial banks. For individual investors, C1 is expected to be greater than 0.7, and since C2 is the opportunity cost of not investing in the firm that was predicted to go bankrupt but did not, C2 could be as low as zero if as profitable a return could be obtained from other investments. Since it is generally believed that higher risk investment generates a higher return, C2 equal to a positive value of 0.01 appears reasonable. A rough guess of C1=0.9 for individual investors is made. The associated Z value is 0.264. Firms with a discriminant score of less than 0.264 will now be classified as bankrupt. Table 9 shows the results of using this new rule. A consequence of using this new rule is that Type I errors are reduced, since a higher cost has been attached to it. There is also a slight overall improvement compared to the results in Table 8, but as indicated above, there is no reason to choose one Z score over another. The reason for using the above analysis is to show that personal tastes, preferences and so on could also be built into the model if desired.

We feel the accuracy of this MDA model justifies the use of its prediction to control for the information content of financial statements.

TABLE 9

THE RESULTS OF THE PREDICTION: USING A NEW CRITERION. i.e. using explicit cost of error estimates and different probabilities of prior group membership. Z=0.264

(A) USING THE LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	32	29 (90.63%)	3 (9.37%)
Non-Bankrupt	32	5 (15.63%)	27 (84.37%)

Percent of cases predicted correctly:87.50%

(B) USING THE SECOND LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	25	19 (76.0%)	6 (24.0%)
Non-Bankrupt	26	0 (0.0%)	26 (100%)

Percent of cases predicted correctly:88.23%

(C) USING THE THIRD LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	PREDICTED GROUP MEMBERSHIP BANKRUPT	NON-BANKRUPT
Bankrupt	22	14 (63.64%)	8 (36.36%)
Non-Bankrupt	24	3 (12.5%)	21 (87.5%)

Percent of cases predicted correctly:76.09%

IV. The Empirical Results

The empirical results in this chapter relate to three of the six reasons given by the Cohen Commission in their proposal to eliminate ST opinions.[39] Evidence will be provided on:

1. the predictive ability of ST opinions as compared to the MDA model used in Chapter 3,
2. the information content of ST opinions, and
3. the self-fulfilling prophecy of issuing a ST opinion.

The other reasons used by the Commission are firstly, not relevant given my propositions in Chapter 1, and secondly, the issue of legal protection for auditors is best addressed by the legal profession.

The Predictive Ability of ST opinions versus an MDA Model

The hypothesis addressed in this section is:

H1: ST opinions predict at least as well as an MDA model.

The predictive ability of the MDA model was presented in Table 8 (see Chapter 3). Table 10 shows the results using ST opinions. It is clear that the MDA model far outperforms ST opinions in predicting bankruptcy. Based on the last financial statement before failure, the MDA model has an overall accuracy of 85.95%, while accuracy is only 62.72% for ST opinions. The results are even more striking when comparing the Type I errors.

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[39]Listed in Chapter 2.

TABLE 10

PREDICTIVE ACCURACY OF SUBJECT-TO OPINIONS.

(A) USING THE LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	FIRMS WITH ST OPINION	FIRMS WITH NO ST OPINION
Bankrupt	28	11 (39.29%)	17 (60.71%)
Non-Bankrupt	31	5 (16.13%)	26 (83.87%)

Percent of cases predicted correctly:62.72%

(B) USING THE SECOND LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	FIRMS WITH ST OPINION	FIRMS WITH NO ST OPINION
Bankrupt	28	5 (17.86%)	23 (82.14%)
Non-Bankrupt	29	3 (10.34%)	26 (89.66%)

Percent of cases predicted correctly:54.39%

(C) USING THE THIRD LAST FINANCIAL STATEMENT BEFORE FAILURE.

ACTUAL GROUPS	NO. OF CASES	FIRMS WITH ST OPINION	FIRMS WITH NO ST OPINION
Bankrupt	25	4 (16.0%)	21 (84.0%)
Non-Bankrupt	26	3 (11.54%)	23 (88.46%)

Percent of cases predicted correctly:52.94%

ST opinions have a Type I error of 60.71%, while it is only 15.6% for the MDA model.[40] Our conclusion is that H1 is not supported.

The Information Content of ST Opinions

The hypothesis tested in this section is:

H2: The difference in average residuals (DAR) is zero for all portfolios. That is, there is no information content in ST opinions and/or the predictions of the MDA model.

The Sharpe-Lintner Market Model[41] was used to determine the abnormal returns, if any, as a result of ST opinions and/or the predictions of the MDA model. A total of 230 daily security returns observations for each firm were obtained from the CRSP tapes. Day 31 was the date that appeared on the audit opinion[42], and will be used in this thesis as the expected date of impact. As information about the ST opinions could have leaked into the financial market before this day, only returns from day -170 to day 0 were used to estimate the parameters of the model. Using the estimated value of the coefficients, the forecast returns are then compared to the actual daily returns for day 1 to day 60. This is shown below:

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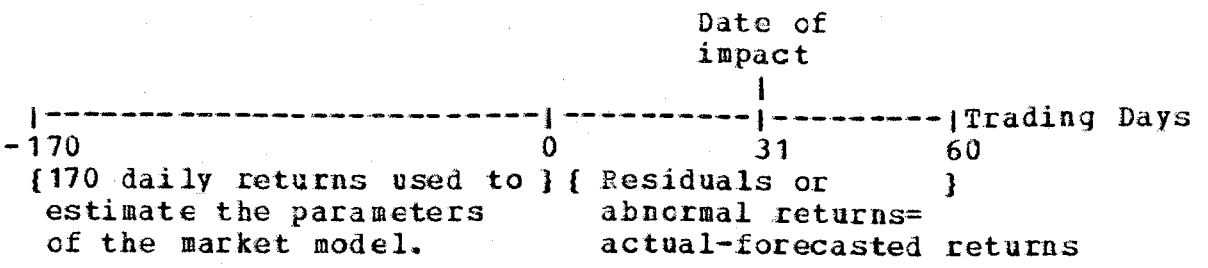
[40]The results above do not include firms that receive a ST opinion subsequent to the firm filing Chapter X or Chapter XI of the Bankruptcy Act, which frequently occurs.

[41]See Appendix G for the theory underlying this model.

[42]The auditor could in fact have signed the opinion prior to this date, but the date of release of the financial statements is always on or subsequent to this date.



Once the residuals of each firm are obtained, they are formed into portfolios, depending on

1. the firm's actual status (bankrupt or non-bankrupt),
2. whether it received a ST opinion or did not, and
3. whether it was P(B) or P(NB).

The average residuals by portfolio are then subtracted from the control portfolio's average residuals.[43] This yields the difference in average residuals (DAR) for each of the primary portfolios (that is, portfolios other than the control groups). The results of the DAR and the cumulative DAR (CDAR) are presented in Appendices C to F. Plot 1 to Plot 9 show the CDAR for the primary portfolios and the cumulative average residuals (CAR) for the control portfolios. Finally, Table 11 shows the significance of the market response in each portfolio using the t-test. The results are then summarized in Table 1A, Table 1B, and Table 1C.

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[43]The control portfolios are Portfolio 4, portfolio 4A, Portfolio 4B, and Group 7 (the particular control group used depends on the specific situation, as will be obvious later). The portfolios are as defined in Chapter 1. Group 7 is the control portfolio for the six groups which are similar to the portfolios except that the definition of information is based on the change in auditor's opinion and/or model prediction. This is shown in Table 1C.

TABLE 11

T-TEST FOR THE D.A.R. OF EACH OF THE PORTFOLIOS.

PORTFOLIOS OF FIRMS	PERIOD=11-30 prior to the date of impact.	PERIOD=31-50 on and after the date of impact.	PERIOD=21-40 around the date of impact.
Portfolio 1	t=.203878 α>0.25	t=-2.354796 α<0.025 *	t=-.612403 α>0.25
Portfolio 2	t=-.723404 0.1<α<0.25	t=-1.030305 0.1<α<0.25	t=.470161 α>0.25
portfolio 3	t=.221647 α>0.25	t=-.852766 0.1<α<0.25	t=.851011 0.1<α<0.25
Portfolio 1A	t=.147085 α>0.25	t=-2.271726 α<0.025 *	t=-.551938 α>0.25
Portfolio 3A	t=.524610 α>0.25	t=-.802213 0.1<α<0.25	t=.637852 α>0.25
Portfolio 2B	t=-.282721 α>0.25	t=-.9371 0.1<α<0.25	t=.413567 α>0.25
Portfolio 3B	t=-.639654 α>0.25	t=-.104404 α>0.25	t=-.598542 α>0.25

Although Portfolios 2 and 2B are not significant at α=0.025 for the time periods used above, it is clear that the market responses to these two portfolios hold for a very short period of time, see Plots 2 and 5.

	PERIOD=44-49
Portfolio 2	t=-2.594057 α<0.025 *
Portfolio 2B	t=-4.103052 α<0.005 *

*significant at α=0.025

TABLE 1A

FINANCIAL STATEMENTS AT A POINT IN TIME AS INFORMATION.

PORTFOLIOS	MARKET RESPONSE
1. Firms with both ST Opinion and P(B) n=13	see Plot 1 Market responded. day 31.
2. Firms with ST Opinion and P(NB) n=5	see Plot 2 Market responded. day 44. corrected with a positive trend at day 50.
3. Firms with No ST Opinion and P(B) n=32	see Plot 3 No market response.
4. Firms with No ST Opinion and P(NB) n=84	see Plot 6 Control portfolio.

Total n=134

TABLE 1B

MARKET RESPONSE TO "SUBJECT TO" REPORTS AND MODEL PREDICTIONS (THE EVIDENCE).

PORTFOLIOS	HINDSIGHT EXPECTATION BASED ON MARKET SOMEHOW CORRECTLY ANTICIPATING ACTUAL OUTCOMES	COMMENTS
1(a) Bankrupt firms with ST and P(B) n=12	Expect negative residuals	Observed significant negative residuals. Market reacts to both the information.
1(b) Non bankrupt firms with ST and P(B) n=1	Expect zero residuals	Sample too small
2(a) Bankrupt firms with ST but P(NB) n=1	Expect negative residuals	Sample too small
2(b) Non Bankrupt firms with ST but P(NB) n=4	Expect zero residuals	Observed significant negative residuals. Market was apparently fooled by ST opinion.
3(a) Bankrupt firms with no ST but P(B) n=27	Expect negative residuals	Observed no response. Market was apparently misled by the absence of a ST opinion. This adds credence to the info. content of ST reports
3(b) Non bankrupt firms with no ST and P(B) n=5	Expect zero residuals	Observed no response.
4(a) Bankrupt firms with no ST and P(NB) n=18	Expect negative residuals	Observed no response. Market was misled by the absence of ST report and the P(NB).
4(b) Non bankrupt firms with no ST and P(NB) n=66	Expect zero residuals	Observed no response as expected.

TABLE 1C

CHANGES IN OPINIONS AND/OR PREDICTIONS AS INFORMATION.

GROUPS **	MARKET RESPONSE
1. Both changes to ST Opinion and P(B) n=1	Sample too small
2. Change to ST from No ST Opinion with no change in predictions. n=4	Market responded from t=10. The average lag in the release of the financial statements as compare to the year before was 14 days.
3. Change to No ST from ST Opinion with no change in predictions. n=2	No market response. (ignored, as sample size is too small).
4. Change to P(B) from P(NB) with no change in auditor's reports. n=10	No market response.
5. Change to P(NB) from P(B) with no change in auditor's reports. n=1	Sample too small
6. Both change to No ST Opinion and P(NB). n=0	Sample too small
7. No change in Predictions and auditor's reports. n=75	Plot 8 Control Group. No market response.

