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# AN EVALUATION OF THE INFORMATION CONTENT OF STATEMENT OF FINANCIAL ACCOUNTING STANDARDS No. 2

By

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ABSTRACT

AN EVALUATION OF
THE INFORMATION CONTENT OF
STATEMENT OF FINANCIAL ACCOUNTING STANDARDS NO. 2

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The objective of this study was to assess the information content of the accounting and reporting requirements of Statement of Financial Accounting Standards No. 2. Statement No. 2 requires all research and development costs to be expensed and disclosed in the year incurred.

The Financial Accounting Standards Board based its expensing decision on the assertion that there is a high degree of uncertainty about the future benefits of individual research and development projects. The Board contended that the relationship between research and development expenditures and the resultant future benefits is so uncertain that alternative accounting procedures such as capitalization would not provide investors with useful information for evaluating the earnings potential of an enterprise. The FASB believed that the immediate expensing of all research and development costs would better enable investors to predict the risk and return of an investment.

The information content of Statement No. 2 was assessed by analyzing the relative stability of the systematic risk of affected firms around the time the statement was issued. If Statement No. 2

provided new information to evaluate the risk and return of a security, a shift in the systematic risk of those firms required to change their accounting treatment of research and development expenditures would be expected.

Two portfolios of firms were included in the study. The treatment portfolio was comprised of firms that had capitalized all or part of their R and D expenditures prior to Statement No. 2 and switched to expensing those costs as a result of the statement. Firms that had expensed and disclosed all of their research and development expenditures prior to Statement No. 2 were included in the control portfolio. A significant adjustment in the systematic risk of the control portfolio would not be expected because the accounting and reporting procedures of those firms did not change as a result of the statement.

Ordinary least squares procedures and the market model were used to estimate the systematic risk of the treatment and control portfolios. An analysis of covariance procedure developed by Harvey (1976) was employed to test the stability of each portfolio's systematic risk during the period surrounding the issuance and adoption of Statement No. 2.

To determine if there were significant differences in the risk behaviors of the treatment and control groups, a portfolio was created which consisted of monthly differences in the returns of the treatment and control portfolios. An analysis of covariance procedure was used to evaluate the constancy of the monthly betas calculated for the "difference portfolio." If there were no significant differences in the risk behaviors of the treatment and control groups, the beta

coefficient of the "difference portfolio" would be relatively stable.

The results of this analysis suggest that the accounting and reporting requirements of Statement No. 2 possessed no information content. Although the systematic risk of the treatment portfolio (change firms) decreased dramatically around the time the Exposure Draft was issued, the systematic risk of the control portfolio (non-change firms) also decreased at that time. The statistical procedures conducted on the "difference portfolio" indicated that the risk changes of the two groups were not significantly different.

These results may imply one of two conditions: (1) capitalization or selective capitalization of research and development expenditures conveyed sufficient information to enable the market to evaluate the risk of a security or (2) the market obtained information about firms' research and development costs from alternative accounting and non-accounting sources. The accounting and reporting policies of Statement No. 2 may have had no effect on investors' perceptions of systematic risk because they provided redundant information.

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# CHAPTER ONE

## INTRODUCTION

In October 1974, Statement of Financial Accounting Standards No. 2, "Accounting for Research and Development Costs," was issued. Statement No. 2 established broad guidelines for determining which activities should be classified as research and development (R and D) and identified the elements of costs that should be included in R and D. Statement No. 2 requires all research and development expenditures as defined by the statement to be charged to expense when incurred.

In defining the activities and costs that were to be recognized as part of research and development, the Financial Accounting Standards Board's (FASB) goal was to achieve a reasonable degree of comparability among enterprises. Prior to Statement No. 2, considerable variation existed with respect to the kinds of costs that were identified as research and development even under substantially similar circumstances.

The Board defined research as:

> planned search or critical investigation aimed at discovery of new knowledge with the hope that such knowledge will be useful in developing a new product or service ... or new process or technique ... or in bringing about a significant improvement to an existing product or process.[1]

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[1]"Statement of Financial Accounting Standards No. 2 -- Accounting for Research and Development Costs," Journal of Accountancy (December 1974), p. 82.

Development was defined as the translation of research findings or other knowledge into a plan or design for a new product or process or for a significant improvement to an existing product or process. Development includes the formulation, design, and testing of product alternatives, the construction of models and prototypes, and the operation of pilot plants. As the definitions indicate, the FASB made a clear distinction between the activities that constitute research and those that are considered to be development.

In determining which method or methods were to be used to account for research and development costs, the Board considered four alternatives:

(1) charge all costs to expense when incurred;

(2) capitalize all costs when incurred;

(3) capitalize costs when incurred if specified conditions are fulfilled and charge all other costs to expense;

(4) accumulate all costs in a special category until the existence of future benefits can be determined.

Prior to Statement No. 2, expensing, capitalization and selective capitalization were used extensively to account for research and development costs.

The FASB decided against accumulating all R and D costs in a special category distinct from assets and expenses because it believed that the use of a special category would change the nature of the basic financial statements and would complicate the computation of ratios and other financial data. Selective capitalization was rejected as an alternative because the Board felt that no set of conditions could be established for selective capitalization that would be objectively and

comparably applied by all enterprises.

Proponents of capitalizing all research and development costs believed that the accounting treatment for research and development costs should be determined by considering all of the R and D activities of an enterprise in the aggregate. They maintained that if there is a high probability of future benefits from an enterprise's total research and development program, the entire cost of those activities should be capitalized regardless of the certainty of future benefits of individual projects.

The Board asserted that it is not appropriate to consider accounting for research and development activities on a total-enterprise basis because the expectation of future benefits is not evaluated in relation to broad categories of expenditures but in relation to individual or related projects. The FASB, therefore, rejected the alternative of capitilizing all R and D costs.

The FASB favored expensing all research and development costs because it believed that there was a high degree of uncertainty about the future economic benefits of research and development projects. The Board felt that expensing all research and development costs would provide investors with useful information for assessing the earnings potential of an enterprise and would better enable them to predict the risk and return of an investment in the firm.

Statement No. 2 requires all research and development expenditures to be charged to expense when incurred. Disclosure must be made in the financial statements of the total amount of research and development costs charged to expense in each period for which an income statement is presented. The requirement must be applied retroactively by prior

period adjustment.[2]

## Research Objective

The objective of this study is to assess the information content of the accounting and reporting requirements of Statement No. 2. Since the FASB asserted that expensing and disclosing all R and D costs would provide investors with useful information to predict the risk and return of an investment in a firm, this study will attempt to determine if Statement No. 2 provided any information which had an effect on investors' assessments of the riskiness of firms affected.

The information content of Statement No. 2 will be evaluated by determining whether or not the systematic risk of firms required to change their accounting treatment of R and D shifted significantly at or around the time the statement was issued. If the statement provided investors with information to assess the risk and return of securities, a shift in systematic risk would be expected. The research design and statistical methods employed to assess the information content will be discussed in Chapter Three.

Gonedes and Dopuch (1974) believe that assessments of effects of accounting statements are important because recommendations concerning accounting procedures are often justified in terms of the effects of the prescribed procedures. They state:

> Since assertions about effects are important parts of the justifications offered for recommendations and prescriptions, we can assess the strength of these justifications by evaluating the theoretical or empirical support for the assertions about effects... In short, assessments of the effects of alternative accounting

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[2] Ibid., p. 83.

> procedures and regulations can be useful to accounting policy-making bodies in making their decisions and to their constituencies in evaluating those decisions. (p. 80)

Assessing the information content of Statement No. 2 is of interest not only because providing useful information is the objective of the statement but because the theoretical arguments used by the FASB to support its expensing decision have been impugned.[3] In addition, respondents to the Discussion Memorandum and Exposure Draft on research and development expressed concern that the regulation would have an adverse impact on the ability of firms to raise debt or equity capital for future research and development projects. A firm's ability to raise capital may have been affected if Statement No. 2 led to a reevaluation of the firm's risk. This study may therefore provide some preliminary evidence as to whether firms' ability to finance future R and D was affected by Statement No. 2.

The Financial Accounting Standards Board has recently established a formal review procedure for statements that have been in effect for at least two years. The initial reviews will cover Statements No. 1 through No. 12. The results of this study may provide some input for a review of Statement No. 2. If this study finds that expensing research and development costs provides information to financial statement users, it may offer some justification for a practice that many feel is a backward step in the development of appropriate accounting standards.

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[3]See Bierman and Dukes (1975), Corbin (1975), and Johnson (1976).

## Criticism of Statement No. 2

The major justification offered by the FASB for expensing research and development expenditures was what it termed a high degree of uncertainty about the future benefits of individual research and development projects. The Board cited two studies which found the failure rate of research and development projects to be very high.[4]

The FASB has been criticized for its lack of scholarly research in concluding that the uncertainties of company sponsored R and D are formidable (Bierman and Dukes, 1975; Schiff and Fabricant, 1974). A study by Gee (1971) which classified R and D projects by objective found that about 70 percent of research and development expenditures are for support of existing business while the remainder is for exploratory research and high risk business development. Research and development in support of existing business is undertaken to maintain and improve the profitability of existing business. Gee found that projects in this category are selected that have the most immediate effect on whatever economic criterion is of greatest interest to the corporation. There is relatively low uncertainty about the outcome of these expenditures.

Gee's findings are supported by statistics of the National Science Foundation which estimated that three-quarters of company sponsored research and development consisted of development in 1974. Only a small portion of research and development expenditures was for exploratory and high risk R and D (Schiff and Fabricant, 1974).

Schiff and Fabricant believe that the 1968 Booz-Allen and Hamilton study cited by the FASB as evidence of the uncertainty and high failure

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[4]See Booz-Allen and Hamilton, Inc. (1968) and Gerlach and Wainwright (1968).

rate of R and D projects does not provide such evidence at all. They argue that if more than half of all R and D expenditures is addressed to the support of existing business and if the success rate for those expenditures is over 50 percent (62 percent for all industry groups in the Booz-Allen and Hamilton study), then it is difficult to accept the argument that the outcome of R and D expenditures is uncertain.

Mansfield (1969) found that the bulk of R and D projects carried out by firms in his sample was relatively safe from a technical point of view. He states that:

> Models or policies based on the popular supposition that the bulk of the research and development in the industrial laboratory is very risky ... are likely to be misconceived and misleading. (p. 66)

I appears that the Board's argument of uncertainty of future benefits as a primary reason for requiring the expensing of R and D costs is unsubstantiated.

In Statement of Financial Accounting Standards No. 2, the Board cites three studies[5] which "failed to find a significant correlation between research and development expenditures and increased future benefits as measured by subsequent sales, earnings, or share of industry sales." (p. 16) The Board states that because there is no direct or even indirect basis for relating costs to revenues, the immediate recognition principle of expense recognition should apply.

One of the three studies cited to support this conclusion was by Alex J. Milburn. Milburn's study was based on an earlier study by Johnson (1967) which tested and failed to find a significant correlation

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[5]See Johnson (1967), Milburn (1971), and Newman (1968).

between research and development costs as a percentage of total income and net income as a percentage of net worth. Using Johnson's sample of ten major drug companies, Milburn tested the hypothesis that changes in the ratio of drug manufacturers' research and development expenditures to the total drug industry's research and development expenditures would lead to corresponding changes in the company's future share of industry sales. Milburn did not find a statistically significant correlation.

The Board concluded from these studies that "a causal relationship between expenditures and specific future revenue can seldom be demonstrated, even with the benefit of hindsight." (p. 16)

In a letter of comment to the FASB's Exposure Draft on accounting for research and development costs, Milburn questioned whether the empirical evidence cited by the Board was sufficient to support the causal relationship conclusion. He pointed out that because the results of his and Johnson's studies were based on such a small sample of firms, the correlation would have to have been very high to be statistically significant. He also indicated that potentially important intervening variables may have obscured observable correlations.

Milburn noted that differences may exist between the relationship of basic research expenditures and development expenditures to observable future benefits. Because his study and Johnson's study used aggregated financial data, the differences could not be determined.

Milburn and other respondents to the Exposure Draft expressed disappointment that the Board would conclude that no correlation can be demonstrated between research and development efforts and future benefits given the scant and ambiguous empirical evidence it cited. The

studies cited by the Board which were unable to detect a significant relationship are not sufficient evidence to conclude that such a relationship does not exist. Bierman and Dukes (1974) adduce studies by Scherer, Bailey and Angilley which provide support for the hypothesis that research and development expenditures do produce benefits for the firm.

The FASB's lack of causal relationship argument does not support its expensing decision.

The FASB asserted that expensing research and development costs would provide useful financial information for investment and credit decisions. It indicated that two of the basic elements in the decision models of many financial users are risk and expected return. The Board claimed that capitalization of research and development costs would not be useful in assessing the earnings potential of an enterprise because of the high degree of uncertainty associated with those costs. It concluded, therefore, that an investor's ability to predict the return on an investment and the variability of that return would not be enhanced by capitalization.

Respondents to the Exposure Draft on research and development costs expressed concern that uniform treatment of all research and development expenditures under all conditions would result in less informative reports and less equitable treatment of companies than if more discriminating treatment were applied.[6] Statement No. 2 makes essentially different activities, higher risk basic research and lower risk development, appear to be alike. Requiring all R and D costs to be expensed,

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[6]See Letters of Comment No. 124 from Ernst and Ernst and No. 153 from Haskins and Sells.

regardless of the nature of those costs, may lead to the appearance of similarities between companies when differences should be emphasized. Expensing all research and development expenditures may not be useful in evaluating the risk and return of securities because it ignores economic realities and treats all R and D expenditures as valueless.

It is interesting that in requiring the expensing of all R and D costs, the FASB is doing exactly what it had earlier termed inappropriate. It is considering accounting for research and development expenditures on an aggregate basis. The Board rejected the alternative of capitalizing all R and D costs because it maintained that future benefits should not be evaluated in relation to broad categories of expenditures but on an individual or related project basis. By requiring mandatory expensing, the Board is stating, in effect, that the future benefits of all R and D projects are highly uncertain. This, obviously, is not so. It is also interesting that after defining and making the distinction between research and development, the FASB disregarded the basic differences between the two activities and required identical treatment.

The immediate expensing of all R and D costs may result in inequitable treatment of companies that have discernible future benefits associated with their R and D projects, for example, companies undertaking planned development of products or processes for which a market exists. The financial positions and results of operations of these companies will be distorted by expensing outlays that should be treated as assets. Capitalizing and subsequently amortizing these research and development expenditures would result in financial reporting that provides investors with a better understanding of the companies' activities.

By denying the option to capitalize, Statement No. 2 suppresses information that otherwise would be provided. When companies capitalized research and development costs prior to Statement No. 2, they very often disclosed in notes to the financial statements the types of costs they capitalized and the basis of their decisions to capitalize. Table 1 presents examples of these footnote disclosures.

Companies with significant amounts of capitalized research and development costs also disclosed the amounts capitalized and amortized in the 10-K reports filed annually with the Securities and Exchange Commission (SEC). For financial statements filed with the SEC on or after December 31, 1973, any item in the category of "other assets and deferred charges" that is in excess of 5 percent of total assets must be disclosed separately. The policy for deferral and amortization must be disclosed and if the amounts deferred and amortized are material, they must be presented in schedule form.[7]

With the issuance of Statement No. 2, the only information about R and D expenditures that must be disclosed in the financial statements is the total amount of research and development costs incurred and expensed. Some contend that this requirement has lowered rather than raised the quality and quantity of information available to financial statement users.

A study by Dukes (1974) which tested the association between earnings generated by expensing research and development costs and security prices found that security price behavior is more closely

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[7]See Securities and Exchange Commission, Regulation S-X, Rules 5-12, 12-08, and 12-16.

TABLE 1

Examples of R and D Footnote Disclosures
Prior to Statement No. 2

Example 1:

Product development costs relating to new products and new models of existing products are deferred and amortized over a period not to exceed three years commencing with the start of production.

Basic research prior to development is expensed as incurred.

Example 2:

The Company expenses research and development costs as incurred, except as follows:

Research and development costs applicable to specific product lines are capitalized only to the extent that they can be realized from firm orders.

Product costs applicable to audio-visual learning techniques are capitalized as incurred and amortized as units are sold, within a maximum period of two years.

Example 3:

The Company defers new research and development costs. Deferred costs include patent costs, salaries of scientists and engineers, and certain equipment, materials, and supplies. Other expenses incurred subsequent to the start of production are charged against income as incurred. The deferred costs are amortized over a period of five years following the start of production.

Deferred costs are reviewed semi-annually and upon the occurrence of any significant event relative to the development program to determine if any write-offs are necessary.

Example 4:

The Company has a program of long-range research and development. Costs pertaining to this program are deferred and amortized over a three year period beginning in the succeeding year. Amortization for 1971 and 1970 amounted to $1,287,760 and $371,200, respectively.

Example 5:

Research and development costs for new product lines have been capitalized for financial statement purposes and are being amortized over three to five years. These costs are expensed as incurred for income tax reporting.