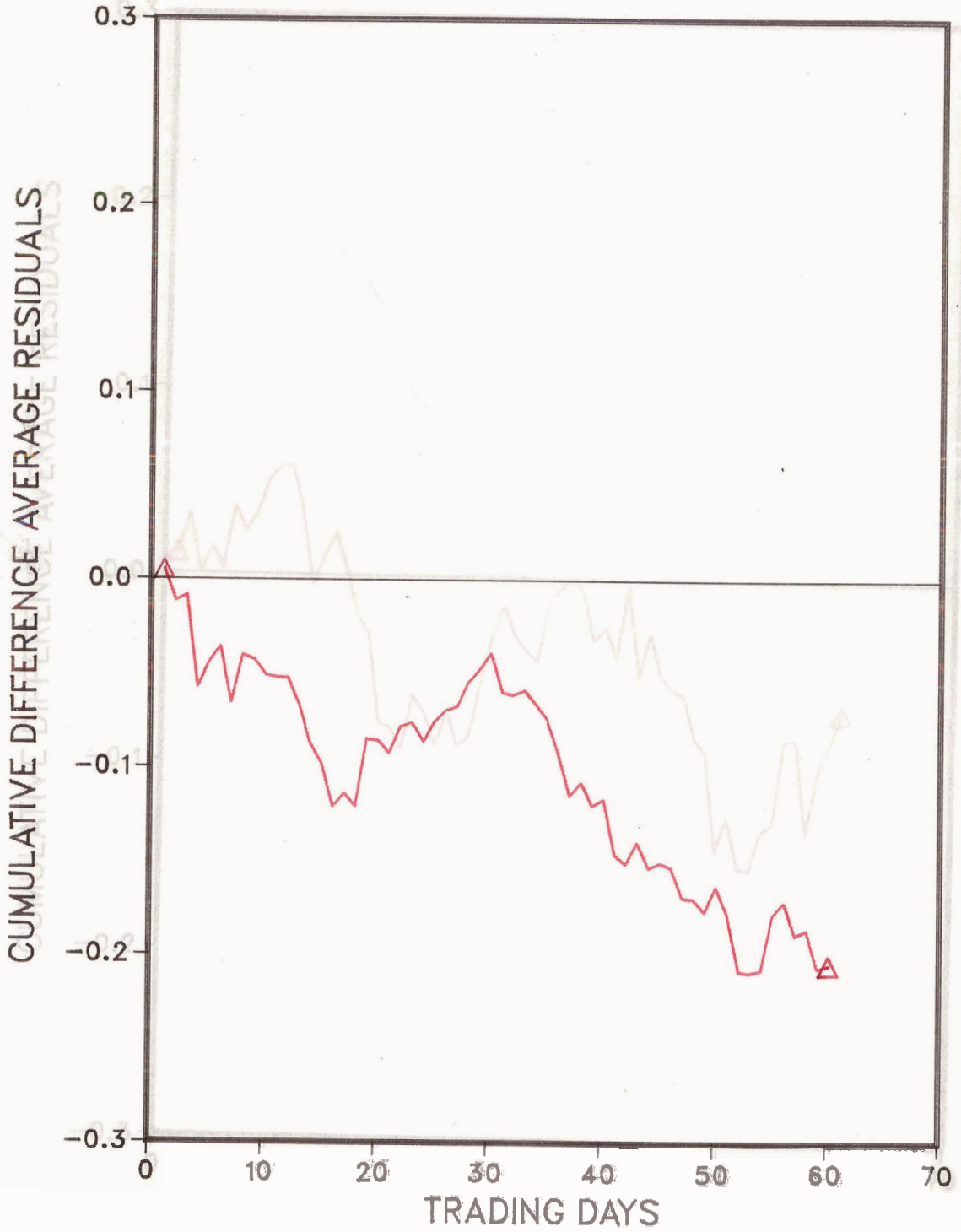
Total n=93

*for market response to groups 2 to 4, see Plot 7.

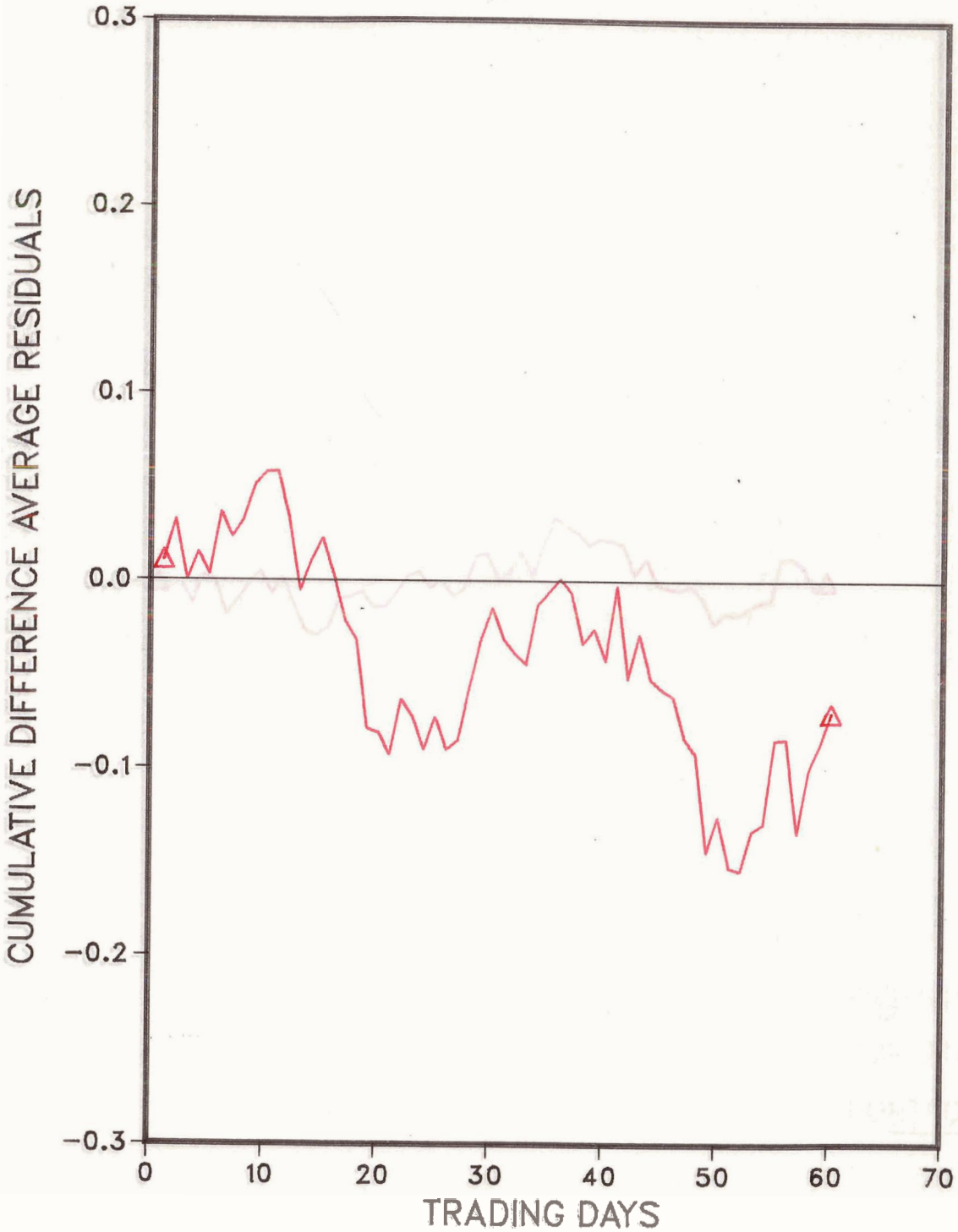
**Note that Groups are used instead of Portfolios for Plots 7 and 8 to indicate that the change in opinions and/or predictions are now used to define information.

***The market response to the above Groups are based on visual inspection of Plots 7 and 8. No statistical test was deemed necessary.

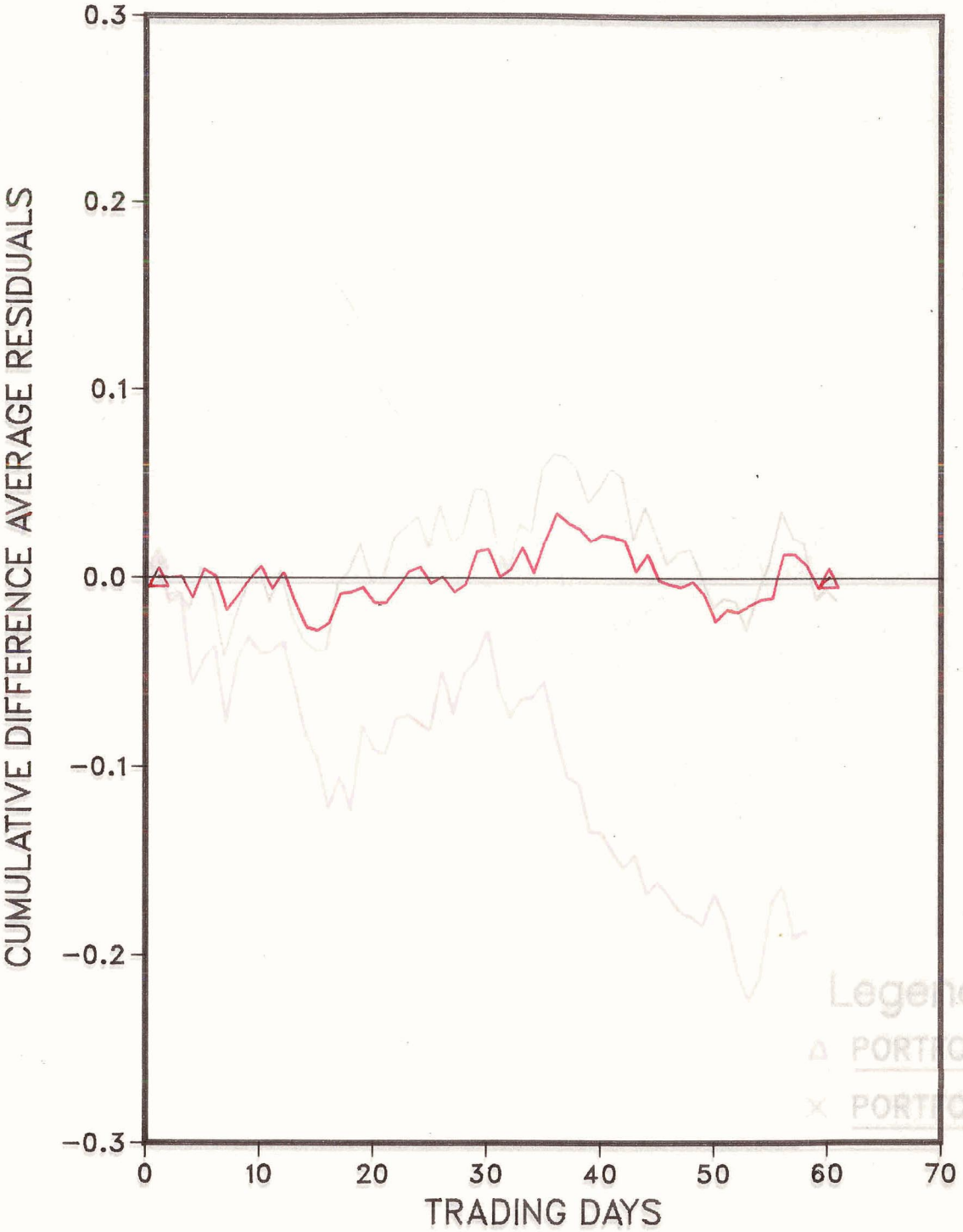
PLOT 1
MARKET RESPONSE TO PORTFOLIO 1



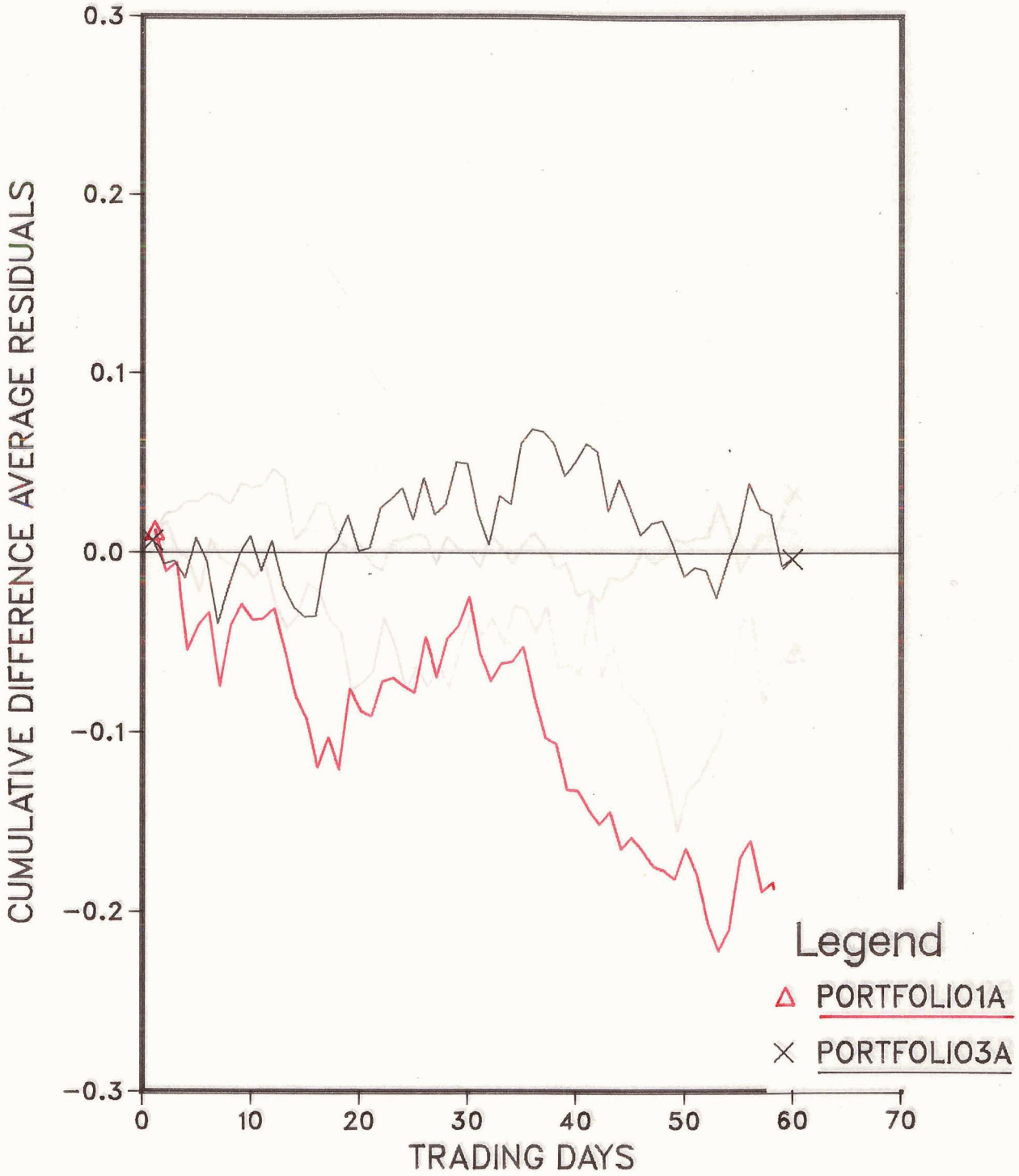
PLOT 2
MARKET RESPONSE TO PORTFOLIO 2



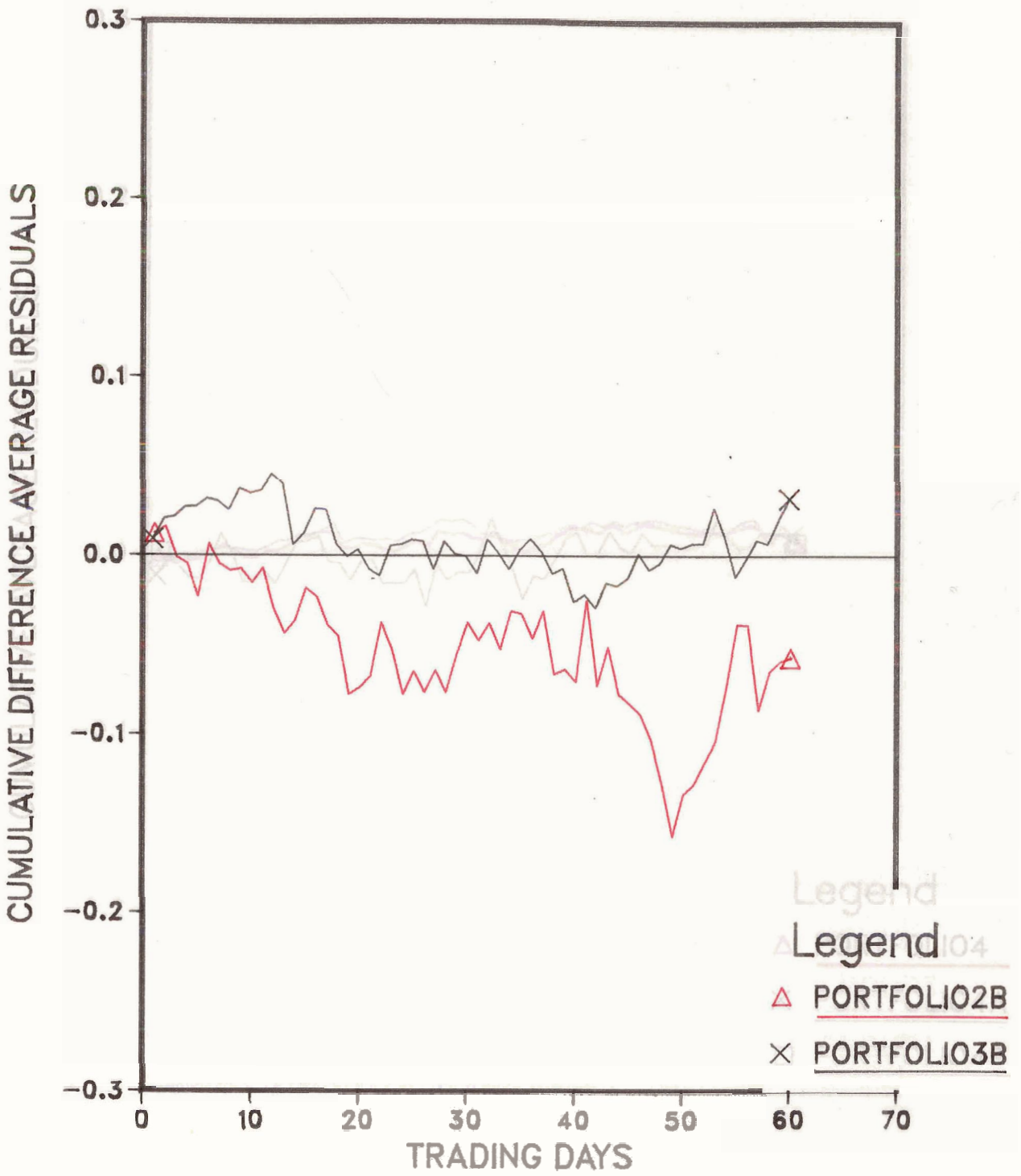
PLOT 3
MARKET RESPONSE TO PORTFOLIO 3



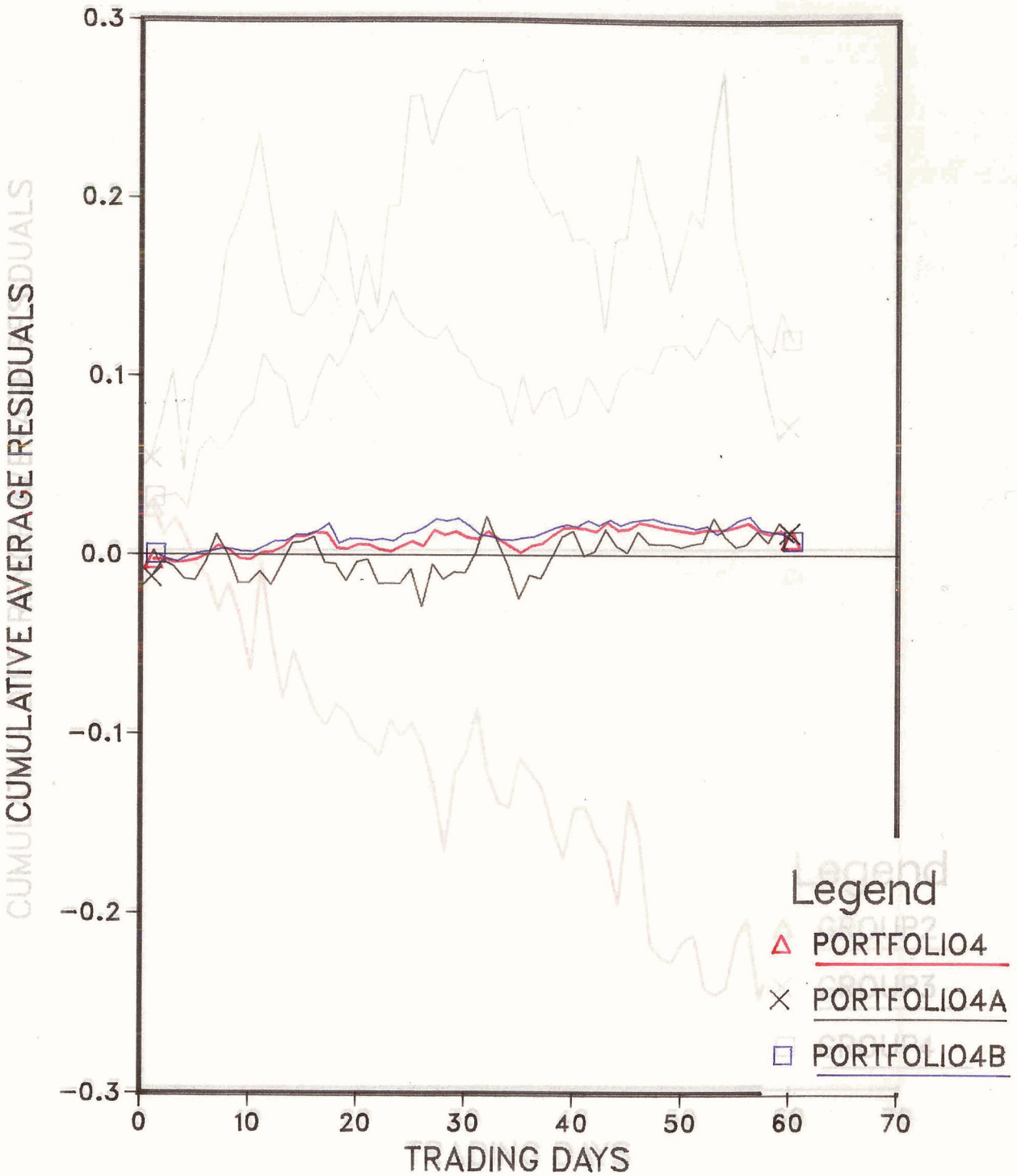
PLOT 4
MARKET RESPONSE TO PORTFOLIOS 1A AND 3A