A schedule of additions and related amortization for the last three years is as follows: ...

related to earnings adjusted for the capitalization of R and D costs than earnings computed with research and development costs expensed. Dukes' findings are consistent with the hypothesis that reported earnings are "systematically adjusted before they are impounded into security prices, that the adjustment is largely industry specific, and that the adjustment appears to be directly related to the research intensity of the industry." (p. 126)

Dukes concluded that accounting policy makers should attempt to ensure that sufficient data are provided to financial statement users to allow them to generate their own expectations regarding future payoffs of research and development expenditures. In light of Dukes' findings, the FASB may have provided investors with more relevant data if they had permitted both capitalization and expensing but had required disclosure of the total R & D expenditures as well as of the amounts expensed and capitalized.

## Effects of Statement No. 2

This research will attempt to determine if the expensing and disclosure requirements of Statement No. 2 provided any information which had an effect on investors' assessments of the riskiness of firms affected. Sunder (1973) notes that changes in the market's assessment of the risk of a stock may occur due to changes in the economic status of the firm or changes in the information system relating the firm to investors.

Changing from capitalizing research and development costs to expensing those costs may have had little effect on the economic status of firms that have had relatively stable R and D expenditures

for a number of years. Earnings would be the same whether the costs were immediately expensed or capitalized and subsequently amortized. Cash flows would be unaffected assuming that the R and D expenditures had been expensed for tax purposes prior to the change.

The firm's balance sheet would be altered since the capitalized R and D costs would be written off against retained earnings. This, in turn, would affect the firm's debt-to-equity ratio. Lev (1974) states that within a given risk class, the higher the firm's leverage (debt-to-equity ratio), the higher the systematic risk. Therefore, a change to expensing R and D costs could affect systematic risk depending upon how significantly the debt to equity ratio was increased.[8] Table 2 presents examples of the footnote disclosures of the change in accounting for R and D.

A change from capitalizing to expensing could seriously affect the economic status of firms with widely fluctuating research and development expenditures or young, growth firms with large R and D expenditures. Mandatory expensing would reduce net income and might even result in a loss. At the same time, the firm's assets would be reduced and its debt-to-equity ratio would increase. This could have an impact on the firm's credit and market standing and affect its ability to raise debt or equity capital. With a higher cost of capital

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[8]Systematic risk is defined as the covariance of the security's return with the market's return divided by the variance of the market's return, $\beta_{im} = \frac{\text{cov}(\tilde{R}_i, \tilde{R}_m)}{\sigma^2(\tilde{R}_m)}$. The higher the debt-to-equity ratio or relative share of fixed interest charges, the higher the risk associated with the common stocks.

TABLE 2

Examples of Footnote Disclosures of Changes in Accounting for Research and Development Costs

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Example 1:

In accordance with a recent ruling of the Financial Accounting Standards Board, research and development expenses were excluded as an element of cost used in pricing inventory. This has been done on a retroactive basis and consequently prior years have been restated. Inventory and taxes have been decreased by $20,853,000 and $9,692,000, respectively at December 31, 1973. The effect of this change on 1974 and 1973 income was not significant.

Example 2:

During 1974 the Company adopted the policy of charging all product research and development expenses ... to costs of goods sold as incurred. The effect of this change on annual net earnings was not material.

Financial data for 1973 has been adjusted by the following amounts and restated to reflect this change in accounting policy.

| | |
|---|---|
| Earnings before taxes | $(1,100,000) |
| Taxes on earnings | (500,000) |
| Net earnings | (600,000) |
| Net earnings per share | (.01) |
| Retained earnings, January 1 | (600,000) |

Example 3:

In accordance with the Financial Accounting Standards Board Statement No. 2, issued in October 1974, the consolidated statements for 1974 reflect all research and development as expensed when incurred, and prior years statements have been restated. ...

The cumulative effect of this restatement at 1 January 1974, after applicable income taxes, was a reduction of $252,145,179 in earnings retained for growth, which reduced shareholders' equity from $941,158,160 to $689,012,981. This change in accounting in 1974 decreased research and development expense by $18,794,000 and increased net earnings, after applicable income taxes, by $7,163,984 ($.18 a share). Comparable amounts for 1973 were $12,380,591 and $3,781,759 ($.10 a share), respectively.

Example 4:

In accordance with a pronouncement of the Financial Accounting Standards Board, the Company revised its accounting policy in 1974 with respect to development costs related to specific production programs. ... The consolidated financial statements have been restated to remove TriStar development costs from inventory ($487.8 million at December 30, 1973), and to charge such costs to earnings in the periods incurred.

TABLE 2
(Continued)

The amount of such costs charged to earnings in 1974 was $18 million. In connection with the change in accounting, gross profit ... which previously had not been recognized has been recorded retroactively ... A reconciliation of net earnings (loss) with amounts previously reported for the four years ended December 30, 1973 follows (in millions of dollars):

| | 1973 | 1972 | 1971 | 1970 |
|---|---|---|---|---|
| Net earnings (loss) - as previously reported | $16.8 | $16.2 | $15.4 | $(86.3) |
| Development costs incurred | (20.7) | (52.9) | (92.7) | (141.6) |
| Gross profit recognized | 20.7 | 9.9 | -- | -- |
| Related income tax effect | 1.4 | 19.6 | 37.9 | 40.1 |
| Net earnings (loss) as restated | $18.2 | $(7.2) | $(39.4) | $(187.8) |

As a result of the change in accounting, consolidated retained earnings at December 31, 1972 has been reduced by $281 million.

and fluctuating returns, the market's assessment of the firm's risk might change.

Some firms may have to reduce their level of R and D activity as a result of Statement No. 2 if they are unable to obtain financing for the projects or their cost of capital increases. The market may perceive these firms as riskier since a decrease in R and D activity may result in fewer new or improved products or processes being developed.

Even if a firm's economic status were unaffected by Statement No. 2, its systematic risk may have changed because the information system relating the firm to its environment may have changed. Prior to Statement No. 2, firms that capitalized all or part of their R and D expenditures disclosed that accounting policy in notes to the financial statements. The amortization policy was often disclosed, but the amount capitalized and amortized annually was usually not presented. For some firms, this information was made more complete by the SEC's disclosure requirements concerning the capitalization and amortization of deferred assets and costs and expenses in excess of one percent of total sales and revenues. Investors of those firms were able to determine the total R and D costs and the amounts expensed and capitalized and thus generate their own expectations concerning the future outcomes of those expenditures.

Investors of firms that did not disclose the capitalized portion of their research and development expenditures may not have been able to determine the firms' total R and D expenditures unless alternative sources of information were available. These investors may have found that the expensing and disclosure requirements of Statement No. 2 provided a more objective basis for evaluating the future earnings

performance of an enterprise. If this occurred, a revaluing of the firms' stock in line with the stockholders' revised expectations would have taken place with resultant changes in systematic risk. Adjustments in beta would not have occurred if Statement No. 2 provided no information or information that was already available from alternative sources.

The formal research hypothesis is stated as follows:

$H_0$: The systematic risk of firms did not change significantly as a result of the accounting and reporting policies of Statement No. 2.

$H_1$: The systematic risk of firms changed significantly as a result of the accounting and reporting policies of Statement No. 2.

# CHAPTER TWO

# LITERATURE REVIEW

In recent years, a number of market-based studies have been undertaken to assess the information content of accounting numbers, alternative accounting procedures, and changes in accounting techniques. Research has also been conducted to determine if accounting information is used by the market to estimate the systematic risk of a firm. This present analysis of the information effect of Statement No. 2 is related to current studies which have investigated the impact of certain accounting requirements on the riskiness of firms.

## The Information Content of Annual Earnings Numbers

One of the earliest studies of information content was performed by Ball and Brown (1968). Ball and Brown's objective was to assess empirically the relative importance of the annual earnings number. They believed that an observed revision of stock prices associated with the release of the income report would provide evidence that the information reflected in income numbers is useful.

To test for information content, Ball and Brown constructed two alternative models of the market's expectation of income, a linear regression model and a naive martingale model.[1] Earnings forecast

[1] A martingale model implies that the best estimate of the current period's income number is the previous period's income number ($E(\text{Income}_t) = \text{Income}_{t-1}$).

errors were generated by comparing the estimated earnings with actual earnings. Firms were grouped into two portfolios, one with positive forecast errors (actual earnings exceeded expected earnings) and the other with negative forecast errors. Using the Abnormal Performance Index,[2] monthly abnormal returns were computed for each portfolio for eleven months prior to the earnings announcements and six months afterwards.

Ball and Brown hypothesized that if the annual income numbers had information content, there would be an association between the sign of the forecast error and the sign of the abnormal return. The results indicated that a positive relationship existed. When actual income differed from expected income, the market tended to react in the same direction.

Ball and Brown concluded that the annual earnings numbers do have information content, but that most of the information contained in reported income (85 to 90 percent) is anticipated by the market by the time the annual report is released. The market uses other sources of information when they are more timely than annual net income.

Ball and Brown's research is relevant to the current study in that if the new accounting and reporting policy is found to have no information content, it may be because the market is getting information concerning research and development expenditures from other sources.[3]

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[2]The Abnormal Performance Index (API) is a measure of the contemporaneous association between accounting data and security prices.

[3]Alternative sources of information include trade journals, security analysts' forecasts, industry forecasts, prospectuses, etc.

A study by Foster (1973) provided evidence that the market uses sources of information other than annual or interim income reports.[4] Foster found that both individual investors and the aggregate market consider pre-audited estimates of earnings per share by company officials to have information content.

The reaction of individual investors to the earnings per share estimates was evaluated by observing trading volume during the week announcements of earnings per share estimates were made in the Wall Street Journal. Foster found that there was a 51 percent increase in the weekly average of the daily percentage of shares traded during the week the estimates were made relative to the sixteen weeks surrounding the estimates. There was only a one percent increase in trading volume of these same firms when the preliminary earnings reports were released following the estimates of earnings per share.

For a control group of firms for which no officials' estimates of earnings per share were publicized, there was a 47 percent increase in trading volume in the preliminary earnings announcement week. Foster interpreted the results as being consistent with individual investors perceiving the annual earnings per share number to have information content but reacting to the earliest source of that number, the company official's estimate.

To examine the aggregate market reaction to earnings per share estimates by company officials, Foster used a price analysis similar

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[4]A number of studies have determined that quarterly earnings announcements possess information content. May (1971) and Kiger (1972) found significant price changes during the weeks that quarterly earnings announcements were made.

to that employed by Ball and Brown (1968). In assessing the ability of trading strategies based on those estimates to generate abnormal returns, Foster determined that there was opportunity to earn abnormal returns up until the time of the announcements. Once the estimates were made public, strategies using information in the earnings per share estimates did not yield abnormal returns.

Foster concluded that estimates of earnings per share have information content and that investors rely on the most timely source of information in setting equilibrium security prices.

### The Information Content of Accounting Changes

According to Gonedes and Dopuch (1974), a change in the accounting techniques used for external reporting purposes can affect capital market equilibrium because (1) the change provides accounting numbers that convey information pertinent to valuing a firm; (2) making the change has a substantive economic impact independent of the accounting numbers affected by the change; or (3) the change signals other events that have economic importance. A number of studies have investigated the impact of accounting changes on security prices.

Kaplan and Roll (1972) examined the effect that two widely adopted accounting changes had on stock prices. One change was the switch from the deferral method to the flow through method of accounting for investment credits. The other change was from accelerated depreciation to straight-line depreciation. Neither change had an effect on taxes, cash, or any other real economic asset or liability of the firm. The firms simply chose different forms of communicating the same information. Kaplan and Roll hypothesized that stock prices would be unaffected

by the accounting changes and earnings announcements.

To assess the impact of the accounting changes, weekly abnormal returns were computed for sixty weeks surrounding the earnings announcements. Kaplan and Roll believed that if a company were able to influence its stock price by an accounting change, the principal impact would occur when the announcement was made of the year's earnings. Firms that increased reported earnings by adopting the flow through method of accounting for the investment credit experienced positive average abnormal returns for ten weeks surrounding the earnings announcements. The increase in security prices was only temporary. The firms experienced negative average abnormal returns for fifteen weeks after that.

Kaplan and Roll suggested that investors may have beem mislead by the earnings announcements but revised their expectations about the firms when they received information about the true reasons for the reported high earnings in the annual reports. Another explanation proffered was that quarterly earnings reports issued about thirteen weeks after the annual earnings announcements may have indicated to investors that the increased rate of earnings was due to the investment credit change and could not be maintained.

Kaplan and Roll found that firms that switched from accelerated to straight-line depreciation appeared to have a small, temporary increase in abnormal returns around the earnings announcement date. These results were not statistically significant and the null hypothesis of no effect could not be rejected.

Gonedes and Dopuch (1974) suggest that the significant results obtained for the firms changing to the flow through method may have

been overstated because a large percentage of the firms switched at essentially the same time, 1964. This bunching may have caused cross-sectional correlation among the disturbance terms (estimated using the market model), understating estimates of their dispersion, and therefore overstating the significance of the results. If that were the case, Kaplan and Roll's estimates would actually be consistent with the hypothesis that the accounting changes had no effect on stock prices.

Ball (1972) argued that Kaplan and Roll detected a market reaction to the accounting changes because they used the constant risk version of the market model. In addition, since a relatively large number of firms changed to the flow through method at the same time, it may not have been reasonable for Kaplan and Roll to assume that the accounting change was independent of the market factor. Ball reasoned that if all firms changed at the same time, the average return on the firms would be the market factor, regardless of any effect of the accounting change. Therefore, use of the market model which removes market effects from the security returns would not be a valid methodology.

Ball attempted to determine whether the market is mislead by changes in accounting techniques by analyzing the relationship between stock prices and a variety of accounting changes over a fourteen year period. A two-factor cross-sectional model of security returns adjusted for risk changes was used to test for price adjustments around the dates of the accounting changes.

Ball believed that firms that change accounting techniques may not be of constant risk. He argued that the two-factor asset pricing

model[5] might incorrectly indicate a market adjustment to an accounting change unless the constant risk assumption were relaxed. He therefore incorporated risk changes in the two-factor model, estimating risk by using an ordinary least squares regression on price data for 50 months prior to and 50 months after the date of the accounting change.

Ball found little abnormal price movement in the nine years before the accounting changes. There was little unusual price behavior in the month of the accounting change and in the 19 months after the accounting change. Ball concluded that changes in accounting techniques are not associated with market adjustments for the average firm.

Ball's study tested and supported the hypothesis of capital market efficiency. Gonedes and Dopuch (1974) state that it is possible to approach Ball's results with the maintained hypothesis of capital market efficiency. If this is done, his results can be viewed as evidence that accounting changes have no information content.

Ball expressed surprise that some of the categories of accounting changes included in his study did not exhibit strong market behavior, especially changes in inventory valuation from first in, first out (Fifo) to last in, first out (Lifo). This change would affect taxable income and, therefore, the after tax cash flow to stockholders. Ball reasoned that this change did not affect stock prices because at the

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[5] Security returns defined by the one-factor or market model, $\tilde{R}_i = \alpha_i + \beta_{im}\tilde{R}_m + u_i$, are conditional upon the ex-poste value of the market return. Estimates of $\alpha_i$ and $\beta_{im}$ are the intercept and slope of the linear relationship between $\tilde{R}_i$ and $\tilde{R}_m$.

The two-factor capital asset pricing model expresses the ex-ante expected return of a security in terms of the rate of return on a risk-free asset ($R_f$) plus a risk premium which is the risk measure $\beta_{im}$ multiplied by the difference between the expected return on the market ($\tilde{R}_m$) and the risk free rate; $E(\tilde{R}_i) = R_f + (E(\tilde{R}_m) - R_f)\beta_{im}$.

same time it reduced tax payments, increases in factor prices may have reduced cash flow.

Sunder (1973) analyzed the relationship between changes in inventory valuation methods and stock price behavior. His study included two samples of firms, those firms that changed their inventory valuation method from Fifo to Lifo and those that changed from Lifo to Fifo.

Sunder assumed that the market is efficient with respect to information about accounting changes and tested for information content. He hypothesized that if the market's expectations about a firm are formed primarily on the basis of reported earnings, the market price of firms switching from Fifo to Lifo would decline while the market price of firms changing from Lifo to Fifo would increase. If the market's expectations about a firm are formed on the basis of real economic value, the market value of firms switching to Lifo should remain unchanged or increase while the market value of firms switching to Fifo should remain unchanged or decline.

Sunder used the market model to test the stock price behavior for twenty-four months surrounding the accounting change. He found that the average price of the stocks of firms switching to Lifo rose 5 percent higher than that of the market in general during the twelve months preceding the accounting change. There was no clear trend in stock prices during the year following the accounting change.

It appeared that the stock prices of firms switching to Fifo declined slightly, but this could not be supported statistically because of the small size of the sample (22 firms). Sunder concluded that the market reacts to information concerning the real economic value of the firm.

In measuring the association between accounting changes and stock prices, Sunder assumed that the relative risk of the stocks remained unchanged. He tested this assumption upon completion of his study and found a significant increase in the relative risk of firms that changed to Lifo. Sunder concluded that using the market model which assumed constant risk may have yielded misleading results.