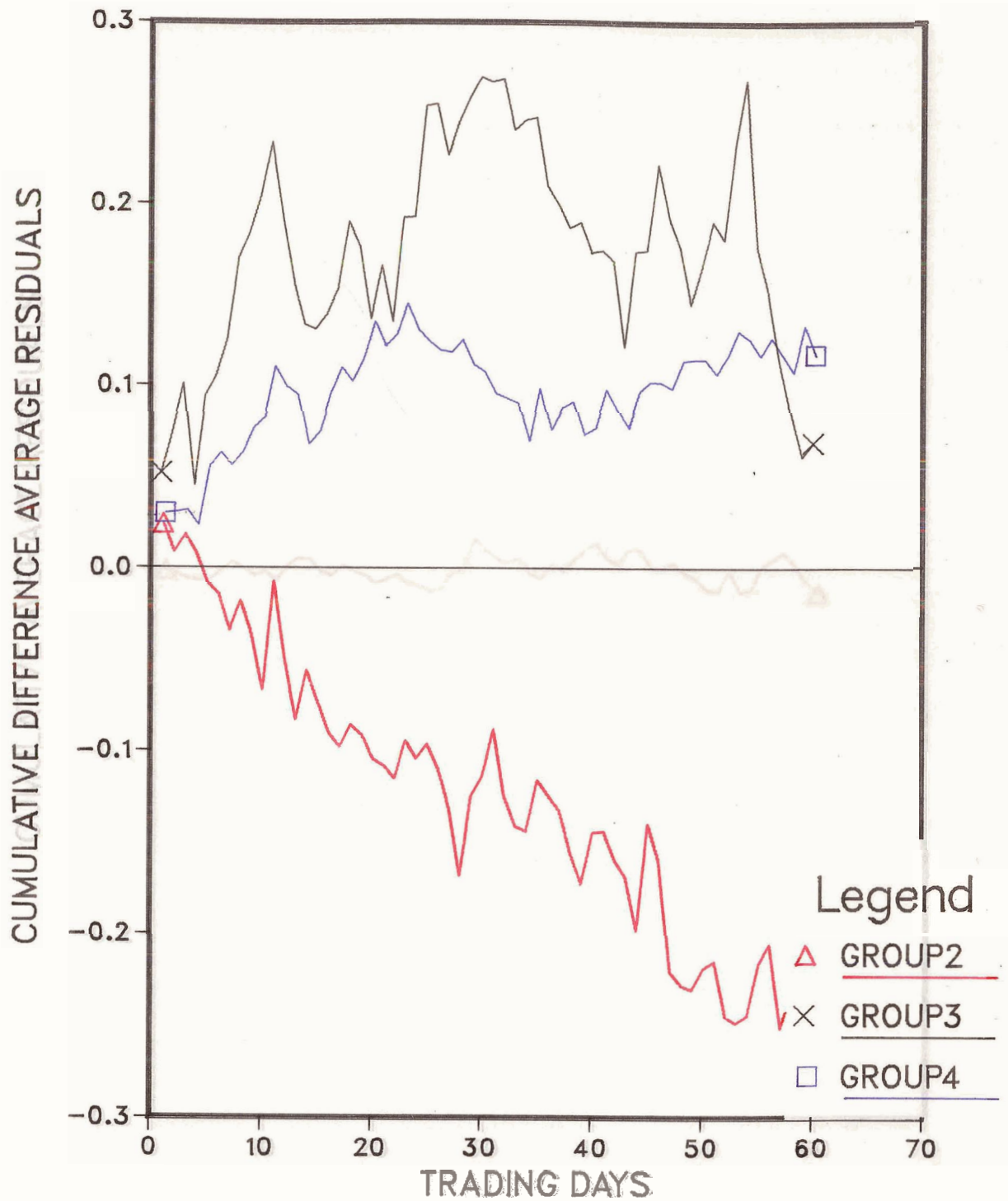
PLOT 5
MARKET RESPONSE TO PORTFOLIOS 2B AND 3B



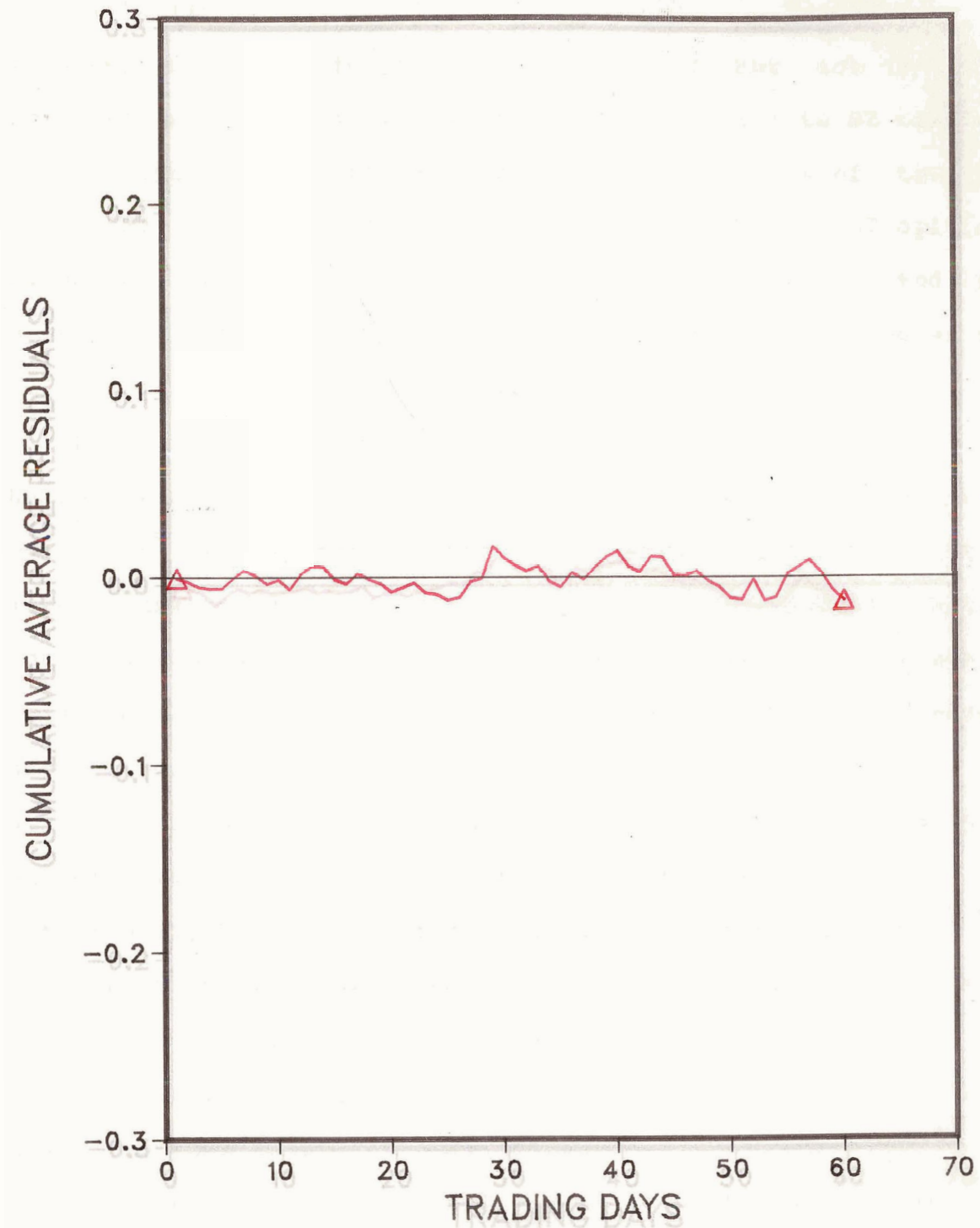
PLOT 6
MARKET RESPONSE TO THE CONTROL PORTFOLIOS



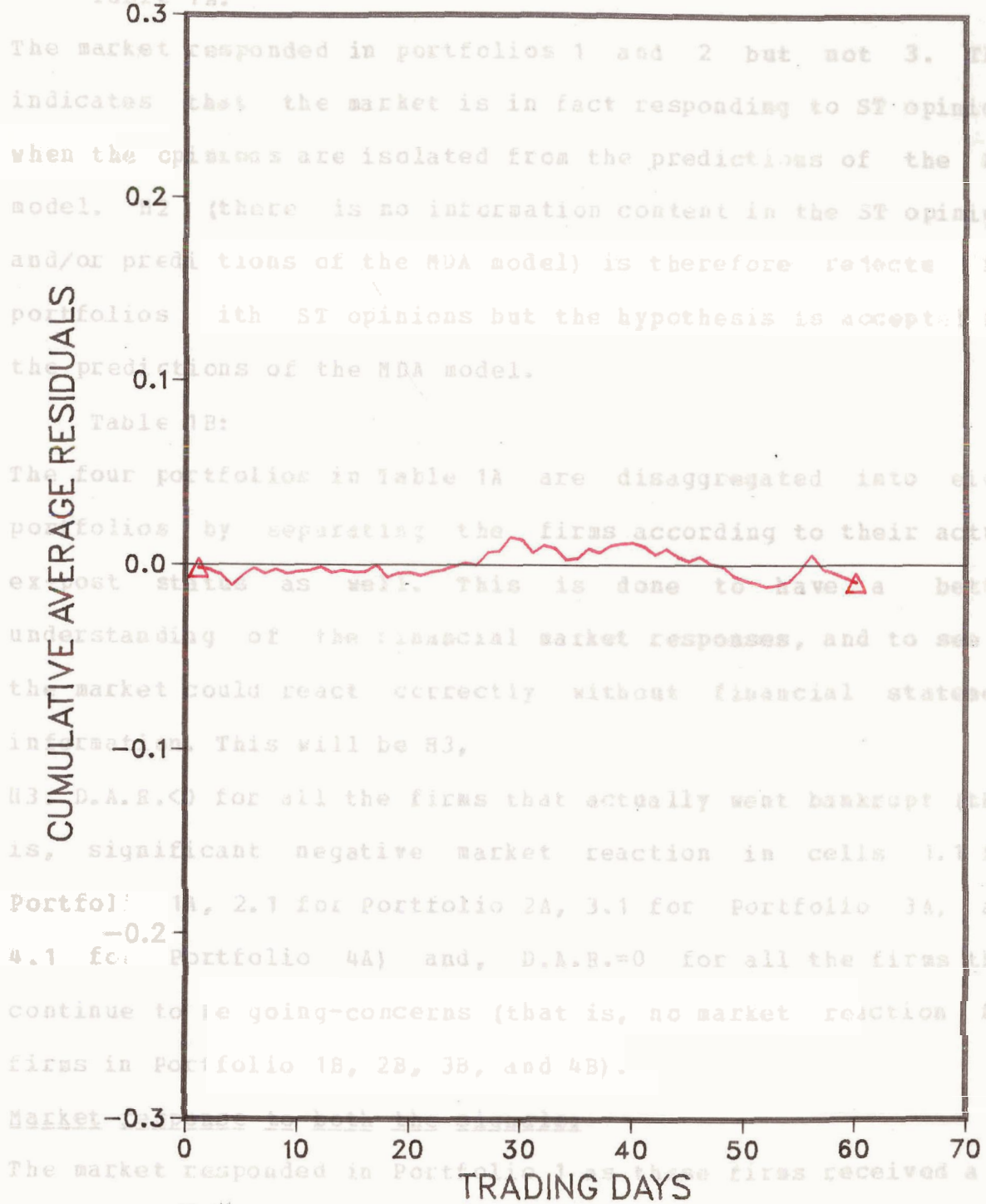
PLOT 7
MARKET RESPONSE TO GROUPS 2, 3 AND 4



PLOT 8
MARKET RESPONSE TO CONTROL GROUP 7



PLOT 9
CUM. RESIDUALS OF ALL THE FIRMS IN THE SAMPLE



Summary of the results

Table 1A:

The market responded in portfolios 1 and 2 but not 3. This indicates that the market is in fact responding to ST opinions when the opinions are isolated from the predictions of the MDA model. H2 (there is no information content in the ST opinions and/or predictions of the MDA model) is therefore rejected for portfolios with ST opinions but the hypothesis is accepted for the predictions of the MDA model.