Sunder (1975) replicated his earlier study and attempted to measure the association between the accounting and price changes by abstracting the effect of risk changes. The relative risk of each stock was estimated for each of the 24 months surrounding the time of an inventory accounting change. A maximum of 41 months and a minimum of 25 months of data were used to estimate the relative risk for each month. The estimates of relative risk were used to estimate the residuals which provided a measure of association between the accounting changes and price changes.

Sunder found that the average risk of firms changing to Lifo was lower in the pre-change months than in the post-change months. During the two year study period, the average risk increased by 5.4 percent, with 78 percent of the total change occurring in the 12 months preceding the accounting change. For firms that made the accounting change from Lifo to Fifo, the average relative risk decreased by 5.3 percent.

The average abnormal price change for firms switching to Lifo was 4.7 percent after being adjusted for relative risk and changes in relative risk. The increase of 4.7 percent during the 12 months preceding the change was only slightly less than the 5.3 percent increase Sunder found when he used a model assuming constant risk. During the 12 months following the accounting change, no significant abnormal price changes

were observed.

Sunder concluded that changes in the market price of stocks are associated with the economic value of firms rather than changes in reported earnings. Investors appear to use information about the underlying economic realities of firms rather than reported earnings in forming their expectations about the securities.

None of the studies cited thus far have dealt with nondiscretionary accounting changes. Harrison (1977) investigated the market effects of discretionary and nondiscretionary accounting changes. He hypothesized that the signal emitted from the nondiscretionary accounting change is more likely to be interpreted as information about the change than about other events in the firm. Discretionary changes can serve as signals about firms' production-investment decisions, expectations about cash flows, attempts to smooth income, etc. Determining the information content of discretionary accounting changes is more difficult because of the presence of these confounding variables.

Harrison's study examined four separate categories of accounting changes: discretionary changes with positive effects on net income; discretionary changes with negative effects on net income; nondiscretionary changes with positive effects on net income; and nondiscretionary changes with negative effects on net income. To test the hypothesis that the relative discretion of management and the sign of the net income effect of an accounting change have information content, Harrison matched the change firms with nonchange firms of similar relative risk and industry membership. The matched firms were dichotomized into high risk and low risk groups because it had been suggested by Gonedes (1975) that the market reaction to accounting changes may

vary across risk classes.

The two-factor asset pricing model was used to compare the total returns of the treatment and control groups. Since the expected returns of the two groups were made equivalent by matching on relative risk, any differences in realized returns could be attributed to the variables of interest. The null hypothesis of no effect was tested over a 13 month period surrounding the post-year end month when most firms issued their preliminary earnings or annual reports.

Harrison found that both discretionary and nondiscretionary accounting changes that increased net income were associated with unique stock market behavior. The results also indicated that the discretion available to management in making the accounting changes possessed information content.

When the return differences of the two risk classes were plotted, it appeared that the high risk and low risk classes of firms were affected differently by the accounting changes. Harrison suggested that further research needs to be done before any conclusions can be drawn about the apparent risk class dependency.

### Information Content and Changes in Systematic Risk

Collins and Simonds (1977) investigated the information content of SEC line of business (LOB) disclosures by examining the impact of the disclosure requirements on the systematic risk of multi-product firms. Using the framework of Rubinstein (1973) which demonstrated the relationship between the operating activities of a multi-product firm and the systematic risk (beta) parameter specified in the two-factor capital asset pricing model, they indicated how segmental reporting may be used

by investors to assess systematic risk.

Collins and Simonds hypothesized that:

> To the extent that the model represents a reasonable characterization of the critical factors on which investors base their assessments of the riskiness of securities and to the extent that the initial disclosure of segmental data under the SEC LOB program conveys 'new' (and what is perceived to be reliable) information with which to assess these parameters, one would expect to observe changes in the systematic risk parameter of those firms most affected... (p. 12)

The study examined the effect of LOB requirements on the systematic risk of three groups of firms: a treatment group that reported little or no segmental data prior to the enactment of the SEC LOB disclosure requirements and two control groups. Estimates of the systematic risk were calculated by using the market model and ordinary least squares procedures on 40 months of return data, ending with the month of interest.

To test for a shift in systematic risk, Collins and Simonds used a series of analysis-of-covariance (ANCOVA) procedures. The test procedures were applied repeatedly to each group during the time period surrounding the enactment of the SEC segmental data requirements because the exact location of the possible shift in risk was not known a priori. The ANCOVA analysis was conducted at both the individual firm and portfolio level.

At the portfolio level, Collins and Simonds found a significant shift in the systematic risk of the treatment group during the hypothesized impact period. The control groups experienced no significant risk changes in the same period. When the ANCOVA beta-change analysis was performed at the individual firm level, the hypothesis that each individual treatment firm's risk remained constant was rejected. The same hypothesis was not rejected for the control groups.

Collins and Simonds concluded that SEC line of business profit data do provide useful information to investors for assessing the riskiness of a firm.

A study by Bar-Yosef and Brown (1977) also tested for information content by analyzing the variability of systematic risk. Bar-Yosef and Brown re-examined the information content of stock splits which had originally been evaluated by Fama, Fisher, Jensen and Roll (FFJR)(1969). The methodology of FFJR assumed that the systematic risk of securities is unaltered during the period surrounding a split.

Bar-Yosef and Brown reasoned that although it is unlikely that stocks undergo a permanent change in risk as a result of stock splits since neither the firm's financial or operating characteristics are altered, it is possible that the risk is unstable around this time. Since stock splits are often preceded by temporally high earnings and followed by increased total dividends, the splits may coincide with market expectations of increased cash dividends. Bar-Yosef and Brown hypothesized that the split announcement may reduce uncertainty regarding the permanence of the higher earnings and signal to investors that higher total cash dividends are forthcoming.

The information content of stock splits was evaluated by examining moving betas for 108 months surrounding the split month. Betas were estimated using the "symmetric method" and 60 months of return data.[6] Firms that increased total cash dividends after the split were

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[6]The "symmetric method" measures systematic risk in month $t_0$ by utilizing data from months $t_{-n}$ through $t_{-1}$ and from months $t_{+1}$ through $t_{+n}$. Collins and Simonds (1977) used the "leading method" which calculates beta in month $t_0$ by using return data from months $t_{-n}$ to $t_0$. Either method is appropriate.

evaluated separately from firms that decreased total cash dividends after the split.

The analysis showed that the risk of both groups became temporarily larger during the period surrounding the split. The systematic risk rapidly returned to its pre-split level for firms increasing dividends but remained high for firms decreasing dividends.

Bar-Yosef and Brown concluded that firms which split their shares after experiencing temporally high earnings reduce investor uncertainty about future earnings and cash dividends. The split announcement increases the uncertainty for investors of firms which have pre-split earnings that indicate no future increases in dividends.

Bar-Yosef and Brown state:

> Our finding that systematic risk increases prior to a split suggests that moving beta techniques should be considered when the information content of other financial events is examined. (p. 1080)

Since past research has shown that moving beta analysis is an effective method to test for information content, it will be used in this research to examine the impact of a change in accounting for research and development expenditures.

## CHAPTER THREE

## RESEARCH DESIGN AND METHODOLOGY

The effect of FASB Statement No. 2 on the systematic risk of firms can be evaluated by assessing the relative stability of the beta coefficient around the time of the accounting change. A time period must be identified within which the market risk adjustment would most likely have taken place if Statement No. 2 provided investors with new information.

In April 1973, the FASB placed on its technical agenda a project on accounting for research and development and similar costs. The Board recognized that research and development expenditures constitute a significant element of the United States economy[1] and was concerned about the number of alternative techniques used to account for and report those costs. The Discussion Memorandum was issued on December 28, 1973, and a public hearing on the subject was held on March 14, 1974.

In deliberations following the hearing, the Board concluded that the Statement of Financial Accounting Standards under consideration should only address accounting for research and development costs and not similar costs such as start-up, marketing research and promotion costs, and costs of training new personnel. An Exposure Draft of the

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[1] In 1973, total research and development expenditures were over 30 billion dollars. Approximately two-thirds of all research and development was conducted by business enterprises.

proposed statement was issued on June 5, 1974, and the statement was adopted in October 1974. Statement No. 2 was effective for fiscal years beginning on or after January 1, 1975, although earlier application was encouraged.

Since the market's reaction to published accounting information can be anticipatory, the earliest point at which a firm's systematic risk would be expected to shift would be at the time the Exposure Draft was issued in June 1974.[2] An adjustment in risk would not be expected at the time the Discussion Memorandum was issued because the FASB did not advocate any particular accounting alternative in the Discussion Memorandum. It simply presented the arguments for and against each alternative and reviewed the current authoritative literature pertinent to accounting for research and development and similar costs. Since the FASB's decision to require immediate expensing was not known until the Exposure Draft was issued, a market reaction to the proposed accounting change would not be expected before that time.

Data sheets obtained from Accounting Trends and Techniques indicated that many of the firms that deferred research and development costs during 1973 switched to expensing those costs in 1974. Firms that complied with Statement No. 2 at the end of 1974 were selected for this study because they would be among the first firms to experience

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[2]Ball and Brown (1968) found that much of the information contained in annual accounting reports is anticipated through alternative sources of information. It is not unreasonable to assume that once the requirements of Statement No. 2 were known by the market, information about R and D costs was developed and leaked to the market through analysts' reports based on conversations with corporate management or corporate management's comments published in the press.

risk changes if Statement No. 2 had an information effect.[3] Since this study will only analyze those firms that changed to expensing at or near the end of 1974, the latest potential beta shift point would be March 1975. Financial statements for the year-end are normally issued within three months.

The relevant time period in which a market risk adjustment would have taken place if Statement No. 2 provided investors with new information would be from June 1974 to March 1975. Whether or not the systematic risk of firms was affected by the expensing and disclosure requirements will be determined by the analysis. Figure 1 presents a time continuum of events related to the issuance of Statement No. 2

## Sample Selection

To test for the effect of Statement No. 2 on systematic risk, this study examined firms that provided incomplete information about research and development costs in their annual reports and 10-K reports prior to the statement. Firms were classified as providing incomplete information if they did not disclose the amount of research and development costs capitalized and amortized either in footnote or schedule form. The amount of research and development costs expensed may or may not have been disclosed. Because these firms did not provide information about the capitalized research and development costs, investors would be unable to make adjustments to the reported earnings to determine what the earnings would have been if the firms had expensed all R and D

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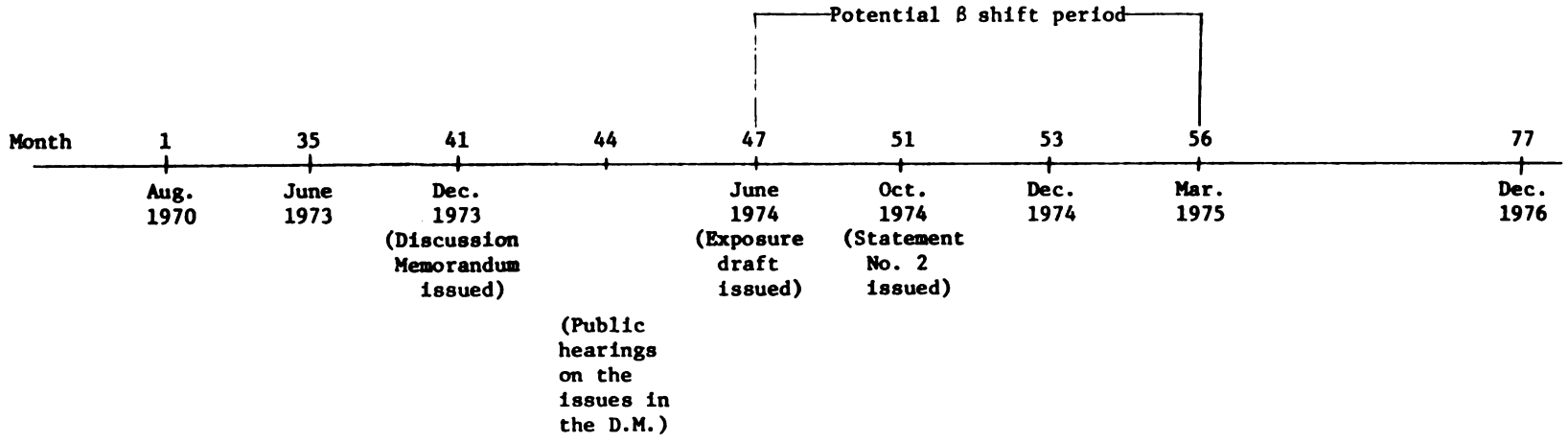
[3]Since the potential impact period was defined as from the time of the Exposure Draft (June 1974) to the time the annual reports were published, only firms with November or December 1974 year-ends were included in the study. This criterion shortened the potential impact period.

FIGURE 1

Time Continuum of Critical Events
Related to Statement No. 2



expenditures. Therefore, one would expect these firms to be most affected by the accounting and reporting requirements of Statement No. 2.

Data sheets obtained from Accounting Trends and Techniques were used to identify those firms that capitalized all or part of their research and development expenditures prior to the issuance of Statement No. 2 and changed to expensing those costs at or near the end of 1974 (November 30 to December 31, 1974). An AICPA computer print-out of footnote disclosures concerning R and D accounting changes was used to supplement the list.

The 1973 10-K reports of the firms identified as having changed their treatment of R and D costs were reviewed to determine the amount of information disclosed about the capitalized R and D expenditures. Those firms that provided complete information, as defined above, were eliminated from the sample. A shift in systematic risk would not be expected for those firms because investors had sufficient data to assess the firms' risk and return under both the expensing and capitalizing alternatives prior to Statement No. 2.

Firms from the populations of both the New York Stock Exchange (NYSE) and American Stock Exchange (ASE) were included in the sample. The NYSE firms were required to have monthly stock price returns available on the Center for Research in Security Prices (CRSP) tape for the 77 month period from August 1970 to December 1976. The ASE firms were required to have complete data available on stock prices, dividends, and capital changes for the same period.

An initial sampling criterion was that firms that had other accounting changes at the time they complied with Statement No. 2 could not be included in the sample. However, during the sampling procedure

it was determined that 11 of the treatment firms (24 percent) had changed their inventory cost flow assumptions from Fifo to Lifo at the end of 1974.[4] In order to maintain an adequate sample size, the criterion was changed to eliminate those firms that had accounting changes other than a change from Fifo to Lifo at the same time they revised their treatment of R and D costs.

A control group consisting of firms that expensed and disclosed all research and development costs prior to Statement No. 2 was matched to the treatment group. A shift in the systematic risk of the control group firms would not be expected since their accounting and reporting of R and D costs did not change as a result of Statement No. 2.

The treatment and control firms were matched on the basis of security exchange and industry membership. Since market risk is determined in part by industry membership, a disproportionate industry membership in either the treatment or control group could cause risk adjustment differences between the two groups if the inherent riskiness of those industries changed during the test period. Matching the firms by 3-digit Standard Industrial Classification (SIC) code controlled for a factor that could have affected the treatment and control groups in a systematic manner. The major industry groupings for each of the samples is presented in Table 3.

As can be seen from Table 3, firms from the metal, machinery, and electronics industries comprise a large percentage (approximately 55 percent) of the treatment and control firms. Firms in the chemical and

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[4]Twelve of the matched control firms (27 percent) changed their accounting policies from Fifo to Lifo at the end of 1974.

TABLE 3

Industry Membership of Sample Firms

| 3-Digit SIC Code | Industry Name | Number of Matched Firms |
|---|---|---|
| 100 | Metals - Miscellaneous | 2 |
| 131 | Oil - Crude Producers | 1 |
| 240 | Forest Products | 1 |
| 284 | Cosmetics | 2 |
| 300 | Tire and Rubber Goods | 1 |
| 322 | Containers - Metal and Glass | 2 |
| 324 | Building Materials - Cement | 2 |
| 335 | Rolling and Drawing Non-Ferrous Metals | 1 |
| 343 | Bldg. Materials - Heat, Air Cond., and Plumb. | 1 |
| 349 | Fabricated Metal Products | 2 |
| 352 | Farm and Garden Machinery | 1 |
| 353 | Machinery - Oil Well Equipment | 1 |
| 354 | Machine Tools | 1 |
| 356 | Machinery - Industrial | 1 |
| 357 | Electronic Computer Equipment | 2 |
| 363 | Electric Household Appliances | 1 |
| 366 | Radio and TV Transmitting Equipment | 2 |
| 367 | Electronics | 1 |
| 371 | Auto Parts and Accessories | 3 |
| 372 | Aircraft and Parts | 3 |
| 376 | Guided Missiles and Space Vehicles | 1 |
| 381 | Engineering, Laboratory and Research Equipment | 2 |
| 391 | Silverware and Plateware | 1 |
| 394 | Toys and Amusement - Sporting Goods | 1 |
| 481 | Telephone Companies | 1 |
| 492 | Natural Gas Transmission | 1 |
| 506 | Electrical Apparatus and Equipment | 1 |
| 737 | Computer Data Processing | 1 |

Number of Matched Firms in the Treatment and Control Groups - 40 per group.

pharmaceutical industries, which carry out a great deal of basic research, are not represented in the sample. Firms in these industries almost exclusively expensed all research and development costs.

It was also determined during the sample selection that very few firms on either the New York Stock Exchange or American Stock Exchange capitalized all of their research and development expenditures. The majority selectively capitalized their R and D costs. The fact that firms carrying out risky, basic research expensed those costs and that few firms capitalized all R and D costs might indicate that firms attempted to accurately represent the results of their R and D activities prior to Statement No. 2.

The firms in the treatment and control groups were matched as much as possible on the basis of their 1973 total asset size. Table 4 presents the asset size distribution of the treatment and control groups. The effect of the selection and matching criteria on the sample size is explained in Table 5.

Table 6 presents the research intensity of the firms in the treatment and control groups which was defined as the ratio of total research and development expenditures to total sales and revenue. Although the treatment and control firms were not matched on the basis of research intensity, the research intensities of the firms in the treatment and control groups are quite similar. Table 6 indicates that 18 of the treatment firms (45 percent) and 19 of the control firms (47.5 percent) spent less than 1 percent of total sales and revenue on research and development in 1974. Only 2 firms in the treatment group and 2 firms in the control group had R and D expenditures that were greater than 5 percent of total sales and revenue. All of those firms were in the computer equipment and computer data processing industries.

TABLE 4

1973 Asset Size of Treatment and Control Firms

| Asset Size (000 deleted) | Treatment Firms | Control Firms |
|---|---|---|
| $25,000 or less | 6 | 6 |
| $25,001 - 50,000 | 7 | 7 |
| $50,001 - 200,000 | 9 | 6 |
| $200,001 - 500,000 | 6 | 10 |
| $500,001 - 1,000,000 | 4 | 4 |
| Over $1,000,000 | 8 | 7 |
| | 40 | 40 |

TABLE 5

Effect of Selection Criteria on Sample Size

| | |
|---|---|
| Firms with 11/30 to 12/31 year ends that changed their R and D accounting policy in 1974* | 68 |
| Less: Firms with other accounting changes in 1974 | 9 |
| | 59 |
| Less: Firms with incomplete data on prices, dividends, and capital changes | 10 |
| | 49 |
| Less: Firms that could not be matched according to 3-digit SIC code | 9 |
| Number of firms in treatment sample | 40 |

*Firms had incomplete data about R and D costs prior to compliance with Statement No. 2.

TABLE 6

1974 Research Intensity of Sample Firms*

| Research Intensity (Percent) | Treatment Firms | Control Firms |
|---|---|---|
| < 1.0 | 18 | 19 |
| 1.0 - 1.9 | 9 | 9 |
| 2.0 - 2.9 | 7 | 8 |
| 3.0 - 3.9 | 2 | 1 |
| 4.0 - 4.9 | 2 | 1 |
| 5.0 and greater | 2 | 2 |
| | 40 | 40 |

*Research intensity is defined as the ratio of total research and development expenditures to total sales and revenue.

## Estimates of Systematic Risk

To determine whether there was a significant shift in systematic risk associated with the accounting and disclosure requirements of Statement No. 2, betas were estimated for each group for each month from June 1973 to December 1976. Although the potential impact period was defined as June 1974 to March 1975, betas were estimated for a longer interval to evaluate their behavior prior to and after any adjustment as a result of Statement No. 2.

To more precisely estimate systematic risk, the individual securities of each group were combined into equally weighted portfolios. The precision with which the beta coefficient can be estimated is inversely related to the magnitude of unsystematic risk. Unsystematic risk can be substantially reduced by grouping individual securities in portfolios.

Collins and Simonds (1977) determined that a test for adjustments in systematic risk is best conducted at the portfolio level. Firm level beta changes are difficult to detect.

A limitation of the portfolio level analysis is that it does not provide information about the beta behavior of individual firms. If the firms in the portfolio undergo changes in their relative risk that are not of the same algebraic sign, the shift in the portfolio beta could be small or non-existent while the betas of some individual firms could have changed appreciably. Since the relative risk of the treatment firms would be expected to increase if Statement No. 2 provided information, it was decided that the beta shift analysis should be conducted at the portfolio level.

The beta coefficients for each month were estimated using ordinary least squares (OLS) regression procedures and the market model on return data for a thirty-five month period ending with the month of interest. For example, the beta coefficient for June 1973 was estimated using return data from August 1970 through June 1973.

The market model is of the form:

$$\tilde{R}_{it} = \alpha_i + \beta_{im}\tilde{R}_{mt} + \tilde{u}_{it} \qquad \text{eq. (1)}$$

where

$\tilde{R}_{it}$ = return of portfolio i in period t

$\tilde{R}_{mt}$ = return on the market portfolio in period t

$\alpha_i$, $\beta_{im}$ = intercept and slope of the linear relationship between $\tilde{R}_{it}$ and $\tilde{R}_{mt}$

$\tilde{u}_{it}$ = portion of portfolio i's return that varies independently of $\tilde{R}_{mt}$.

The monthly return of each portfolio is the average of the monthly returns of all the securities in that portfolio. The return on each security is defined as:

$$\tilde{R}_{it} = \left[(P_{it} + D_{it})/P_{i,t-1}\right] - 1 \qquad \text{eq. (2)}$$

where

$P_{it}$ = price of security i at end of month t

$D_{it}$ = dividends per share paid on security i in month t.

The return on the market is computed using the Standard and Poor's (S&P) Composite Index. This index of common stock performance is market value weighted, that is, the price of each stock is weighted by the number of shares outstanding. The S&P Composite Index includes 500 of the largest stocks in the United States in terms of stock market value.

The monthly returns for the market are in the form of:

$$\tilde{R}_{mt} = \left[(P_{mt} + D_{mt})/P_{m,t-1}\right] - 1 \qquad \text{eq. (3)}$$

where

$\tilde{R}_{mt}$ is the common stock total return during month t

$P_{mt}$ is the value of the S&P Composite Index at the end of month t

$D_{mt}$ is the estimated dividends received during month t and reinvested at the end of month t.

## Data Sources

Monthly stock price relatives for the NYSE firms were generated from the CRSP tape. Monthly closing stock prices for the ASE firms were collected from the ISL Daily Stock Price Record and Barron's.

Data on cash dividends, stock dividends, and stock splits were gathered from the ISL Daily Stock Price Record and Standard and Poor's Annual Dividend Record.

## Statistical Testing Procedures

An analysis of covariance procedure developed by Harvey (1976) was used to test the stability of each portfolio's systematic risk during the period surrounding the adoption of Statement No. 2. If the exact location of a possible shift in beta had been known a priori, a single ANCOVA or Chow test could have been applied to each portfolio at the hypothesized shift point.[5] Since a single potential shift point could not be identified, a series of Chow tests developed by Harvey was applied repeatedly from June 1973 through December 1976. This period encompassed the hypothesized shift interval of June 1974 to March 1975.

The test procedure repeatedly divides the overall time series of monthly returns into two adjacent sub-periods. Recursive residuals calculated for each of the sub-periods are then compared to determine if a significant shift in beta has occurred.

The following regression model is used to derive the recursive residuals:

$$y_j = x_j' \beta + u_j, \; j = 1,\ldots,n \qquad \text{eq. (4)}$$

where

$x_j$ is a k x 1 vestor of fixed observations on the independent variables = $\begin{bmatrix} x_{j1} \\ x_{j2} \end{bmatrix}$

[5]The ANCOVA procedure is frequently referred to as a CHOW test because of the extensions Chow (1960) made to the ANCOVA procedure.

$\beta$ is a k x 1 vector of coefficients = $\begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix}$

$y_j$ is the $j^{th}$ observation on the dependent variable (the return on the portfolio)

$u_j$ is a disturbance term.

In its expanded form the model is:

$$y_j = x_{j1}\,\beta_1 + x_{j2}\,\beta_2 + u_j.$$

If $x_{j1} = 1$, then

$$y_j = (1)\,\beta_1 + x_{j2}\,\beta_2 + u_j \qquad \text{eq. (5)}$$

$$= \alpha + x_{j2}\,\beta_2 + u_j.$$

Equation (5) is equivalent to the market model explained earlier.

The n-k recursive residuals are defined as:

$$\tilde{u}_j = \frac{y_j - x_j' b_{j-1}}{[1 + x_j'(X_{j-1}'X_{j-1})^{-1}x_j]^{\frac{1}{2}}} \quad , \quad j=k+1,\ldots,n \qquad \text{eq. (6)}$$

where

$y_j$ = the $j^{th}$ return on the portfolio

$x_j$ = a k x 1 vector of fixed observations on the independent variables = $\begin{bmatrix} 1 \\ \tilde{R}_{mt} \end{bmatrix}$

$b_j$ = the estimates of the coefficients obtained from the first j observations = $\begin{bmatrix} \alpha \\ \beta \end{bmatrix}$

$X_j$ = a j x k matrix of full rank consisting of the first j observations on the independent variables.

The denominator of the equation depends only on the observations on the independent variables and is introduced to standardize the recursive residuals so that under the null hypothesis the variance is $\sigma^2$. The recursive residuals are normally and independently distributed with a mean of zero under the null hypothesis.

To analyze the constancy of the regression parameters, the n observations generated by Equation 4 are ordered according to time and allocated into p mutually exclusive groups, with $m_1$ (>k) observations in the first group, $m_2$ observations in the second group, etc. Let $n_i = m_1+m_2+\ldots m_i$, for i=1,...,p and set $n_o=k$.

The p-1 test statistics are:

$$F_i = \frac{(\sum_{j=n_{i-1}+1}^{n_i} \hat{u}_j^2) / m_i}{(\sum_{j=k+1}^{n_{i-1}} \hat{u}_j^2) / n_{i-1}-k}, \quad i = 2,\ldots,p. \qquad \text{eq. (7)}$$

The test statistics have F-distributions with $m_i$ and $n_{i-1}-k$ degrees of freedom and are statistically independent under the null hypothesis.

In this study, 75 recursive residuals were computed from 77 observations on the portfolio returns and market index and the least squares estimates of beta. The 77 observations were ordered according to time in 7 groups with 13 observations in the first group, 11 observations in each of the next 5 groups and 9 observations in the last group.[6]

---

[6]The number of groups and observations per group is arbitrary. The 77 observations were ordered into groups of 11 so that the recursive residuals for the impact period of June 1974 to March 1975 would be included in one group. The program used to calculate the recursive residuals requires the first group to contain m+k observations. Therefore the first group contains 13 observations and the last group contains 9 observations.

Eleven recursive residuals were calculated for each of the first six groups and 9 recursive residuals were calculated for the last group.

The test procedure first compares the sum of the first 11 recursive residuals to the sum of the second 11 recursive residuals and computes a test statistic. The sum of the first 22 recursive residuals is then compared to the sum of the next 11 recursive residuals and a test statistic is again computed. This procedure is repeated until the sum of the first 66 recursive residuals has been compared to the sum of the last 9 recursive residuals.

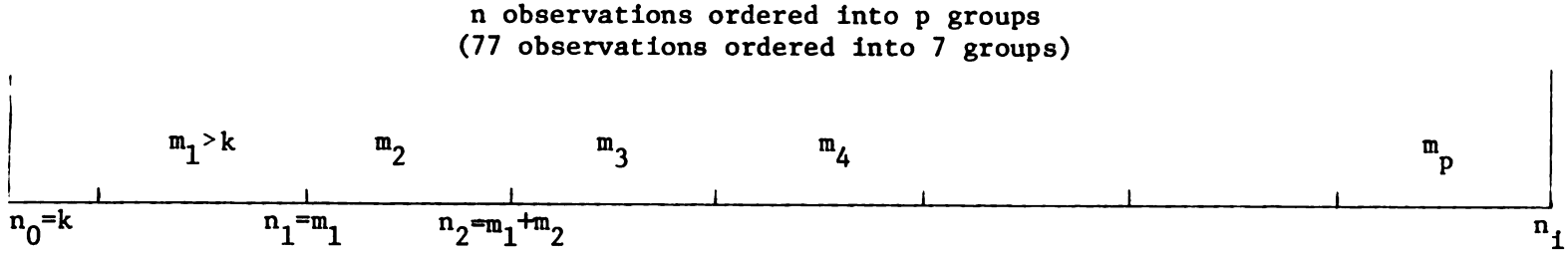
To determine whether the regression coefficients were constant over the entire interval, each of the test statistics is compared to an F-statistic with $m_i$ and $n_{i-1}-k$ degrees of freedom. A significant test statistic indicates that there was a shift in the beta coefficient between periods $n_{i-1}$ and $m_i$. Figure 2 summarizes the sequence of tests.

An assumption of the recursive F-test is that if there is a significant test result, then the shift in beta occurred between the last observation (month) in the interval $n_{i-1}$ and the first observation in the subsequent interval, $m_i$. The test procedure has the greatest power when the shift occurs between those two points. However, if a shift in beta occurs within an interval, a significant test may also result. Therefore, the recursive F-tests identify the sub-period in which the beta coefficients changed but do not identify the specific month of the shift. The beta coefficients must be plotted in order to determine the specific month of a significant shift.

If Statement No. 2 provided no new information to assess a firm's systematic risk, the beta coefficient of the treatment portfolio (as well as of the control portfolio) would be relatively stable throughout

FIGURE 2

Illustration of the Sequence of F-tests in the Harvey Analysis of Covariance Procedure




$\left(\sum_{j=k+1}^{n_{i-1}} \tilde{u}_j^2\right)\left(\sum_{j=n_{i-1}+1}^{n_i} \tilde{u}_j^2\right)$ - 1st test procedure with $m_i$ and $n_{i-1}-k$ degrees of freedom

( ) ( ) - 2nd test procedure with $m_i$ and $n_{i-1}-k$ degrees of freedom

( ) ( ) - p-1 test procedure

the hypothesized impact period. If Statement No. 2 had information content, the beta coefficient of the treatment group would be expected to increase in a month within the impact period. Figures 3 and 4 illustrate (hypothetically) the behavior of the treatment portfolio beta in each situation.

## Difference Analysis

The risk stability of each portfolio was evaluated separately using the recursive F-tests. The results of the separate tests indicate if the systematic risk of each portfolio was stable during the hypothesized impact period but do not determine if there were significant differences in the risk behaviors of the two groups. If the accounting and reporting policies of Statement No. 2 provided new information, significant differences in the risk behaviors of the two portfolios would be expected during the designated impact period.

To assess whether the risk behaviors of the treatment and control portfolios were dissimilar, monthly differences in the returns of the two portfolios were calculated. The differences were defined as:

$$\tilde{R}_{Dt} = \tilde{R}_{Tt} - \tilde{R}_{Ct} \qquad \text{eq. (8)}$$

where

$\tilde{R}_{Dt}$ = the return difference in month t

$\tilde{R}_{Tt}$ = the return on the treatment portfolio in month t

$\tilde{R}_{Ct}$ = the return on the control portfolio in month t.

A constrained model based on the Sharpe-Lintner capital asset pricing model (CAPM) was used to regress the return differences against the market return to estimate monthly beta coefficients for the

FIGURE 3

Hypothetical Beta Behavior if Statement No. 2
Possessed No Information Content*

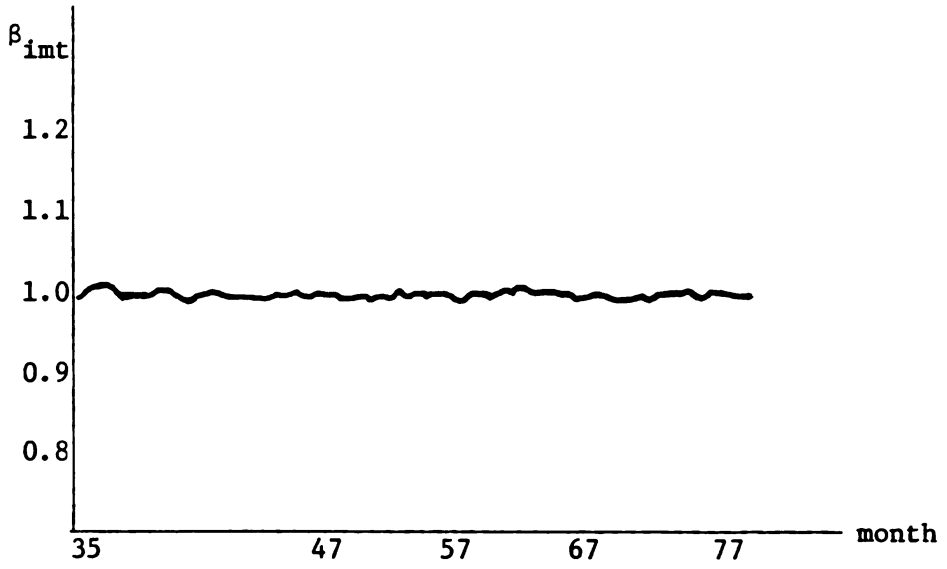
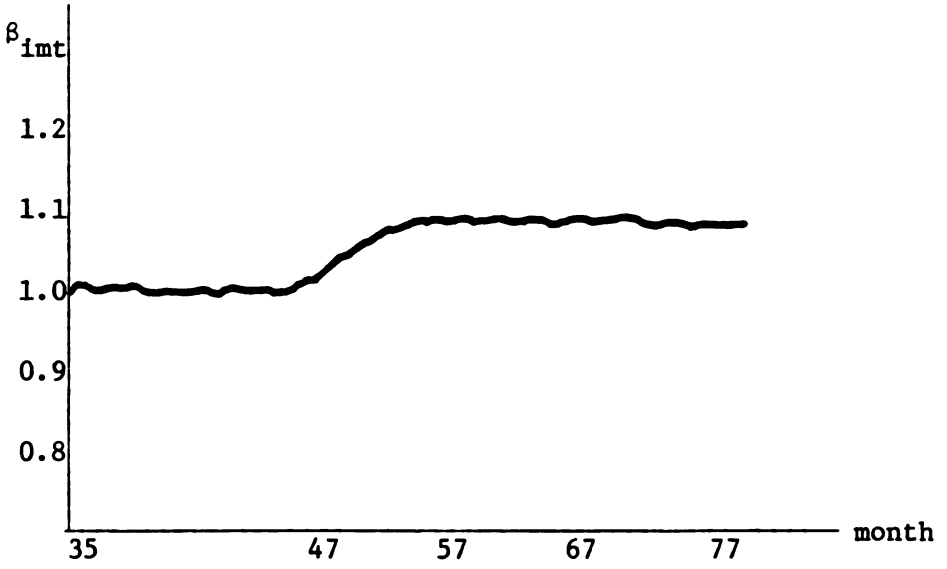



FIGURE 4

Hypothetical Beta Behavior if Statement No. 2
Possessed Information Content**




*For illustration purposes, the beta of the portfolio is assumed to be 1.0.