Table 1B:

The four portfolios in Table 1A are disaggregated into eight portfolios by separating the firms according to their actual ex-post status as well. This is done to have a better understanding of the financial market responses, and to see if the market could react correctly without financial statement information. This will be H3,

H3: D.A.R.<0 for all the firms that actually went bankrupt (that is, significant negative market reaction in cells 1.1 for Portfolio 1A, 2.1 for Portfolio 2A, 3.1 for Portfolio 3A, and 4.1 for Portfolio 4A) and, D.A.R.=0 for all the firms that continue to be going-concerns (that is, no market reaction for firms in Portfolio 1B, 2B, 3B, and 4B).

Market response to both the signals:

The market responded in Portfolio 1 as these firms received a ST opinion and P(B). No market response was observed when the exact

opposite information was signaled. The results of Table 1B seems to indicate that the stock market does rely on the aggregate financial statements for information with respect to the evaluation of insolvency.

Appropriateness of market response:

The market did not respond to portfolios where the firms subsequently went bankrupt, and responded incorrectly to Portfolio 2(b) when in fact these firms continue as going-concerns (although they did receive going-concern qualifications). Thus, H3 is rejected. The market could not distinguish correctly those firms that will subsequently fail from those that continue as going-concerns. Similar results were reported by Westerfield (1970a) and Altman (1971). Hennawy and Morris (1983) reported the opposite. They found that the market anticipated the firm's failure up to five years in advance.

Market response to ST opinions and to MDA model predictions individually:

The results from Portfolio 2(b) and 3(a) indicate that the market responded to ST opinions even if the opinions turned out to be wrong. This could be explained by an excessive reaction to current information, which Arrow (1982) suggested, characterizes all the securities and future markets. Also, the model predictions by themselves did not trigger any market reaction even when the predictions were correct. This is also consistent with the findings of Altman and Brenner (1981).

Interpretations of the results

Financial statements are prepared on the assumption that a firm will continue as a going-concern. The auditor does not search for evidential matter relating to the entity's continued existence. Only when information contrary to that assumption is brought to his attention while applying auditing procedures, primarily for other purposes, does the auditor initiate a search for such evidence [Statement on Auditing Standards Number 34]. As such, a clean opinion need not be, nor (I believe) will be, interpreted as a signal that a firm will not go bankrupt. Whenever there is a possibility of receiving a return over and above that of investing in a risk free asset, the probability of insolvency of a firm is always positive.

Participants in the stock market may not use an MDA model or any explicit model to predict possible insolvency. However, the accuracy of the MDA model used in this thesis indicates that it captures the main elements that ultimately lead to a firm's failure. Given an efficient market (as assumed), the market will have used and responded to these elements. There is, however, a small but important difference. If investors made their decisions not using an explicit model, but rather relied on their subjective judgements (using the financial ratios as a basis for their decisions), then we would expect fewer firms to be predicted bankrupt by investors. Like auditors, investors assume that firms will continue as going-concerns. Most investors do not go all out to look for evidence that will

contradict that assumption, as this thesis has done by using an MDA model. This could explain the lack of market response to the MDA model predictions, as reported in this thesis ,by Altman and Brenner (1981), and Westerfield (1970a).** If the above argument is accepted, then the direction of the bias in my results is clear. Portfolios 1 and 2 make up the entire population of firms that receive ST opinions in my sample. Firms in Portfolio 1 are also P(B). Using my argument above, some of these firms will not be P(B) by the investors. As such, some firms from Portfolio 1 should be in Portfolio 2. As the market response is greater for firms in Portfolio 1 on average, this would cause the market response to Portfolio 2 to be even more significant. There is, therefore, stronger evidence that investors do see ST opinions as relevant information.

Finally, ST opinions are relatively rare and are probably be given a lot of weight. A clean opinion or a P(NB), on the other hand, is simply the norm and such information is treated as no information and ignored. Thus, the "no market response" in Portfolios 3 and 4 is not due to (a) the market using the no ST opinions, (b) the market fooled by the no ST opinions, and (c) the market fooled by the no ST opinions and the P(NB). Rather, it should be seen as no information relating to the above events and thus, no market response was observed.

**In my study and similar ones, the portfolios of firms P(B) by the MDA model are contaminated by firms not predicted bankrupt by investors, if investors do not use an explicit MDA prediction model.

The difference between the results in Table 1A and Table 1B as compared to Table 1C is that Table 1C is based on the change in audit opinions and/or predictions of the MDA model as information. Table 1A and Table 1B, on the other hand, are based on the opinions and/or predictions at a point in time as information, regardless of prior audit opinions and predictions. The results from the three tables above indicate that either of the above interpretations of events as information could be correct, as the results turn out to be similar. Since Table 1C has a smaller sample size in each of it's portfolios than those of Table 1A and Table 1B, the results of Table 1C are used only to corroborate the evidence already discussed.

Self-fulfilling Prophecies

The hypotheses made in this section are:

H4: That the P(B), based on financial ratios, have no effect on the firm's ability to borrow.

H5: That the issue of a ST opinion has no effect on the firm's ability to borrow.

The statistical tool used is the exact method for 2X2 tables [Ostle, 1963]. It has the following form:

TABLE 12

THE EXACT TEST FOR 2X2 TABLES.

	A1	A2	TOTAL
B1	a	b	a+b
B2	c	d	c+d
TOTAL	a+c	b+d	n

The two fractions, $\hat{p}1=a/(a+b)$ and $\hat{p}2=c/(c+d)$ are the estimates of p1 and p2, the parameters of two binomial populations. The exact probability of observing $\hat{p}1$ and $\hat{p}2$ when p1=p2 (the proportion in row 1 equals the proportion in row 2 or the observed outcome is independent of A1 and A2) is

$P1= (a+b)!(c+d)!(a+c)!(b+d)!/a!b!c!d!n!$

The final probability includes the probabilities of the most divergent fractions other than those observed. Assuming p1<p2, the next more divergent situation would be the one in which a and d are decreased by one, and b and c increased by unity or

$P2= (a+b)!(c+d)!(a+c)!(b+d)!/(a-1)!(b+1)!(c+1)!(d-1)!n!$

The same rule applies until P_{a+1} is calculated. The final probability is, therefore, $P=\sum_{i=1}^{a+1} P_i$.

Table 13 shows the 2X2 Table for those firms that actually went bankrupt. The columns show the number of firms that either had an increase or a decrease in their total debt (TD) while the rows show the number of firms that were either P(B) or P(NB). H4 can then be rewritten as H4: p1=p2. In other words, the proportion of firms that have less TD is the same whether the firms were P(B) or P(NB) (that is, the change in TD is independent of the model prediction). The use of only bankrupt

firms is an attempt to use firms with similar characteristics. These firms would generally need more financing, and using less debt the year following the predictions is assumed not to be of their own choice. $\hat{p}1=0$ (proportion of firms that were P(NB) and used less debt) and $\hat{p}2=0.3333$ (proportion of firms that were P(B) and used less debt). The probability of observing $\hat{p}1$ and $\hat{p}2$ if in fact p1=p2 is 0.1048 or 10.48%. With a fairly large probability H4 is accepted. The change in TD is independent of the MDA model predictions.

Table 14 is similar to Table 13 except that the rows are now the number of firms that either received a ST opinion or No ST opinion. H5 is now rewritten as H5: p1=p2. The change in TD is independent of the auditor's opinion. $\hat{p}1=0.1304$ and $\hat{p}2=0.8$. The probability of observing $\hat{p}1$ and $\hat{p}2$ if p1=p2 is 0.007693 or 0.77%. Using $\alpha=0.025$, H5 is rejected.[45] There is less than a 1% chance that one would observe these results if in fact the change in TD is independent of the auditor's opinion with respect to going-concern qualifications. This thesis supports the Cohen Commission in that the issue of a ST opinion could be a self-fulfilling prophecy. A point to note is that all the five firms that receive a ST opinion in Table 14 are also P(B).

The above results are consistent with the market reaction to ST opinions. Bankers, who are also stock market participants, see a ST opinion as relevant information.

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[45] Although the sample size is small, a χ^2 test was also performed. The results was almost identical to those reported above.

TABLE 13

SELF-FULFILLING PROPHECY WITH RESPECT TO MDA MODEL PREDICTION.

FIRMS THAT ACTUALLY WENT BANKRUPT.

PREDICTION USING DATA FROM THE 2nd. LAST FINANCIAL STATEMENTS.	NO.OF FIRMS THAT USED LESS TOTAL DEBT THE FOLLOWING YEAR	NO. OF FIRMS THAT USED MORE TOTAL DEBT THE FOLLOWING YEAR	TOTAL
P(NB)	0 (1.68)	7 (5.32)	7
P(B)	6 (4.32)	12 (13.67)	18
TOTAL	6	19	25

TABLE 14

SELF-FULFILLING PROPHECY WITH RESPECT TO "SUBJECT TO" OPINION.

FIRMS THAT ACTUALLY WENT BANKRUPT.

AUDITORS' OPINIONS IN THE 2nd. LAST FINANCIAL STATEMENTS	NO. OF FIRMS THAT USED LESS TOTAL DEBT THE FOLLOWING YEAR	NO. OF FIRMS THAT USED MORE TOTAL DEBT THE FOLLOWING YEAR	TOTAL
NO ST OPINION	3 (5.75)	20 (17.25)	23
ST OPINION	4 (1.25)	1 (3.75)	5
TOTAL	7	21	28

The values in the parenthesis are the expected values if the columns and the rows are independent of each other, that is, the change in the amount of debt used is not affected by the MDA model prediction in Table 13 and not affected by the ST opinion in Table 14. Using the notation in Table 12, $a^* = ((a+c)/n)(a+b)$. The values for the other three cells are likewise determined.

V. Conclusion

This thesis was an attempt to overcome the problems of past studies in evaluating the information content of ST opinions. It used the prediction of the MDA model to control for the information in the financial statements. This serves to isolate the information content of the audit opinions. This approach is by no means restricted to the evaluation of the information content of ST opinions. The same approach could be used in most MBAR studies. If events A and B occur simultaneously, then one need to find a tool to predict event A, for example. The prediction of event A can then be used as a control for the information in event A. The information content of each of the events is then determined in isolation from the effects of the other information.