**For illustration purposes, the beta of the portfolio is assumed to be 1.0 before the shift due to Statement No. 2.

"difference portfolio." If the relative risk of the treatment portfolio did not shift more significantly than the relative risk of the control portfolio, the beta coefficient of the "difference portfolio" would be relatively stable.[7]

The constrained model is of the form:

$$\tilde{R}_{jt} = R_{Ft} + \beta(\tilde{R}_{mt} - R_{Ft}) + \tilde{u}_j$$

or $$\tilde{R}_{jt} - R_{Ft} = \beta(\tilde{R}_{mt} - R_{Ft}) + \tilde{u}_j \qquad \text{eq. (9)}$$

where

$\tilde{R}_{jt}$ = the return on portfolio j in period t

$R_{Ft}$ = the risk free rate of return in period t (the rate of return on U.S. Treasury bills)

$\tilde{R}_{mt}$ = the return on the market portfolio in period t

$\tilde{u}_j$ = the disturbance term which is independent of $R_{Ft}$ and $\tilde{R}_{mt}$.

If the return differences from equation (8) are substituted for $\tilde{R}_{jt}$, equation (9) becomes:

$$(\tilde{R}_{Tt} - R_{Ft}) - (\tilde{R}_{Ct} - R_{Ft}) = \beta_T(\tilde{R}_{mt} - R_{Ft}) - \beta_C(\tilde{R}_{mt} - R_{Ft}) + (\tilde{u}_T - \tilde{u}_C)$$

$$(\tilde{R}_{Tt} - \tilde{R}_{Ct}) = (\beta_T - \beta_C)(\tilde{R}_{mt} - R_{Ft}) + (\tilde{u}_T - \tilde{u}_C)$$

$$\tilde{R}_D = \beta_D(\tilde{R}_{mt} - R_{Ft}) + \tilde{u}_D \qquad \text{eq. (10)}$$

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[7] The results of the difference analysis will determine if the risk behaviors of the two groups were different and will indicate the sub-period in which they differed, but they will not reveal whether the risk of one or both groups changed. If the risk of only one portfolio shifted, the analysis cannot identify the "shift" portfolio. Therefore to determine if Statement No. 2 affected the risk of the treatment group, separate analyses as well as the difference analysis were conducted.

The recursive F-tests described earlier were used to evaluate the constancy of the "difference portfolio" beta. The constrained model was used to estimate the betas so that any significance in the recursive F-tests would be due to changes in beta only.

Recall that the recursive residuals are computed using the model $y_j = x_j' \beta + u_j$, $j=1,\ldots,n$, where $\beta$ is a k x 1 vector of coefficients. If the constrained model is not used, a significant recursive F-test may be the result of changes in $\beta_1$ (the intercept or $\alpha$ in the market model) or $\beta_2$ (the systematic risk). Since a difference in the risk behavior of the treatment and control portfolios was defined as a shift in the beta coefficient (systematic risk) of the "difference portfolio," it is important that the recursive residuals be calculated in a way that only shifts in the systematic risk affect the F-tests. This can be accomplished by using the constrained model in which the intercept of the linear relationship between the security and market returns is defined as the risk-free rate of return. Since the risk-free rate of return in any period is the same for both the treatment and control portfolios, this factor drops out of the equation for the return differences (eq. 10). Therefore, the recursive residuals are computed with only one coefficient, the systematic risk of the "difference portfolio," and the recursive F-tests are affected by changes in the systematic risk only.

The n-k recursive residuals for the "difference portfolio" are defined as:

$$\tilde{u}_j = \frac{y_j - x_j' b_{j-1}}{[1 + x_j'(X_{j-1}'X_{j-1})^{-1}x_j]^{\frac{1}{2}}} \quad , j=k+1,\ldots,n \qquad \text{eq. (11)}$$

where

$y_j$ = the monthly return difference,
$\tilde{R}_{Dt} = \tilde{R}_{Tt} - \tilde{R}_{Ct}$

$x_j$ = the return on the market minus the risk free rate of return,
$(\tilde{R}_{mt} - R_{Ft})$

$b_j$ = the least squares estimate of the "difference portfolio" beta obtained from the first j observations

$X_j$ = a vector of the first j observations on the independent variable, $x_j$.

The null hypothesis of the difference analysis is stated as follows:

$H_0$: There was no significant change in the beta coefficient of the "difference portfolio" during the potential impact period.

$H_1$: There was a significant change in the beta coefficient of the "difference portfolio" during the potential impact period.

Since the potential impact period was defined as the 10 month interval from June 1974 to March 1975, the risk stability of the "difference portfolio" was tested at several points within that interval as well as at numerous points outside the impact period. The 77 return observations were ordered into 26 groups with 4 observations in the first group, 3 observations in each of the next 24 groups, and 1

observation in the last group.[8] A shift in the beta coefficient of the "difference portfolio" during the impact period indicates that there were differences in the risk behaviors of the treatment and control groups as a result of Statement No. 2.

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[8]In the separate analyses, the return observations were ordered into 7 groups so that the systematic risk of each portfolio during the impact period could be compared to the risk before and after the impact period. The analyses could also have been conducted with more groups and fewer observations in each group in which case the risk stability of each portfolio would also have been evaluated at one or more points within the impact period.

# CHAPTER FOUR

## RESULTS OF THE ANALYSIS

This chapter presents data on the analysis of the risk behaviors of the treatment and control groups during the period of June 1973 to December 1976. The results of the analysis indicate that both the treatment and control groups experienced significant shifts in risk during the hypothesized impact period of June 1974 to March 1975. There were no differences in the risk changes of the treatment and control groups. Firms that altered their accounting and reporting policies as a result of FASB Statement No. 2 experienced shifts in risk that were not statistically different than the risk changes of firms that did not change their accounting and reporting methods. These results suggest that Statement No. 2 had no information effect.

### Test for Constancy of the Risk Parameters

The moving beta estimates calculated for the treatment and control groups are presented in Tables 7 and 8 and are plotted in Figure 5. Inspection of Table 7 indicates that there were dramatic decreases in the risk of the treatment group in months 47 and 48. The beta coefficient decreased by 23 percent between months 46 and 47 and by 29 percent between months 47 and 48. The risk of the treatment group decreased until it reached a minimum at month 53. There was then a 28 percent increase in risk between months 53 and 54.

TABLE 7

Treatment Portfolio Moving Beta Coefficients Estimated Using 35 Months of Return Data and the Market Model

| Observation | | | |
|---|---|---|---|
| First | Last | Month | Beta Coefficient |
| 1 | 35 | June 1973 | 1.8133 |
| 2 | 36 | | 1.8777 |
| 3 | 37 | | 1.7587 |
| 4 | 38 | | 1.7510 |
| 5 | 39 | | 1.8640 |
| 6 | 40 | | 1.8538 |
| 7 | 41 | December 1973 | 1.7161 |
| 8 | 42 | | 1.6563 |
| 9 | 43 | | 1.6371 |
| 10 | 44 | | 1.6592 |
| 11 | 45 | | 1.6480 |
| 12 | 46 | | 1.6583 |
| 13 | 47 | June 1974 | 1.2721 |
| 14 | 48 | | .8983 |
| 15 | 49 | | .9179 |
| 16 | 50 | | .8581 |
| 17 | 51 | October 1974 | .8281 |
| 18 | 52 | | .7583 |
| 19 | 53 | December 1974 | .7309 |
| 20 | 54 | | .9385 |
| 21 | 55 | | .9518 |
| 22 | 56 | March 1975 | .9599 |
| 23 | 57 | | .9674 |
| 24 | 58 | | .9959 |
| 25 | 59 | | 1.0013 |
| 26 | 60 | | .9926 |
| 27 | 61 | | .9956 |
| 28 | 62 | | 1.0034 |
| 29 | 63 | | .9898 |
| 30 | 64 | | .9925 |
| 31 | 65 | December 1975 | .9896 |
| 32 | 66 | | 1.1009 |
| 33 | 67 | | 1.0952 |
| 34 | 68 | | 1.0853 |
| 35 | 69 | | 1.0775 |
| 36 | 70 | | 1.0756 |
| 37 | 71 | | 1.0556 |
| 38 | 72 | | 1.0529 |
| 39 | 73 | | 1.0451 |
| 40 | 74 | | 1.0437 |
| 41 | 75 | | .9753 |
| 42 | 76 | | .9805 |
| 43 | 77 | December 1976 | 1.0015 |

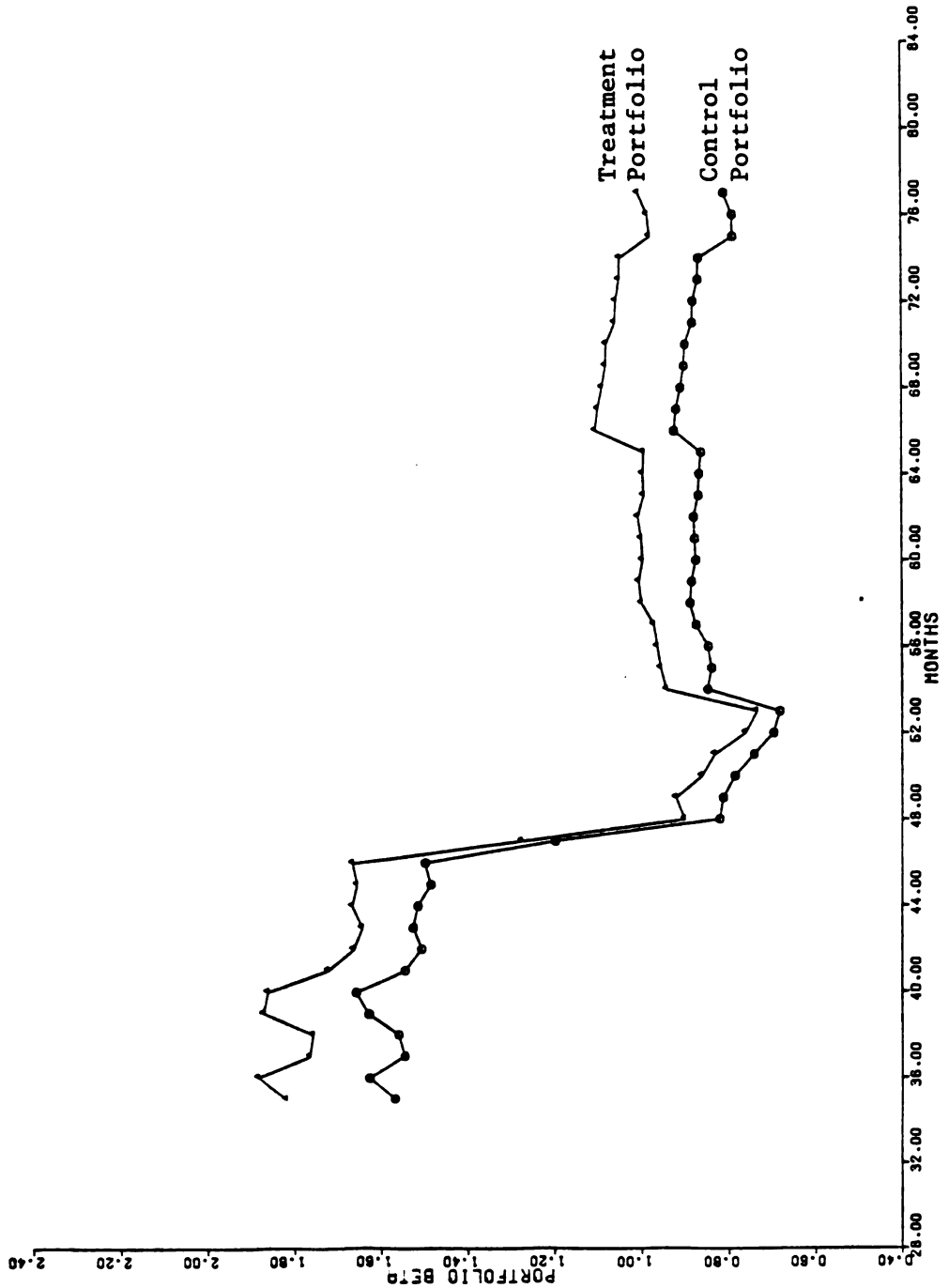
TABLE 8

Control Portfolio Moving Beta Coefficients Estimated Using 35 Months of Return Data and the Market Model

| Observation | | | |
|---|---|---|---|
| First | Last | Month | Beta Coefficient |
| 1 | 35 | June 1973 | 1.5673 |
| 2 | 36 | | 1.6246 |
| 3 | 37 | | 1.5442 |
| 4 | 38 | | 1.5588 |
| 5 | 39 | | 1.6253 |
| 6 | 40 | | 1.6535 |
| 7 | 41 | December 1973 | 1.5432 |
| 8 | 42 | | 1.5048 |
| 9 | 43 | | 1.5241 |
| 10 | 44 | | 1.5131 |
| 11 | 45 | | 1.4835 |
| 12 | 46 | | 1.4958 |
| 13 | 47 | June 1974 | 1.1969 |
| 14 | 48 | | .8195 |
| 15 | 49 | | .8114 |
| 16 | 50 | | .7848 |
| 17 | 51 | October 1974 | .7407 |
| 18 | 52 | | .6955 |
| 19 | 53 | December 1974 | .6817 |
| 20 | 54 | | .8454 |
| 21 | 55 | | .8366 |
| 22 | 56 | March 1975 | .8442 |
| 23 | 57 | | .8725 |
| 24 | 58 | | .8860 |
| 25 | 59 | | .8818 |
| 26 | 60 | | .8723 |
| 27 | 61 | | .8746 |
| 28 | 62 | | .8772 |
| 29 | 63 | | .8662 |
| 30 | 64 | | .8646 |
| 31 | 65 | December 1975 | .8605 |
| 32 | 66 | | .9226 |
| 33 | 67 | | .9177 |
| 34 | 68 | | .9076 |
| 35 | 69 | | .9001 |
| 36 | 70 | | .8973 |
| 37 | 71 | | .8808 |
| 38 | 72 | | .8787 |
| 39 | 73 | | .8675 |
| 40 | 74 | | .8660 |
| 41 | 75 | | .7877 |
| 42 | 76 | | .7887 |
| 43 | 77 | December 1976 | .8079 |

FIGURE 5

Moving Portfolio Betas Estimated Using 35 Months of Return Data and the Market Model



The control group also experienced substantial decreases in risk in months 47 and 48. The beta coefficient of the control group decreased by 20 percent between months 46 and 47 and by 32 percent between months 47 and 48. The risk continued to drop until month 53. Between months 53 and 54, there was a 24 percent increase in the risk of the control group.

The shifts in the risk of the treatment and control groups occurred during the designated impact period of June 1974 to March 1975. The Exposure Draft was issued in month 47 (June 1974) and the year-ends of the firms in the treatment and control groups were in month 53 (December 1974).[1]

To analyze the observed beta changes in a formal manner, the recursive F-tests developed by Harvey and described earlier were applied to the treatment and control groups. The 77 monthly observations of the portfolio returns were ordered into 7 groups with 13 observations in the first group, 11 observations in each of the next 5 groups, and 9 observations in the last group. Figure 6 illustrates the ordering of the monthly observations.

FIGURE 6

Ordering of the 77 Monthly Return Observations into 7 Groups

| | 1-13 | 14-24 | 25-35 | 36-46 | 47-57 | 58-68 | 69-77 |
|---|---|---|---|---|---|---|---|
| Months | Aug.'70-Aug.'71 | Sept.'71-July '72 | Aug.'72-June'73 | July '73-May '74 | June '74-Apr. '75 | May '75-Mar.'76 | Apr.'76-Dec.'76 |

[1] Two NYSE firms in the treatment group have 11/30 year-ends. All other firms in the treatment group and all firms in the control group have December year-ends.

Seventy-five recursive residuals were calculated from the 77 observations. The recursive F-statistics computed by comparing the sums of squared recursive residuals for the seven groups are presented in Table 9. The treatment and control groups were analyzed separately.

Analysis of Table 9 indicates that a significant shift in beta occurred between the first 46 months and the subsequent 11 months for the treatment group. The computed F-statistic is 3.328 which is statistically significant at an $\alpha$-level of .01. The results of the recursive F-tests are consistent with the graph of the treatment group betas (Figure 5) which exhibited a sizable decrease in beta between months 46 and 47 and months 47 and 48 and an increase between months 53 and 54. Inspection of Table 9 and Figure 5 reveals that the risk of the treatment group was relatively stable prior to month 47 and after month 53.

The recursive F-tests indicate that the control group also experienced a significant shift in risk between the first 46 months and the succeeding 11 months. The computed F-statistic is 4.188 which is satistically significant at an $\alpha$-level of .01. A shift in the beta coefficient of the control group between the first 35 months and the following 11 months is also indicated at an $\alpha$-level of .05. The computed F-statistic is 2.724. This result is not consistent with the plot of the control group risk (Figure 5) which appears to be relatively stable between months 35 and 46. The beta coefficient of the control group is 1.5673 at month 35 and varies between 1.6535 and 1.4835 from months 36 to 46.

The risk behavior of the control group can be evaluated prior to month 35 if the beta coefficient is estimated using 20 months of return data. Figure 9 (page 70) plots the beta coefficient of the

TABLE 9

Recursive F-Statistics Computed for the Treatment and Control Portfolios

| $\Sigma\hat{u}_j^2$ for months: | Compared to $\Sigma\hat{u}_j^2$ for months: | F-value | Degrees of Freedom |
|---|---|---|---|
| Treatment Group: | | | |
| 1-13 | 14-24 | .487 | (11,11) |
| 1-24 | 25-35 | .347 | (11,22) |
| 1-35 | 36-46 | 1.938 | (11,33) |
| 1-46 | 47-57 | 3.328* | (11,44) |
| 1-57 | 58-68 | 1.101 | (11,55) |
| 1-68 | 69-77 | .054 | (9,66) |
| Control Group: | | | |
| 1-13 | 14-24 | .407 | (11,11) |
| 1-24 | 25-35 | .250 | (11,22) |
| 1-35 | 36-46 | 2.724** | (11,33) |
| 1-46 | 47-57 | 4.188* | (11,44) |
| 1-57 | 58-68 | .688 | (11,55) |
| 1-68 | 69-77 | .251 | (9,66) |

* - significant at an $\alpha$-level of .01

** - significant at an $\alpha$-level of .05

control group for months 20 to 77. Examination of Figure 9 reveals that the control portfolio beta decreased from approximately 1.57 in month 20 to 1.37 in month 26. The beta coefficient was relatively stable between months 26 and 31 but increased to approximately the month 20 level (1.56) in month 35 and to 1.68 in month 36.

The significant recursive F-test indicated at an $\alpha$-level of .05 was apparently caused by the increase in beta in month 36. The beta coefficient was stable between months 36 and 46. Since the shift in beta occurred prior to the designated impact period (and in the control portfolio), it is unlikely that it is related to the issuance of Statement No. 2.

As explained in Chapter 3, the results of the recursive F-tests may be influenced by changes in alpha (the intercept of the linear relationship between the portfolio and market returns) as well as by changes in the beta coefficient because of the model used to calculate the recursive residuals. It is doubtful that changes in alpha (if any) significantly affected the results of the recursive F-tests since the beta coefficients of the treatment and control groups decreased so dramatically between months 46 and 48 (46 percent and 45 percent, respectively). Nonetheless, to be assured that the significant test results were not due to changes in alpha, the beta coefficients of the treatment and control portfolios were re-estimated using the constrained model and the recursive F-statistics were recomputed.[2] The re-estimated beta coefficients are presented in Table 10.

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[2]The beta coefficients were estimated using 35 months of return data. To conduct the recursive F-tests, the 77 observations were ordered into groups of 11 as in the first series of F-tests.

TABLE 10

Moving Beta Coefficients Re-estimated Using the Constrained Model and 35 Months of Return Data

| Month | Beta Coefficient | |
|---|---|---|
| | Treatment Group | Control Group |
| June 1973 | 1.7249 | 1.4854 |
| | 1.7982 | 1.5507 |
| | 1.6938 | 1.4872 |
| | 1.6893 | 1.5048 |
| | 1.8180 | 1.5840 |
| | 1.8393 | 1.6378 |
| December 1973 | 1.7122 | 1.5350 |
| | 1.6457 | 1.4926 |
| | 1.6329 | 1.5111 |
| | 1.6614 | 1.4979 |
| | 1.6443 | 1.4624 |
| | 1.6596 | 1.4737 |
| June 1974 | 1.2755 | 1.1924 |
| | .9243 | .8241 |
| | .9504 | .8165 |
| | .8881 | .7886 |
| October 1974 | .8439 | .7437 |
| | .7885 | .7092 |
| December 1974 | .7843 | .7088 |
| | .9538 | .8465 |
| | .9618 | .8383 |
| March 1975 | .9671 | .8431 |
| | .9719 | .8668 |
| | .9945 | .8799 |
| | .9986 | .8766 |
| | .9889 | .8639 |
| | .9923 | .8661 |
| | .9987 | .8667 |
| | .9871 | .8576 |
| | .9886 | .8567 |
| December 1975 | .9848 | .8514 |
| | 1.0939 | .9162 |
| | 1.0873 | .9104 |
| | 1.0831 | .9056 |
| | 1.0756 | .8984 |
| | 1.0734 | .8954 |
| | 1.0547 | .8803 |
| | 1.0542 | .8803 |
| | 1.0439 | .8670 |
| | 1.0443 | .8672 |
| | .9851 | .7972 |
| | .9894 | .7979 |
| December 1976 | 1.0154 | .8227 |

The results of the second series of recursive F-tests were identical to the results of the first series for both the treatment and control groups. The recursive F-statistics are presented in Table 11.

Analysis of Table 11 indicates that both the treatment and control groups experienced significant shifts in beta between the first 46 months and the following 11 months. The computed F-statistics of 3.263 (treatment group) and 3.980 (control group) are statistically significant at an $\alpha$-level of .01. A shift in the control group beta between the first 35 months and the succeeding 11 months was also indicated at an $\alpha$-level of .05. The F-statistic is 2.368. Therefore, the treatment and control portfolios have experienced significant changes in systematic risk during the designated impact period.

## Analysis of Observed Beta Decline

It appears that since both the treatment and control groups experienced significant shifts in relative risk between June 1974 and January 1975, the changes in the beta were not related to the issuance of Statement No. 2. The relative risk of the control group would not have changed as a result of the statement because the firms in the control group expensed and disclosed their research and development expenditures prior to Statement No. 2. If the expensing and disclosure requirements had provided investors with new information to evaluate the risk of firms, an increase (not a decrease) in the beta coefficient of the treatment group would be expected because of increased leverage and, in some cases, decreased net income.

The beta estimates used in this risk analysis were determined through ordinary least squares procedures. According to Johnston

TABLE 11

Recursive F-Statistics for the Treatment and Control Portfolios
Beta Coefficients Estimated Using the Constrained Model

| $\Sigma\hat{u}_j^2$ for months: | Compared to $\Sigma\hat{u}_j^2$ for months: | F-value | Degrees of Freedom |
|---|---|---|---|
| Treatment Group: | | | |
| 1-13 | 14-24 | .501 | (11,11) |
| 1-24 | 25-35 | .486 | (11,22) |
| 1-35 | 36-46 | 1.765 | (11,33) |
| 1-46 | 47-57 | 3.263* | (11,44) |
| 1-57 | 58-68 | 1.126 | (11,55) |
| 1-68 | 69-77 | .064 | (10,66) |
| Control Group: | | | |
| 1-13 | 14-24 | .427 | (11,11) |
| 1-24 | 25-35 | .396 | (11,22) |
| 1-35 | 36-46 | 2.368** | (11,33) |
| 1-46 | 47-57 | 3.980* | (11,44) |
| 1-57 | 58-68 | .825 | (11,55) |
| 1-68 | 69-77 | .250 | (10,66) |

* - significant at an $\alpha$-level of .01

** - significant at an $\alpha$-level of .05

(1972), these estimates can be dramatically affected by extreme outlier observations. If a small number of abnormal returns occurred near the time of the shift in beta, the observed decline would not reflect a true change in relative risk but would reflect the fact that several abnormal observations did not adhere to the otherwise stable relationship between the portfolio and market returns.

To determine if extreme outlier observations caused the very significant shifts in beta, the returns of the treatment and control portfolios were plotted against the returns of the market portfolio for months 1 through 77 (Figures 7 and 8). It appears from inspection of Figure 7 that the outlier observations at months 47 and 48 and months 50 and 51 were responsible for causing the changes in beta for the treatment group. The observations at months 47 and 48 seem to have caused the beta coefficient to drop sharply at those points while the outlier observations at months 50 and 51 led to the substantial increase in beta that followed. Figure 8 reveals that the control group exhibited the same pattern of outlier observations.

If the beta coefficients are estimated using a moving regression length of 20 months, it becomes apparent that the significant decline in beta is not the result of an altered relationship between the portfolio and market returns. The betas estimated using 20 months of portfolio and market data are plotted in Figure 9. Figure 9 reveals that the betas of the treatment and control groups return to approximately their pre-month 47 levels when the intervals used for estimation do not include the observations at months 47, 48, 50, and 51.

The betas estimated for month 71 are the first betas calculated over 20 month intervals that did not include the outlier observations.

FIGURE 7

Monthly Returns of the Treatment Portfolio
Plotted Against the Returns on the Market
for August 1970 to December 1976

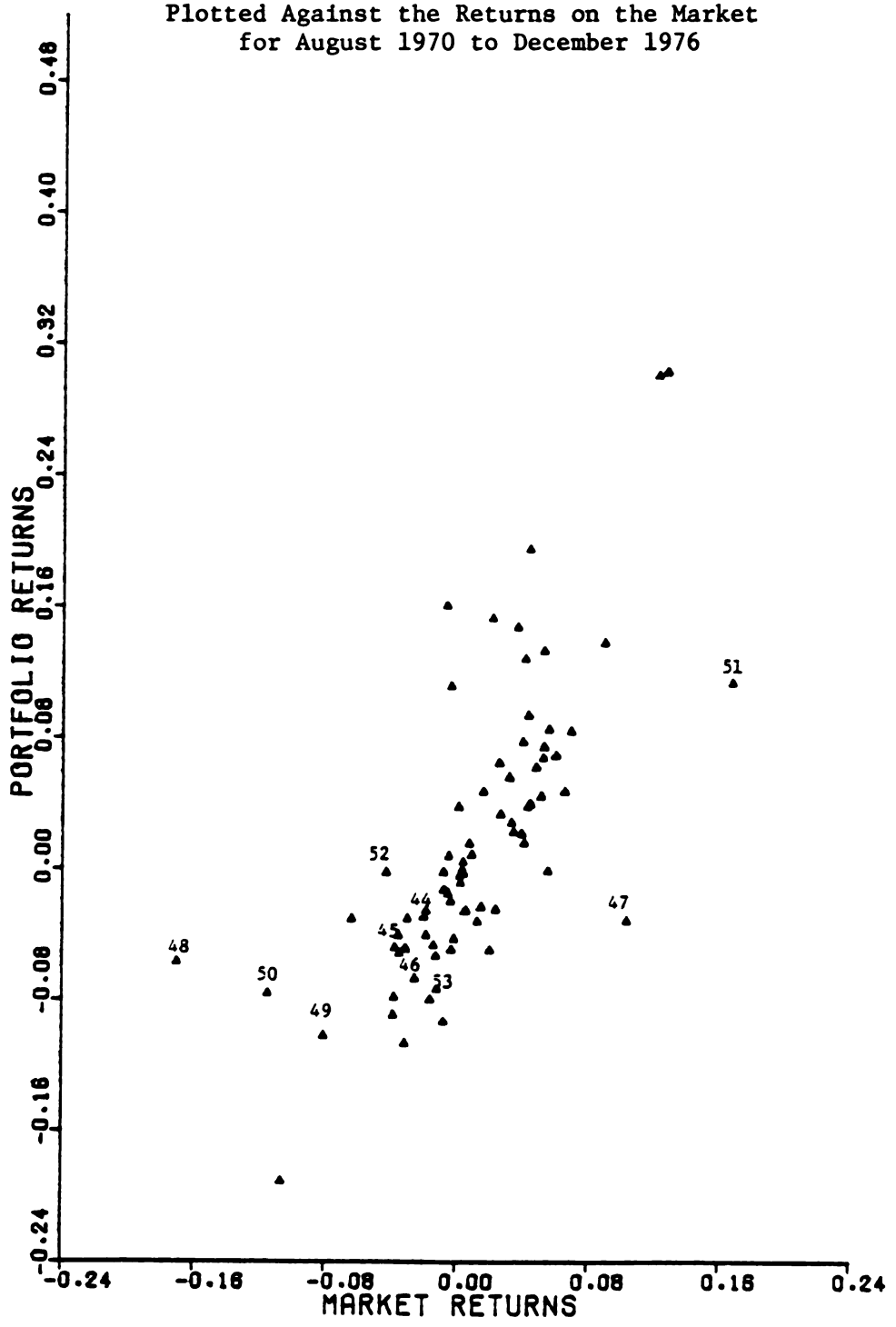


FIGURE 8

Monthly Returns of the Control Portfolio
Plotted Against the Returns on the Market
for August 1970 to December 1976