The results in this study indicates that there is information content in ST opinions. It also found that an MDA model could perform better than ST opinions in predicting insolvency. Finally, evidence indicates that the issue of a ST opinion could be a self-fulfilling prophecy. That is, firms that receive a ST qualification may be denied loans because of the qualification and this causes the firm to fail.

Given the above results, which of the four propositions suggested in Chapter 1 should be accepted? Proposition 1 states that if the ST opinions generally predict correctly and are seen as a relevant information, then, ST opinions should continue to

be provided. Proposition 2 differs from proposition 1 only if the financial markets do not see the ST opinions as relevant information. In this case, the accounting profession should educate the public on their usefulness. Proposition 3 states that if the ST opinions do not predict as well as the MDA model, but are seen as relevant information in financial markets, then the auditor should make use of the prediction model to help them decide if a qualification should be issued. Proposition 4, on the other hand, proposed the elimination of the ST opinions if they could not predict as well as the MDA model, and are not seen as relevant information in financial markets. Given that the results in this thesis indicate that the ST opinions do not predict as well as the MDA model but are seen as useful information in the financial markets, Proposition 3 is the most appropriate conclusion. It suggest that auditors make use of the prediction model to help them decide if a qualification should be issued. This was also suggested by Altman (1974, 1982). However, the evidence is not straight-forward. As reported above, there is strong evidence that the issue of ST opinions could be a self-fulfilling prophecy. Should we accept proposition 3 even if the issue of a ST opinion, in itself, may cause a firm to fail? Turning the question around, one could ask, would banks behave differently if these firms did not receive a ST opinion? It is now clear that the results in Table 13 (Chapter 4) are the crucial issue. These firms actually failed and they are either P(B) or P(NB). The probability of

observing the results in Table 13 if the change in the T.D. used is independent of the MDA model predictions is 10.48%. If one accept this as too large a probability to reject the hypothesis of independence above, then the conclusion is obvious. Even without ST opinions, firms P(B) are likely to be denied credit. Bank loan officers do not have to use the ST opinions and thus, the issue of ST opinions could not, in itself, cause bankers to refuse credit (note again, that all five firms that received a ST opinion are also P(B) in Table 14).

The conclusion is less obvious if we accept the hypothesis that the change in TD is independent of the MDA model prediction. Do we provide information that is useful but may cause the firm to fail, which may not happen if that information is not provided?

A final note is the findings of Kida (1980). Using a questionnaire approach, he found that auditors were able to discriminate problem from nonproblem firms, given only ratio data, with an average accuracy of 83%. The accuracy using an MDA model was 90%. This, therefore, suggests that the results in this thesis and reported by Altman (1974, 1982) that ST opinions do not predict as well as an MDA model may not be due to an inability to predict on the part of the auditors but rather, it is the consequence of additional considerations. The consequences of qualifying an opinion, for example, losing a client or resulting in a lawsuit, may affect decisions to issue going-concern qualifications. Chow and Rice (1982) provided some

evidence that firms switch auditors more frequently after receiving qualified opinions. Although proposition 3 is supported in this thesis, it is realised that it may be impractical as long as auditing firms see the costs of qualifying an opinion as exceeding the benefits of doing so. The costs and benefits could be changed through legislation or a more strict requirement to qualify an opinion with respect to going-concern. Lastly, it is clear that this thesis rejects the conclusion of the Cohen Commission and supports the view that ST opinions are useful and should continue to be provided.

Limitations and Extensions

The main limitation of this thesis is the sample size. A study using a larger sample size, preferably 2 to 3 times the sample size used in this thesis, would be the most appropriate extension of this thesis. One could use firms that failed prior to 1972 in addition to the firms used in this thesis. This, however, runs the risk that the MDA model prediction may not be appropriate for the firms in the 1972 to 1982 period. The characteristics of failed firms may change over time. The other possibility is to use firms traded over-the-counter or on regional exchanges. This requires either daily or monthly security returns to be currently available, or the arduous and costly task of compiling them. It also requires that financial statements be available. Other possible extensions of this thesis include incorporating explicitly a dynamic bankruptcy

prediction model, and using its predictions as the control for the information content of the financial statements. A study of the cost and benefit to the auditors of qualifying an opinion would be helpful, and may be used to predict the possibility of auditors issuing a ST opinion. Such information will be useful as the stock market does respond to these qualifications. Finally, a study using an approach similar to that of Estes (1982) should be utilized to study the differential in the information content of different ways of presenting the current ST opinions.

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APPENDIX A

SAMPLE B (BANKRUPT FIRMS -MANUFACTURING INDUSTRY ONLY)

FIRM NO.	CO. NO.	COMPANY NAME
Firm 1B	379848	GLOVER INC
Firm 2B	888837	TOBIN PACKING CO INC
Firm 3B	302819	FABIEN CORP
Firm 4B	320488	FIRST HARTFORD CORP
Firm 5B	810122	SCOTTEX CORP
Firm 6B	817460	SEQUOYAH INDUSTRIES INC
Firm 7B	101241	BOTANY INDS INC
Firm 8B	126351	CS GROUP INC
Firm 9B	366064	GARLAND CORP-CL A
Firm 10B	551675	LYNNWEAR CORP-CL A
Firm 11B	640303	NELLY DON INC
Firm 12B	950698	WENTWORTH MFG CO
Firm 13B	731588	POLORON PRODUCTS INC
Firm 14B	959078	WESTERN ORBIS CO
Firm 15B	112061	BRODY (B.) SEATING CO
Firm 16B	805567	SAXON INDUSTRIES
Firm 17B	703181	PATERSON PARCHMENT PAPER CO
Firm 18B	591846	METROPOLITAN CONS INDS INC
Firm 19B	868647	SUPRONICS CORP
Firm 20B	779664	ROWLAND INC
Firm 21B	749222	RAI INC
Firm 22B	233045	DCA DEVELOPMENT CORP
Firm 23B	577438	MAULE INDUSTRIES INC
Firm 24B	880447	TENNESSEE FORGING STEEL CORP
Firm 25B	925385	VESPER CORP
Firm 26B	829880	SITKIN SMELTING & REFINING
Firm 27B	913453	UNIVERSAL CONTAINER CORP
Firm 28B	781768	RUSCO INDUSTRIES INC
Firm 29B	389370	GRAY MFG CO
Firm 30B	738102	POTTER INSTRUMENT INC
Firm 31B	237570	DATA ACCESS SYSTEMS INC
Firm 32B	286155	ELECTROSPACE CORP
Firm 33B	376424	GLADDING CORP
Firm 34B	670096	NOVO CORP
Firm 35B	521687	LEADER INTL INDUSTRIES INC
Firm 36B	524166	LEECO INC
Firm 37B	858552	STELLAR INDUSTRIES INC-DEL
Firm 38B	018859	ALLIED ARTISTS INDUSTRIES
Firm 39B	007752	AERODEX INC
Firm 40B	683714	OPEN ROAD INDS
Firm 41B	400118	GRUEN INDS INC
Firm 42B	042078	ARMAC ENTERPRISES INC
Firm 43B	585163	MEGO INTERNATIONAL
Firm 44B	858518	STELBER INDUSTRIES INC
Firm 45B	872415	TGC INC
Firm 46B	559142	MAGIC MARKER CORP

SAMPLE N (NON-BANKRUPT FIRMS)

FIRM NO.	CO. NO.	COMPANY NAME
Firm 1N	398028	GREYHOUND CORP
Firm 2N	484098	KANE-MILLER CORP
Firm 3N	012347	ALBANY INTL CORP
Firm 4N	206813	CONE MILLS CORP
Firm 5N	235773	DAN RIVER INC
Firm 6N	574803	MASLAND (C.H.) & SONS
Firm 7N	158627	CHAMPION PRODUCTS INC
Firm 8N	235721	DAMON CREATIONS-CL A
Firm 9N	409189	HAMPTON INDUSTRIES
Firm 10N	696593	PALM BEACH INC
Firm 11N	746316	PURITAN FASHIONS CORP
Firm 12N	918204	VF CORP
Firm 13N	636418	NATIONAL HOMES CORP
Firm 14N	886498	TIDWELL INDUSTRIES
Firm 15N	313693	FEDERAL PAPER BOARD CO
Firm 16N	699313	PARAMOUNT PACKAGING
Firm 17N	615785	MOORE CORP LTD
Firm 18N	866645	SUN CHEMICAL CORP
Firm 19N	68797	BARRY (R.G.)
Firm 20N	636316	NATIONAL GYPSUM CO
Firm 21N	629449	NVF CORP
Firm 22N	912656	U S STEEL CORP
Firm 23N	686679	ORMAND INDUSTRIES
Firm 24N	476304	JENSEN INDUSTRIES
Firm 25N	690207	OVERHEAD DOOR CORP
Firm 26N	150033	CECO CORP
Firm 27N	562706	MANGOOD CORP
Firm 28N	68887	BARRY WRIGHT CORP
Firm 29N	313855	FEDERAL SIGNAL CORP
Firm 30N	671400	OAK INDUSTRIES INC
Firm 31N	345370	FORD MOTOR CO
Firm 32N	235811	DANA CORP
Firm 33N	359370	FRUEHAUF CORP
Firm 34N	754647	RAYMARK CORP
Firm 35N	812132	SEALED POWER
Firm 36N	459362	INTL CONTBOLS CORP
Firm 37N	189873	COACHMEN INDUSTRIES INC
Firm 38N	526264	LENOX INC
Firm 39N	193378	COLECO INDS
Firm 40N	292007	EMPIRE OF CAROLINA INC
Firm 41N	601753	MILTON BRADLEY CO
Firm 42N	677143	OHIO ART CO
Firm 43N	90545	BINNEY & SMITH INC
Firm 44N	615798	MOORE MCCORMACK RESOURCES

The FIRM NO. were assigned to the firms for convenience and the CO. NO. is assign to the firms by Compustat and CRSP.

APPENDIX B

FINANCIAL RATIOS USED IN THIS THESIS.

RATIO SYM.	RATIOS
S(NI/TD)	Standard Deviation of Net Income/Total Debt
C.R.	Current Assets/Current Liabilities or Current Ratio
Q.R.	Quick Assets/Current Liabilities or Quick Ratio
ST/TD	Short Term Debt/Total Debt
TD/TA	Total Debt/Total Assets or Debt-Equity Ratio
INT/S	Interest Expense/Sales
MV/TD	Market Value of Securities/Total Debt
CF/TD	Cash Flow/Total Debt
NI/TD	Net Income/Total Debt
CF/OC	Cash Flow/Operating Cost for One Year
WC/OC	Working Capital/Operating Cost for One Year
IBIT/TA	Income Before Interest and Taxes/Total Assets
GP/S	Gross Profit/Sales
RE/TA	Retained Earnings/Total Assets
S/TA	Sales/Total Assets
TA	Total Assets in Millions of Dollars

The ratios are defined as in the Compustat Manual.

Precise specification for variables in the final MDA model:

- Q.R. = Cash, short term investments and receivables over current liabilities.
- TD/TA = Total long term debt, debt due in one year and notes payable in current liabilities (excluding deferred taxes, investment tax credit, accounts payable and income tax payable) over total assets.
- NI/TD = Income after extraordinary items and discontinued operations over total debt.