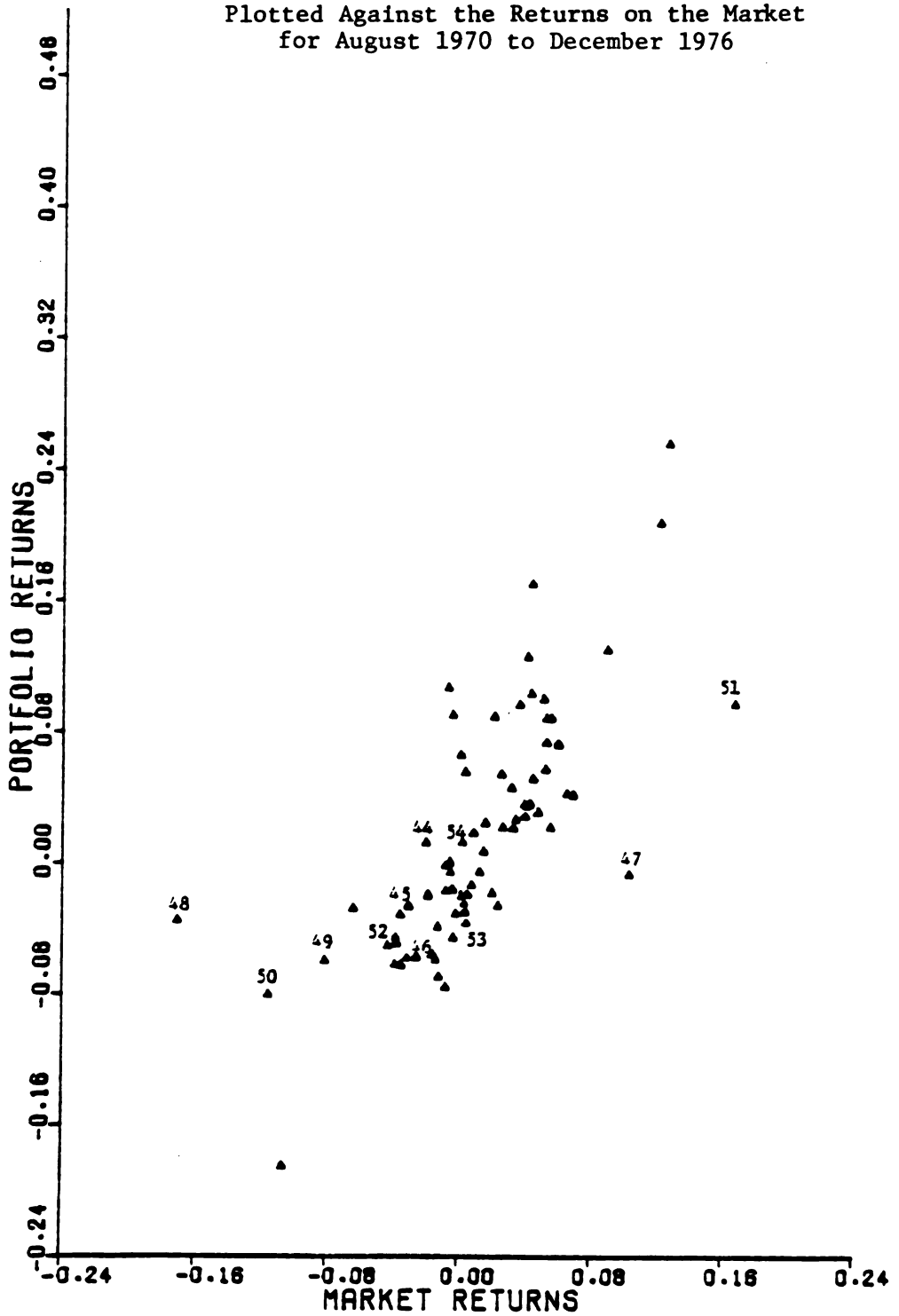
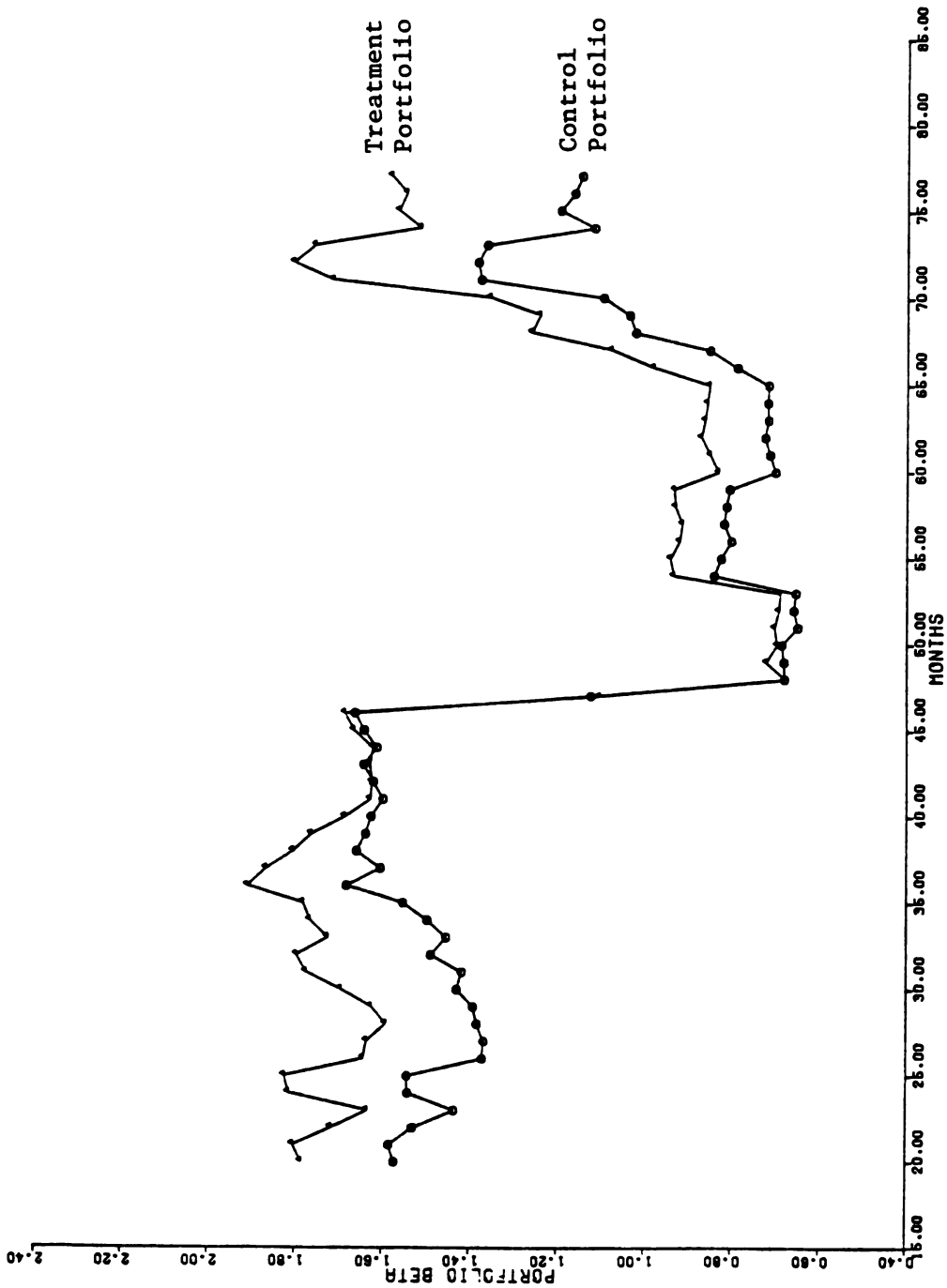


FIGURE 9

Moving Portfolio Betas Estimated Using 20 Months of Return Data and the Market Model



The increase in beta to the pre-month 47 level was not evident when the moving regression length was 35 months because the outlier observations had not yet dropped out of the beta estimation interval and therefore caused the beta coefficient to remain at a lower level.

Examination of Figures 7 and 8 reveals that the returns on the treatment and control portfolios were quite stable from month 44 to month 50. The returns on the treatment portfolio ranged from minus 3 percent to minus 10 percent. The control group returns ranged from 1 percent to minus 8 percent during the same period. The returns on the market portfolio were very volatile in this 7 month period. The market return was minus 2.7 percent in month 46, 10 percent in month 47, minus 17 percent in month 48, and minus 8 percent in month 49. This temporary divergence between the study groups' and the market's behavior caused the outlier observations and led to the significant decline in beta.

In month 51, the returns of the treatment and control portfolios and the market portfolio all increased significantly. The market return increased from minus 12 percent in month 50 to 17 percent in month 51. The returns on the treatment and control portfolios increased from minus 8 percent to 11 percent and minus 8 percent to 10 percent, respectively. The substantial increase in the returns of the market portfolio and the treatment and control portfolios appear to have led to the increase in beta in month 54.

According to reports in Barron's, the market experienced serious declines throughout 1974. Factors contributing to the decline included rising interest rates, a high rate of inflation, real declines in the GNP for two quarters, and concern over the growing power of the Arab

oil block to drive the economy into a depression.

The prime rate rose steadily during the first half of 1974, reaching nearly 12 percent at the end of May. The market experienced a downward trend throughout this period. Investment confidence was restored temporarily in June when the prime rate was reduced slightly and predictions were published that the rate would be reduced to a range of 7 to 8 percent by the end of 1974.

The increase in market activity was short-lived. The market fell steeply in July when the prime rate was increased further and the Labor Department disclosed that the cost of living had risen at an annual rate of 12 percent in June. At the end of September the stock market plummeted to a 12 year low. In October 1974, the stock market finally recovered. This was due in part to overall good third quarter earnings reports.

The reason that the treatment and control portfolios did not exhibit price behaviors that were as volatile as the market's may be that the treatment and control portfolios are not very diversified. As indicated in Chapter 3, approximately 55 percent of the firms in the matched treatment and control groups are in the metal, machinery and electronics industries. It is possible that the price behaviors of the predominant industries in the treatment and control portfolios were not as volatile as the price behavior of the market in general during the hypothesized impact period. The returns on the study portfolios would not, therefore, be as volatile as the returns on the market since 55 percent of the study firms are in those industries.

According to Standard and Poor's Trade and Security Statistics, Security Price Index Record, the composite market index decreased by

approximately 8 percent between June and July 1974 (months 47 and 48). The price indices of the metal fabricating and miscellaneous metal industries decreased by approximately 6 percent and 3 percent, respectively, between months 47 and 48 while the price index of the machinery industry dropped by 7 percent during the same time. It is very likely that differences in the industry composition of the market portfolio and the treatment and control portfolios led to the disparity in the groups' behaviors and therefore the observed decline in the risks of the treatment and control groups.

### Comparison of the Treatment and Control Group Risk Changes

The recursive F-tests verified that the relative risks of the treatment and control groups changed significantly between June 1974 and January 1975. The F-tests were applied to the treatment and control groups separately. To assess whether the relative risks of the treatment and control portfolios behaved differently between months 35 and 77 (the overall study period), monthly changes in the beta of each group were computed. The monthly percentage changes are presented in Table 12 and graphed in Figure 10. It appears from inspection of the table and graph that the risk changes of the two groups were very similar over the entire interval of June 1973 to December 1976.

To empirically evaluate whether the risk changes of the treatment and control portfolios were significantly different, recursive F-tests were applied to the "difference portfolio" betas as explained in Chapter 3. The observations were ordered into groups of 3 so that the risk changes of the treatment and control portfolios could be compared at several points within the impact period of June 1974 to March 1975.

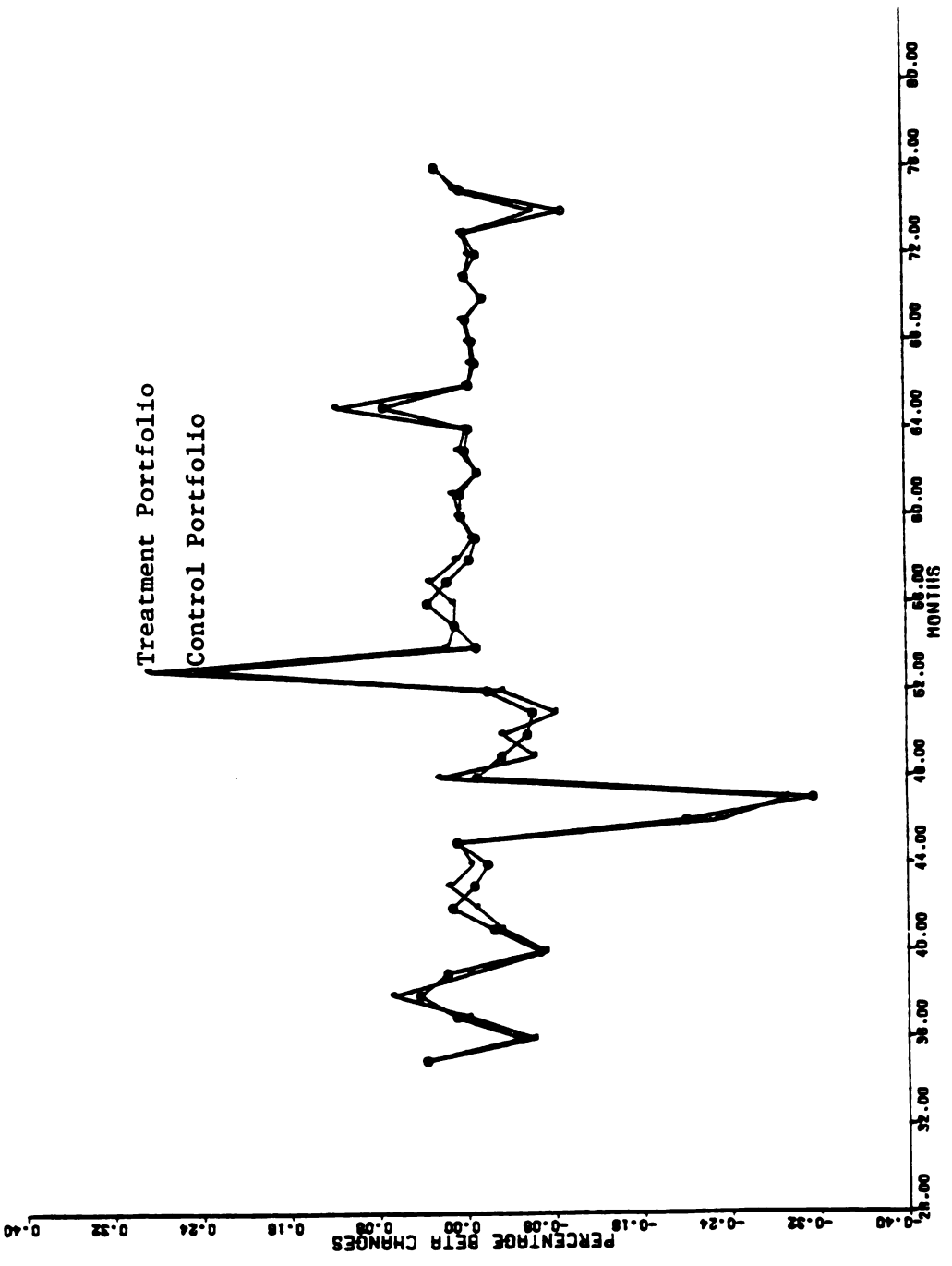
TABLE 12

Percentage Changes in the Beta Coefficients of the Treatment and Control Portfolios

| Between Months | Treatment Group Percentage Change | Control Group Percentage Change | Differences in Percentage Change |
|---|---|---|---|
| 35-36 | .0355 | .0365 | -.0010 |
| 36-37 | -.0634 | -.0494 | -.0140 |
| 37-38 | -.0044 | .0095 | -.0139 |
| 38-39 | .0645 | .0427 | .0218 |
| 39-40 | -.0055 | .0174 | .0229 |
| 40-41 | -.0743 | -.0667 | -.0086 |
| 41-42 | -.0348 | -.0249 | -.0099 |
| 42-43 | -.0116 | .0128 | -.0244 |
| 43-44 | .0135 | -.0072 | .0207 |
| 44-45 | -.0068 | -.0196 | .0128 |
| 45-46 | .0062 | .0083 | -.0021 |
| 46-47 | -.2329 | -.1998 | -.0431 |
| 47-48 | -.2938 | -.3153 | .0215 |
| 48-49 | .0218 | -.0099 | .0317 |
| 49-50 | -.0650 | -.0328 | .0327 |
| 50-51 | -.0351 | -.0562 | .0211 |
| 51-52 | -.0843 | -.0610 | .0233 |
| 52-53 | -.0361 | -.0198 | -.0163 |
| 53-54 | .2840 | .2401 | .0439 |
| 54-55 | .0140 | -.0104 | .0246 |
| 55-56 | .0085 | .0091 | -.0006 |
| 56-57 | .0078 | .0335 | -.0257 |
| 57-58 | .0295 | .0156 | .0139 |
| 58-59 | .0054 | -.0047 | .0101 |
| 59-60 | -.0087 | -.0109 | .0022 |
| 60-61 | .0030 | .0026 | .0004 |
| 61-62 | .0078 | .0030 | .0048 |
| 62-63 | -.0136 | -.0125 | -.0011 |
| 63-64 | .0027 | -.0018 | .0045 |
| 64-65 | -.0029 | -.0047 | .0018 |
| 65-66 | .1125 | .0722 | .0403 |
| 66-67 | -.0052 | -.0053 | .0001 |
| 67-68 | -.0090 | -.0110 | .0020 |
| 68-69 | -.0072 | -.0083 | .0011 |
| 69-70 | -.0018 | -.0031 | .0013 |
| 70-71 | -.0186 | -.0184 | -.0002 |
| 71-72 | -.0026 | -.0024 | -.0002 |
| 72-73 | -.0074 | -.0127 | .0053 |
| 73-74 | -.0013 | -.0017 | .0004 |
| 74-75 | -.0655 | -.0904 | .0249 |
| 75-76 | .0053 | .0013 | .0040 |
| 76-77 | .0214 | .0243 | -.0029 |

FIGURE 10

Percentage Changes in the Beta Coefficients of the Treatment and Control Portfolios (Beta Coefficients Estimated Using 35 Months of Return Data and the Market Model)



The recursive F-tests were applied at months 47, 50, 53, and 56 within the impact period as well as at numerous points outside the impact period.

Table 13 presents the test statistics for the recursive F-tests. Analysis of Table 13 discloses that there were 2 significant F-tests at an $\alpha$-level of .05. A significant test statistic (4.512) resulted when the sum of the squared recursive residuals from the first 40 observations was compared to the sum of the squared recursive residuals for months 41 through 43. A second significant test statistic (2.947) resulted from the comparison of the sum of the squared recursive residuals for the first 64 observations to the sum of the squared recursive residuals for months 65 through 67. Both of these test statistics were outside the impact period of June 1974 to March 1975. Therefore, the risk changes of the treatment and control groups in months 47, 48, and 54 were not significantly different from one another.

Figure 11 plots the series of test statistics from the recursive F-tests and the F-distribution at an $\alpha$-level of .05 for 3 and $n_{i-1}-1$ degrees of freedom. Figure 11 illustrates that the test statistics were well below the significance level except at months 41 and 65 [(3,39) and (3,63) degrees of freedom].

The beta coefficients of the "difference portfolio" are plotted in Figure 12.[3] Inspection of Figure 12 reveals that there were no substantial increases or decreases in beta between months 40 and 43 or between months 64 and 67. The "difference portfolio" beta was

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[3]The beta coefficients were estimated using 35 months of "return difference" data.

TABLE 13

Recursive F-Statistics Computed for the "Difference Portfolio"

| $\Sigma\tilde{u}_j^2$ for months | Compared to $\Sigma\tilde{u}_j^2$ for months: | F-value | Degrees of Freedom |
|---|---|---|---|
| 1-4 | 5-7 | .277 | (3,3) |
| 1-7 | 8-10 | 1.190 | (3,6) |
| 1-10 | 11-13 | .597 | (3,9) |
| 1-13 | 14-16 | .201 | (3,12) |
| 1-16 | 17-19 | 2.138 | (3,15) |
| 1-19 | 20-22 | .451 | (3,18) |
| 1-22 | 23-25 | .568 | (3,21) |
| 1-25 | 26-28 | .523 | (3,24) |
| 1-28 | 29-31 | 1.793 | (3,27) |
| 1-31 | 32-34 | .226 | (3,30) |
| 1-34 | 35-37 | .033 | (3,33) |
| 1-37 | 38-40 | .635 | (3,36) |
| 1-40 | 41-43 | 4.512* | (3,39) |
| 1-43 | 44-46 | .758 | (3,42) |
| 1-46 | 47-49 | 1.343 | (3,45) |
| 1-49 | 50-52 | 1.745 | (3,48) |
| 1-52 | 53-55 | 1.371 | (3,51) |
| 1-55 | 56-58 | 2.646 | (3,54) |
| 1-58 | 59-61 | .362 | (3,57) |
| 1-61 | 62-64 | .159 | (3,60) |
| 1-64 | 65-67 | 2.947* | (3,63) |
| 1-67 | 68-70 | .136 | (3,66) |
| 1-70 | 71-73 | .547 | (3,69) |
| 1-73 | 74-76 | .387 | (3,72) |
| 1-76 | 77 | .233 | (1,75) |

* - significant at an $\alpha$-level of .05.