APPENDIX C

DAYS	D.A.R. FOR PORT.1	C.D.A.R. FOR PORT.1	D.A.R. FOR PORT.2	C.D.A.R. FOR PORT.2	D.A.R. FOR PORT.3	C.D.A.R. FOR PORT.3
1	.005188	.005188	.010951	.010951	.000291	.000291
2	-.017025	-.011837	.021412	.032363	-.000414	-.000123
3	.003325	-.008512	-.032752	-.000389	.000734	.000611
4	-.049296	-.057808	.015438	.015049	-.011475	-.010864
5	.013289	-.044519	-.012208	.002841	.015404	.004540
6	.008697	-.035822	.033499	.036340	-.003750	.000790
7	-.030186	-.066008	-.013426	.022914	-.018417	-.017627
8	.025874	-.040134	.009357	.032271	.008435	-.009192
9	-.002678	-.042812	.018654	.050925	.008231	-.000961
10	-.008423	-.051235	.006716	.057641	.006957	.005996
11	-.001205	-.052440	.000404	.058045	-.012156	-.006160
12	-.000064	-.052504	-.024707	.033338	.008961	.002801
13	-.014776	-.067280	-.039093	-.005755	-.016156	-.013355
14	-.020258	-.087538	.016282	.010527	-.012944	-.026299
15	-.010582	-.098120	.012184	.022711	-.001884	-.028183
16	-.023367	-.121487	-.020189	.002522	.003967	-.024216
17	.007549	-.113938	-.024413	-.021891	.015767	-.008449
18	-.006997	-.120935	-.010021	-.031912	.000605	-.007844
19	.036150	-.084785	-.047167	-.079079	.002469	-.005375
20	-.000887	-.085672	-.002154	-.081233	-.008140	-.013515
21	-.006758	-.092430	-.011970	-.093203	.000059	-.013456
22	.014343	-.078087	.029779	-.063424	.007785	-.005671
23	.001943	-.076144	-.009242	-.072666	.008894	.003223
24	-.010245	-.086389	-.017547	-.090213	.002306	.005529
25	.010905	-.075484	.017429	-.072784	-.008621	-.003092
26	.006125	-.069359	-.017394	-.090178	.003764	.000672
27	.001945	-.067414	.004821	-.085357	-.008379	-.007707
28	.012554	-.054860	.027351	-.058006	.004089	-.003618
29	.006870	-.047990	.026749	-.031257	.017535	.013917
30	.009137	-.038853	.016838	-.014419	.001240	.015157
31	-.021034	-.059887	-.016828	-.031247	-.014649	.000508
32	-.001252	-.061139	-.007660	-.038907	.003867	.004375
33	.002368	-.058771	-.005956	-.044863	.011760	.016135
34	-.007462	-.066232	.032038	-.012825	-.013513	.002622
35	-.007824	-.074056	.006680	-.006145	.017618	.020240
36	-.018372	-.092428	.007489	.001344	.014529	.034769
37	-.022590	-.115018	-.007899	-.006555	-.005295	.029474
38	.007374	-.107644	-.027069	-.033624	-.003217	.026257
39	-.012601	-.120245	.008202	-.025422	-.007014	.019243
40	.003777	-.116468	-.017256	-.042678	.003630	.022873
41	-.029701	-.146169	.040237	-.002441	-.000991	.021882
42	-.005083	-.151252	-.049889	-.052330	-.002305	.019577
43	.011757	-.139495	.024083	-.028247	-.016462	.003115
44	-.013825	-.153320	-.024111	-.052358	.009387	.012502
45	.003140	-.150180	-.005604	-.057962	-.013905	-.001403
46	-.002668	-.152848	-.003742	-.061704	-.002095	-.003498
47	-.016316	-.169164	-.022406	-.084110	-.001606	-.005104
48	-.000550	-.169714	-.008227	-.092337	.003209	-.001895

49	-.006917	-.176631	-.052399	-.144736	.007246	-.009141
50	.013811	-.162820	.019216	-.125520	-.014094	-.023235
51	-.015297	-.178117	-.027094	-.152614	.006375	-.016860
52	-.029976	-.208093	-.001738	-.154352	-.001474	-.018334
53	-.000835	-.208928	.021125	-.133227	.003603	-.014731
54	.001369	-.207559	.003875	-.129352	.003120	-.011611
55	.029532	-.178027	.044749	-.084603	.000961	-.010650
56	.006825	-.171202	.000264	-.084338	.023203	.012553
57	-.017659	-.188861	-.050301	-.134639	.000127	.012680
58	.002856	-.186005	.033974	-.100665	-.005869	.006811
59	-.020717	-.206722	.013746	-.086919	-.011781	-.004970
60	.002002	-.204720	.016789	-.070130	.005130	.000160

++

D.A.R. = Difference Average Residuals.
C.D.A.R. = Cumulative Difference Average Residuals.
PORT.1 = Portfolio 1.
Estimated day of release of auditors report is day 31.

APPENDIX D

DAYS	D.A.R. FOR PORT. 1A	C.D.A.R. FOR PORT. 1A	D.A.R. FOR PORT. 3A	C.D.A.R. FOR PORT. 3A
1	.012648	.012648	.007042	.007042
2	-.023036	-.010388	-.013060	-.006018
3	.005338	-.005050	.001602	-.004416
4	-.049385	-.054435	-.009487	-.013903
5	.013875	-.040560	.022313	.008410
6	.007320	-.033240	-.013323	-.004913
7	-.041195	-.074435	-.034541	-.039454
8	.034306	-.040129	.020882	-.018572
9	.011639	-.028490	.018156	-.000416
10	-.008936	-.037426	.009938	.009522
11	.000619	-.036807	-.019312	-.009790
12	.005876	-.030931	.016770	.006980
13	-.023422	-.054353	-.024968	-.017988
14	-.025775	-.080128	-.012289	-.030277
15	-.012635	-.092763	-.005286	-.035563
16	-.027020	-.119783	.000389	-.035174
17	.017018	-.102765	.034858	-.000316
18	-.018032	-.120797	.006788	.006472
18	.045144	-.075653	.014504	.020976
20	-.012548	-.088201	-.020022	.000954
21	-.002792	-.090993	.001830	.002784
22	.019398	-.071595	.022387	.025171
23	.001991	-.069604	.005103	.030274
24	-.004741	-.074345	.005953	.036227
25	-.003515	-.077860	-.017614	.018613
26	.031149	-.046711	.023245	.041858
27	-.022592	-.069303	-.020446	.021412
28	.021546	-.047757	.005768	.027180
29	.007043	-.040714	.023495	.050675
30	.016472	-.024242	-.000642	.050033
31	-.032018	-.056260	-.028321	.021712
32	-.015167	-.071427	-.016905	.004807
33	.010128	-.061299	.027318	.032125
34	.000834	-.060465	-.004824	.027301
35	.008466	-.051999	.033911	.061212
36	-.028054	-.080052	.008028	.069240
37	-.022743	-.102795	-.001426	.067814
38	-.003208	-.106003	-.006921	.060893
39	-.025725	-.131728	-.017746	.043147
40	-.000330	-.132058	.007612	.050759
41	-.010901	-.142959	.010398	.061157
42	-.008358	-.151317	-.004576	.056581
43	.007166	-.144151	-.033184	.023397
44	-.021106	-.165257	.017419	.040816
45	.006998	-.158259	-.015245	.025571
46	-.008005	-.166264	-.015437	.010134
47	-.008310	-.174574	.006488	.016622
48	-.002237	-.176811	.001672	.018294

49	-.004789	-.181600	-.013854	.004440
50	.017206	-.164394	-.017287	-.012847
51	-.014674	-.179068	.005011	-.007836
52	-.027014	-.206082	-.001456	-.009292
53	-.015520	-.221602	-.015236	-.024528
54	.011778	-.209824	.019831	-.004697
55	.040157	-.169667	.016040	.011343
56	.009496	-.160171	.027895	.039238
57	-.028683	-.188854	-.014344	.024894
58	.005420	-.183434	-.003273	.021621
59	-.032867	-.216301	-.028697	-.007076
60	.005036	-.211265	.004047	-.003029

Estimated day of release of auditors report is day 31.

APPENDIX E

DAYS	D.A.R. FOR PORT.2B	C.D.A.R. FOR PORT.2B	D.A.R. FOR PORT.3B	C.D.A.R. FOR PORT.3B
1	.012331	.012331	.009055	.009055
2	.003500	.015831	.011389	.020444
3	-.016901	-.001070	.001392	.021836
4	-.003757	-.004827	.005327	.027163
5	-.018546	-.023373	.000177	.027340
6	.029902	.006529	.004456	.031796
7	-.011450	-.004921	-.001325	.030471
8	-.003939	-.008860	-.005264	.025207
9	.001315	-.007545	.012180	.037387
10	-.007972	-.015517	-.002603	.034784
11	.008456	-.007061	.001517	.036301
12	-.022789	-.029850	.009251	.045552
13	-.014124	-.043974	-.005551	.040001
14	.007113	-.036861	-.034233	.005768
15	.018525	-.018336	.006849	.012617
16	-.004816	-.023152	.013756	.026373
17	-.016066	-.039218	-.000998	.025375
18	-.006181	-.045399	-.019317	.006058
19	-.032441	-.077840	-.006895	-.000837
20	.003930	-.073910	.004131	.003294
21	.006023	-.067887	-.010683	-.007389
22	.030224	-.037663	-.004072	-.011461
23	-.015304	-.052967	.017063	.005602
24	-.025022	-.077989	.000735	.006337
25	.013115	-.064874	.002468	.008805
26	-.011792	-.076666	-.000668	.008137
27	.012360	-.064306	-.015900	-.007763
28	-.012400	-.076706	.015852	.008089
29	.021767	-.054939	-.007199	.000890
30	.017423	-.037516	-.001384	-.000494
31	-.010004	-.047520	-.009491	-.009985
32	.009769	-.037751	.019412	.009427
33	-.014826	-.052577	-.007937	.001490
34	.021721	-.030856	-.009071	-.007581
35	-.001596	-.032452	.011003	.003422
36	-.013900	-.046352	.006105	.009527
37	.015370	-.030982	-.007317	.002210
38	-.035368	-.066350	-.012204	-.009994
39	.002677	-.063673	.002870	-.007124
40	-.007004	-.070677	-.018912	-.026036
41	.045920	-.024757	.004207	-.021829
42	-.048154	-.072911	-.007511	-.029340
43	.021796	-.051115	.014105	-.015235
44	-.026472	-.077587	-.001602	-.016837
45	-.005389	-.082976	.004200	-.012637
46	-.005968	-.088944	.013937	.001300
47	-.014464	-.103408	-.009266	-.007966
48	-.024558	-.127965	.003834	-.004132

49	-.029269	-.157234	.010562	.006430
50	.023365	-.133869	-.002077	.004353
51	.006005	-.127864	.002402	.006755
52	.012281	-.115583	.000188	.006943
53	.011611	-.103972	.019821	.026764
54	.030447	-.073525	-.015727	.011037
55	.034955	-.038570	-.022976	-.011939
56	-.000085	-.038655	.009801	-.002138
57	-.048056	-.086711	.010904	.008766
58	.021735	-.064976	-.002003	.006763
59	.005754	-.059222	.013341	.020104
60	.001974	-.057248	.011955	.032059

Estimated day of release of auditors report is day 31.

APPENDIX F

DAYS	D.A.R. FOR GROUP2	C.D.A.R. FOR GROUP2	D.A.R. FOR GROUP3	C.D.A.R. FOR GROUP3	D.A.R. FOR GROUP4	C.D.A.R. FOR GROUP4
1	.024004	.024004	.051641	.051641	.029758	.029758
2	-.015589	.008415	.023145	.074786	.000508	.030266
3	.009631	.018046	.025874	.100660	.001278	.031544
4	-.009983	.008063	-.055964	.044696	-.008273	.023271
5	-.016612	-.008549	.049389	.094085	.032102	.055373
6	-.005997	-.014546	.011297	.105382	.007443	.062816
7	-.019902	-.034448	.019770	.125152	-.006794	.056022
8	.016405	-.018043	.044452	.169604	.006979	.063001
9	-.019151	-.037194	.014293	.183897	.013471	.076472
10	-.029851	-.067045	.020693	.204590	.005756	.082228
11	.059575	-.007470	.029026	.233616	.027957	.110185
12	-.043700	-.051170	-.041354	.192262	-.010822	.099363
13	-.032126	-.083296	-.035699	.156563	-.004632	.094731
14	.027002	-.056294	-.023218	.133345	-.027348	.067383
15	-.017354	-.073648	-.002737	.130608	.007276	.074659
16	-.016807	-.090455	.008382	.138990	.020788	.095447
17	-.007606	-.098061	.014160	.153149	.014316	.109763
18	.012030	-.086031	.036921	.190070	-.007622	.102141
19	-.005527	-.091558	-.014093	.175977	.012424	.114565
20	-.013114	-.104672	-.039690	.136287	.020610	.135175
21	-.003650	-.108322	.029827	.166114	-.013578	.121596
22	-.006971	-.115293	-.031228	.134886	.006581	.128177
23	.020829	-.094464	.057385	.192271	.016956	.145133
24	-.009811	-.104275	.000286	.192557	-.014458	.130675
25	.007790	-.096485	.061237	.253794	-.006067	.124608
26	-.013683	-.110168	.001117	.254911	-.005043	.119565
27	-.021551	-.131719	-.028380	.226531	-.001217	.118348
28	-.036543	-.168262	.018497	.245028	.007028	.125376
29	.043447	-.124815	.013850	.258878	-.013666	.111710
30	.010813	-.114001	.010777	.269655	-.004052	.107658
31	.025631	-.088370	-.002655	.267000	-.011752	.095906
32	-.036704	-.125074	.001618	.268618	-.002644	.093262
33	-.016337	-.141411	-.028232	.240386	-.002703	.090559
34	-.002449	-.143860	.005770	.246156	-.020932	.069627
35	.027730	-.116130	.001231	.247387	.028867	.098494
36	-.008449	-.124579	-.037837	.209550	-.022827	.075667
37	-.008358	-.132937	-.009816	.199734	.012031	.087698
38	-.022851	-.155788	-.013085	.186649	.003535	.091233
39	-.017153	-.172941	.002883	.189532	-.018095	.073138
40	.028195	-.144746	-.016450	.173082	.003821	.076959
41	.000583	-.144163	.001031	.174113	.021057	.098016
42	-.015538	-.159701	-.005829	.168284	-.011274	.086742
43	-.009636	-.169337	-.047235	.121049	-.010004	.076738
44	-.029000	-.198337	.052314	.173363	.019637	.096375
45	.058410	-.139927	.000771	.174134	.005482	.101857
46	-.020337	-.160264	.047407	.221541	-.000031	.101826
47	-.060421	-.220685	-.029364	.192177	-.003533	.098293
48	-.007608	-.228293	-.016695	.175482	.015343	.113636

49	-.002105	-.230398	-.031217	.144265	.000629	.114265
50	.011445	-.218953	.020861	.165126	0.	.114265
51	.003822	-.215131	.024937	.190063	-.008055	.106210
52	-.029666	-.244797	-.010121	.179942	.009759	.115969
53	-.003844	-.248641	.051695	.231637	.013902	.129870
54	.004110	-.244531	.037210	.268847	-.004220	.125650
55	.028047	-.216484	-.093862	.174985	-.009584	.116066
56	.010791	-.205693	-.023889	.151096	.010165	.126231
57	-.045493	-.251186	-.037320	.113775	-.009242	.116989
58	.017412	-.233774	-.028628	.085147	-.009614	.107375
59	.029817	-.203957	-.024191	.060956	.025665	.133040
60	.000365	-.203592	.007681	.068637	-.015892	.117148

Estimated day of release of auditors report is day 31.

APPENDIX G

THE MARKET MODEL : A SUMMARY.

If R_{it} (return on any security) and R_{mt} (return on a "market" portfolio of all securities) are bivariate normal, then the expected value of R_{it} conditional on R_{mt}, is

(1) $E(R_{it}|R_{mt}) = \alpha_i + \beta_i R_{mt}, \quad t=1,\ldots,T,$

with

(2) $\beta_i = cov(R_{it}, R_{mt}) / \sigma^2(R_{mt})$ and

$\alpha_i = E(R_{it}) - \beta_i E(R_{mt}), \quad t=1,\ldots,T.$

The relationship between R_{it} and R_{mt} can then be written as

(3) $R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}, \quad t=1,\ldots,T.$

Intuitively, $\alpha_i + \beta_i R_{mt}$ is the component of R_{it} that can be attributed to the relationship between R_{it} and R_{mt}, while e_{it} is the disturbance in this relationship.

The properties and assumptions of the above equation are as follows:

(5) $\sigma^2(e_{it}) = \sigma^2(e_i), \quad t=1,\ldots,T,$

(6) $cov(e_{it}, R_{mt}) = 0 \quad t=1,\ldots,T.$

the subscript t will be dropped, henceforth, by assuming that the joint distribution of R_{it} and R_{mt} is stationary.

From (6), e_{it} and R_{mt} are independent, and the variance

of equation (3) can, therefore, be written as

(7) $\sigma^2(R_i) = \beta_i^2 \sigma^2(R_m) + \sigma^2(e_i)$

Dividing (7) by $\sigma^2(R_i)$ yields

(8) $1 = \beta_i^2 \sigma^2(R_m) / \sigma^2(R_i) + \sigma^2(e_i) / \sigma^2(R_i)$

Since the correlation coefficient between R_i and R_m is $p_{im} = \text{cov}(R_i, R_m) / \sigma(R_i)\sigma(R_m)$ and given the definition of β_i in equation (2), equation (8) can be rewritten as

(9) $1 = p_{im}^2 + \sigma^2(e_i) / \sigma^2(R_i)$

p_{im}^2 is, therefore, the proportion of the variance of R_i attributed to the relationship between R_i and R_m, while $1 - p_{im}^2$ is the proportion of R_i attributed to the disturbance term e_i.

APPENDIX H

DISCRIMINANT FUNCTIONS: THE THEORY.

In this thesis, firms are either assigned to group 1 (the bankrupt firms) or group 2 (the non-bankrupt firms). A kx1 vector x (of financial ratios) is observed for each firm. The individual firms whose measurements are given by x are then assigned to either group 1 or group 2. If the parameters of the distributions of x in 1 and 2 are known, this can be used to construct an assignment rule. Otherwise, the sample estimates of the parameters are used. One criterion of goodness of classification is that of Fisher, who suggested the use of a linear combination of the observations, and choosing the coefficients so that the ratio of the difference of the means of the linear combination in the two groups to its variance is maximized.

Let us denote the linear combination as $y=\beta' x$. The mean of y is $\beta' u_1$ in group 1 and $\beta' u_2$ in group 2. Assuming that the covariance matrices are the same, that is, $\Sigma_1 = \Sigma_2 = \Sigma$, the variance of either population is therefore, $\beta' \Sigma \beta$.

Fisher's rule is to maximize $\phi = (\beta' u_1 - \beta' u_2)^2 / \beta' \Sigma \beta$ by choosing β. We therefore differentiate ϕ with respect to β;

$$\frac{\partial \phi}{\partial \beta} = \frac{2(u_1 - u_2)\beta' \Sigma \beta - 2\Sigma\beta(\beta' u_1 - \beta' u_2)}{(\beta' \Sigma \beta)^2} = 0$$

This gives $u_1 - u_2 = \Sigma\beta((\beta' u_1 - \beta' u_2)/\beta' \Sigma \beta)$

As β is used only to separate the population into the two

groups, it can be multiplied by any constant. β is thus proportional to $\Sigma^{-1}(u_1 - u_2)$. When the population parameters are not known, we can estimate them by $\bar{x}_1$, $\bar{x}_2$ and S. $\bar{x}_i$ is the sample mean vector of group i and S is the sample covariance. An alternative derivation is shown in Anderson (1958, pp.133-134). An individual firm is assigned to group 1 if $y=(\bar{x}_1 - \bar{x}_2)'S^{-1}x$ is closer to $\bar{y}_1=(\bar{x}_1 - \bar{x}_2)'S^{-1}\bar{x}_1$, then to $\bar{y}_2$ and to group 2 otherwise.

The above assignment rule can also be expressed (equivalently) in the following manner:

Group 1 if $(\bar{x}_1 - \bar{x}_2)'S^{-1}x - 1/2(\bar{x}_1 + \bar{x}_2)'S^{-1}(\bar{x}_1 - \bar{x}_2) < \log k$

Group 2 if $(\bar{x}_1 - \bar{x}_2)'S^{-1}x - 1/2(\bar{x}_1 + \bar{x}_2)'S^{-1}(\bar{x}_1 - \bar{x}_2) > \log k$

where k is given by $k=(p1)(c1)/(p2)(c2)$. p1 and p2 are the probabilities that a firm belong to group 1 or group 2 respectively. c1 and c2 are the cost of type I and type II errors respectively. This can also be written as $Z=\log(p1)(c1)/(p2)(c2)$; where Z is the discriminant function cut-off score (with an intercept). Under the special case when p1=p2 and c1=c2, k=1 and Z=0. Differences in p1 and p2 and/or c1 and c2 can be used to establish defferent cut-off scores, as illustrated in Chapter 3 of this thesis.

Note: Proof that $k=(p1)(c1)/(p2)(c2)$ is the cut-off score.

The conditional probability of a firm coming from Group 1, given an observation x is

$p1q1(x)/p1q1(x)+p2q2(x)$ where qi is the density of population group i. The total expected cost of misclassification is

$c1p1\int_{R_2} q1(x)dx + c2p2\int_{R_1} q2(x)dx$ where Ri is the region of

classification of firms to group i. To minimize the total expected cost of misclassification above, the following R1 and R2 are chosen:

R1:c1p1q1(x)$\geq$c2p2q2(x)

R2:c1p1q1(x)<c2p2q2(x)

This can be rewritten as

R1:c1p1/c2p2$\geq$q2(x)/q1(x)

R2:c1p1/c2p2<q2(x)/q1(x)

By letting q2(x)/q1(x)=k, we have, therefore, established c1p1/c2p2=k as the cut-off score.

APPENDIX I

AN EXAMPLE OF A "SUBJECT TO" OPINION.

Report of Certified Public Accountants

The Board of Directors
XYZ, Inc.
Seattle, Washington

We have examined the balance sheet of XYZ, Inc. as of April 29, 1978, and April 30, 1977, and the related statements of operations and retained earnings and changes in financial position for the year then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

The Company has incurred significant losses during the two years ended April 29, 1978 and has experienced a significant reduction in working capital during the current year. Accordingly, the Company's ability to realize its assets and retire its liabilities in the normal course of business is dependent upon the Company's obtaining additional financing, as described in Note 13, or achieving profitable operations.

In our opinion, subject to the favorable resolution of the matters discussed in the preceding paragraph, the financial statements designated above present fairly the financial position of XYZ, Inc. at April 29, 1978, and April 30, 1977, and the results of its operations and changes in its retained earnings and financial position for the year then ended, in conformity with generally accepted accounting principles applied on a consistent basis.

Big Eight & Co.

Seattle, Washington
June 17, 1978