FIGURE 11

Comparison of the Critical Values of the F-Distribution and the Test Statistics for the "Difference Portfolio"

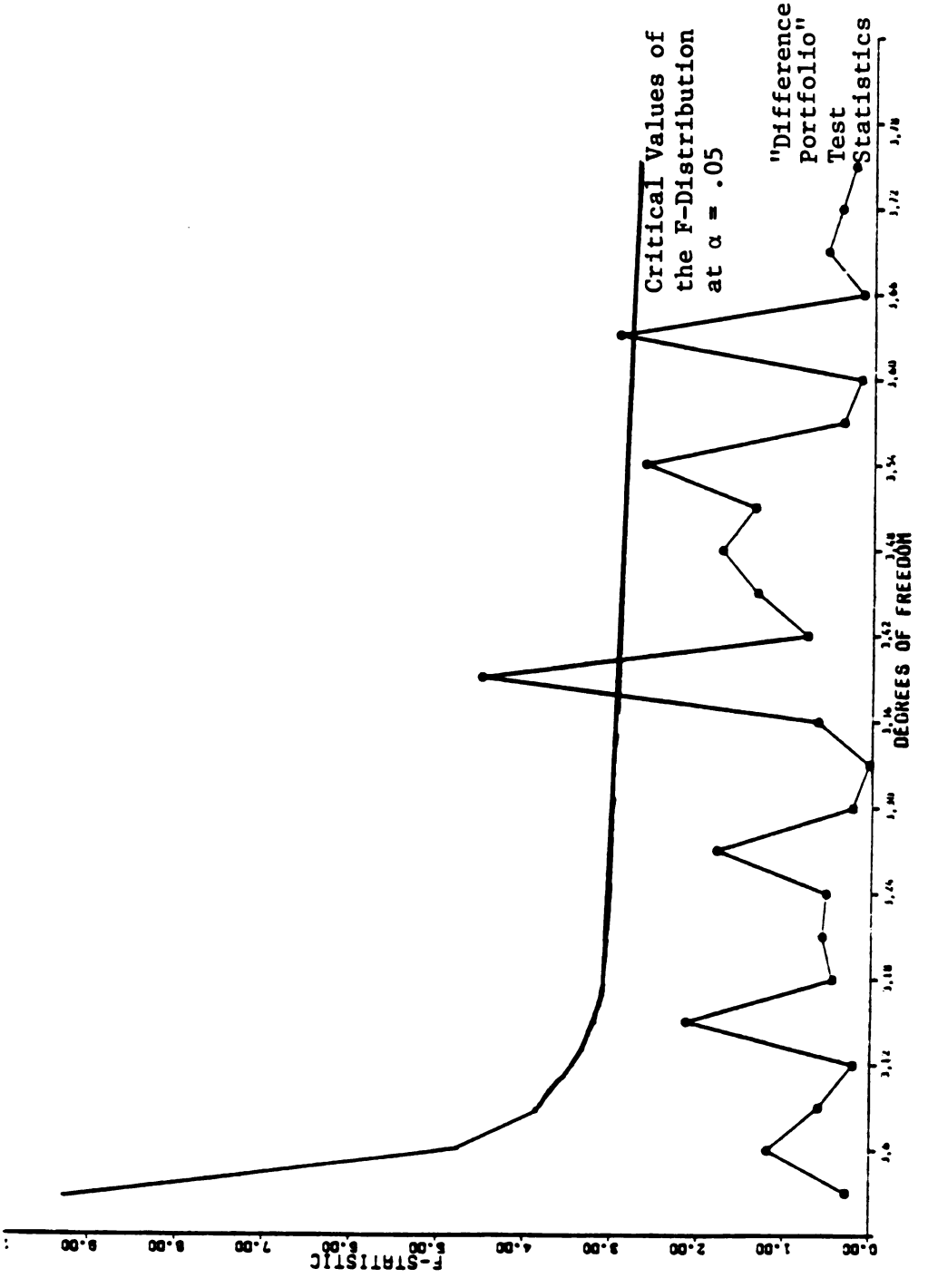

FIGURE 12

"Difference Portfolio" Beta Coefficients Estimated Using
35 Months of Return Differences and the Constrained Model

relatively stable between months 35 and 77.

It should be noted that when a large number of tests are conducted (25 tests in this case) and a few tests are significant, the significant tests could be the result of chance. Therefore, the significant test statistics at month 41 and 65 may not indicate true differences in the risk behaviorsof the treatment and control groups in those months. Examination of the percentage risk changes in Table 12 reveals that the beta coefficients of the treatment and control groups decreased by 7.4 percent and 6.7 percent, respectively, between months 40 and 41. Between months 64 and 65, the beta of the treatment group decreased by .29 percent while the beta coefficient of the control group decreased by .47 percent. The risk changes of the treatment and control groups appear to be very similar in those two months.

To determine whether the two significant tests occurred by chance, a binomial test was conducted. The probability of obtaining x significant tests by chance when N tests are conducted is given by:

$$p(x) = \binom{N}{x} P^x Q^{N-x} \qquad \text{eq. (11)}$$

where

$P$ = alpha level

$Q$ = 1-P

$$\binom{N}{x} = \frac{N}{x!(N-x)!} \quad , \quad ! \text{ denotes factorial.}$$

The results of the binomial test indicate that the probability that exactly 2 significant tests occurred by chance is 23 percent.[4] Therefore, it is very likely that there are no real differences in the risk behaviors of the treatment and control groups in months 41 and 65.

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[4]The probability that 2 or less significant tests occurred by chance is 59.5 percent, [p(2) + p(1)].

# CHAPTER FIVE

## SUMMARY AND CONCLUSIONS

The objective of this study was to investigate whether Statement of Financial Accounting Standards No. 2 provided investors with information to assess the riskiness of firms. Statement No. 2 requires all research and development expenditures as defined by the statement to be charged to expense and to be disclosed in the financial statements in each period for which an income statement is presented. One of the Financial Accounting Standards Board's goals in issuing Statement No. 2 was to provide useful financial information about research and development costs. The Board believed that the capitalization of any research and development expenditures was not useful in assessing the earnings potential of an enterprise and therefore would not enhance the ability of investors to predict the risk and return on an investment. Many have criticized the FASB's expensing decision and have questioned whether this accounting and reporting policy provides investors with relevant information to assess the risk and return of firms undertaking research and development projects.

The information content of Statement No. 2 was assessed by testing the stability of the systematic risk of firms that changed their accounting and reporting policies to comply with Statement No. 2. It was hypothesized that if Statement No. 2 provided new information to evaluate the riskiness of a security, a shift in the security's beta

would occur. A sample of firms that changed their R and D accounting policies at the end of 1974 was matched to a sample of firms that expensed and disclosed all research and development expenditures prior to the issuance of Statement No. 2. No adjustment in systematic risk would be expected for firms that had expensed all R and D costs prior to Statement No. 2 because the accounting and reporting policies of those firms did not change.

Monthly beta coefficients were estimated for each of the samples which were treated as equally weighted portfolios of securities. Recursive F-tests were performed separately on each portfolio to determine whether there was a shift in the portfolio's systematic risk. It was hypothesized that if Statement No 2 possessed information content, a shift in the relative risk of the treatment group (change firms) would occur at some point between June 1974, the time the Exposure Draft was issued, and March 1975.

The results of the recursive F-tests indicated that the beta coefficients of the treatment and control groups shifted significantly between June 1974 and March 1975. Analysis of the plots of the beta coefficients revealed that both the treatment and control groups experienced significant declines in risk in June 1974 and again in July 1974. The betas of both groups increased significantly in January 1975.

To determine whether there were significant differences in the beta shifts of the treatment and control groups, a "difference portfolio" was created which consisted of monthly differences in the returns of the treatment and control portfolios. Monthly beta coefficients were estimated for the "difference portfolio." It was

hypothesized that if the shifts in the relative risks of the treatment and control groups were significantly different, the beta coefficient of the "difference portfolio" would not be stable during the impact period of June 1974 to March 1975.

The recursive F-tests conducted on the "difference portfolio" indicated that there were no significant differences in the beta shifts of the two groups. Examination of the plots of the monthly returns on the treatment and control portfolios and the market suggested that the significant shifts in the relative risks of both groups resulted from extreme outlier observations around the time of the shifts.

## Conclusions

The results of this analysis suggest that Statement No. 2 possessed no information content. Although the beta coefficient of the treatment group was not constant, the instability of the beta coefficient does not reflect a true change in relative risk as a result of Statement No. 2. This conclusion is supported by the fact that the control group experienced beta changes in the same months which were not statistically different than those of the treatment group.

It appears that the market viewed the changes necessitated by Statement No. 2 as mere bookkeeping variations having no real economic substance. Although Statement No. 2 resulted in all research and development expenditures being treated as having no future value, the market's expectations of the future payoffs of firms' research and development expenditures apparently did not change. The market's perception of the riskiness of firms formerly capitalizing some or all of their research and development costs was not altered by Statement No. 2.

The FASB's contention that the capitalization of any research and development expenditures would not be useful in assessing the risk and return on an investment was not supported by the results of this study. It appears that either capitalization of R and D costs conveyed sufficient information to evaluate the risk of a security or that the market obtained information about firms' R and D expenditures from alternative accounting and non-accounting sources. The accounting and reporting policies of Statement No. 2 may have had no effect on investors' perceptions of systematic risk because they provided redundant information.

One of the concerns of opponents of Statement No. 2 was that the regulation would have an adverse impact on the ability of firms to raise capital for future research and development projects. The fact that the relative risk of the treatment group did not increase as a result of Statement No. 2 may provide preliminary evidence that firms were not adversely affected by the regulation.

## Implications of the Results

The Financial Accounting Standards Board has established a formal review procedure for statements that have been in effect for at least two years. The initial reviews will include Statement No. 2. One of the Board's primary justifications for expensing research and development costs was that this accounting alternative would provide relevant information for investment and credit decisions. A tentative conclusion of this study is that Statement No. 2 provided no new information to assess the riskiness of firms.

Many have argued that the decision to expense all research and development expenditures was not based on sound accounting theory.

Some have cautioned that Statement No. 2 creates questionable new accounting theory with potentially wide application. If the degree of uncertainty of future benefits is a valid criterion for expensing research and development costs (it was argued in Chapter 1 that it is not valid for development expenditures), then the criterion could be extended to many investments, especially investments in long-lived plant and equipment in fields where there are rapid technological advances.

The FASB's treatment of research and development expenditures appears to be in direct contrast to its definition of an asset in the proposed conceptual framework for accounting. In the Exposure Draft, "Objectives of Financial Reporting and Elements of Financial Statements of Business Enterprises," the FASB states:

> A resource other than cash must have three characteristics to be represented as an asset in the financial statements of an enterprise: (a) the resource must, singly or in combination with other resources, contribute directly or indirectly to future cash inflows (or to obviating future cash outflows), (b) the enterprise must be able to obtain the benefit from it, and (c) the transaction or event giving rise to the enterprise's right or interest in the benefit must already have occurred. (page 21)

Many development expenditures which Statement No. 2 now requires to be expensed would be considered assets under this definition.

The FASB contended that selective capitalization of research and development expenditures was not a viable accounting alternative because no set of conditions could be established for capitalization that could be objectively and comparably applied by all enterprises. The International Accounting Standards Committee (IASC) has recently issued International Accounting Standard 9, "Accounting for Research and

Development Activities." The IASC states that the allocation of research and development costs to accounting periods is determined by their relationship to the expected future benefits to be derived from the R and D activities. In cases where there is little direct relationship between the amount of research and development costs and future benefits because the amount of such benefits is too uncertain, the IASC requires immediate expensing. When the product or process is technically or commercially feasible and the enterprise has adequate resources to enable the product or process to be marketed, the costs of development activities may be deferred to future periods.

The IASC established the following criteria which must be satisfied for development costs to be deferred:

(a) the product or process is clearly defined and the costs attributable to the product or process can be separately identified;

(b) the technical feasibility of the product or process has been demonstrated;

(c) the management of the enterprise has indicated its intention to produce and market, or use, the product or process;

(d) there is a clear indication of a future market for the product or process or, if it is to be used internally rather than sold, its usefulness to the enterprise can be demonstrated; and

(e) adequate resources exist, or are reasonably expected to be available, to complete the project and market the product or process.

International Accounting Standard 9 requires the disclosure of the total research and development costs expensed in each period, including the amortization of deferred development costs, the balance of unamortized development costs, the additions to the deferred development cost account, and the basis for amortization. The comprehensive disclosure requirement of IAS 9 will enable investors to make adjusting calculations to the reported earnings numbers to compare firms that have expensed all research and development costs with firms that have selectively capitalized development expenditures.

It appears that in light of the results of this study, the criticism of Statement No. 2, and the proposed conceptual framework for accounting, the FASB should reconsider its position on accounting for research and development costs. International Accounting Standard 9 may be a useful model for the Board to consider.

## Limitations of the Study

The effect of Statement No. 2 on investors' perceptions of risk was evaluated at the portfolio level because past research indicated that firm level beta analysis lacks statistical power. A limitation of the portfolio level analysis is that it is not capable of providing information which may be disaggregated to the individual firm level. It is possible, therefore, that the relative risks of some treatment firms increased as a result of Statement No. 2 although the beta coefficients of the portfolios decreased significantly.

The firms in this study were drawn from the New York Stock Exchange and the American Stock Exchange and were not randomly sampled. The results of this analysis, therefore, cannot be generalized beyond the

firms in the sample. Logical but not statistical inferences can be made about the effect of Statement No. 2 on other firms to the extent that those firms are similar to the firms in the study.

One of the sampling criteria of this study was that a firm must have changed its method of accounting for research and development costs at the end of 1974. (Although Statement No. 2 was not effective until fiscal years beginning on or after January 1, 1975, the FASB encouraged earlier application.) This sampling criterion may have biased the results of the study. Firms that complied with Statement No. 2 before the effective date may have done so because their earnings or financial positions were less affected by the statement. These firms, for example, may have capitalized fewer of their research and development expenditures and therefore reduced their assets by less as a result of Statement No. 2. Firms that delayed making the accounting change until 1975 or later may have capitalized a greater percentage of their R and D expenditures. The financial positions and financial ratios of these firms may have been more adversely affected by the statement due to larger asset write-offs. Although the results of this study indicate that Statement No. 2 had no information content, it is possible that Statement No. 2 provided information about the risk of firms that postponed making the accounting change until 1975 or later.

## Suggestions for Future Research

Further research may overcome some of the limitations of this current study. An extension of this study would be to evaluate the risk behavior of firms that delayed changing their R and D accounting

policies until fiscal years beginning on or after January 1, 1975. Statement No. 2 may have provided useful information to assess the riskiness of those firms.

No firms whose equity securities are traded over the counter (OTC) were included in this study. Past research has shown that the OTC market relies heavily on the information in annual reports to make investment decisions due to the lack of more timely sources of information.[1] An analysis of the risk stability of OTC firms that changed their R and D accounting policies may indicate whether Statement No. 2 provided useful financial information to OTC investors.

The information content of Statement No. 2 could also be investigated with a different research design. The information content could be measured by determining if abnormal stock returns, adjusted for relative risk and changes in relative risk, were associated with the accounting change. Either the market model or the two-factor model could be used to estimate the price residuals.

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[1]See Grant (1977).

## APPENDIX A

### Treatment Sample

| | Stock Exchange |
|---|---|
| Aeroflow Dynamics | ASE |
| Aeronca Incorporated | ASE |
| Alaska Interstate Corporation | NYSE |
| American Hoist and Derrick | NYSE |
| Applied Data Research Inc. | ASE |
| Arvin Industries | NYSE |
| Austral Oil Company | ASE |
| Avco Corporation | NYSE |
| Avon Products | NYSE |
| Belden Corporation | NYSE |
| Big Three Industries | NYSE |
| Braun Engineering Company | ASE |
| Cetec Corporation | ASE |
| Cyprus Mines Inc. | NYSE |
| Del Laboratories Inc. | ASE |
| The Goodyear Tire and Rubber Company | NYSE |
| Hanna Mining Company | NYSE |
| Hasbro Industries Inc. | ASE |
| Hazeltine Corporation | NYSE |
| Hoffman Electronics Corporation | NYSE |
| Honeywell Inc. | NYSE |
| Insilco Corporation | NYSE |
| Lockheed Aircraft Corporation | NYSE |
| Lone-Star Industries | NYSE |
| Martin Marietta Corporation | NYSE |
| McDonnell Douglas Corporation | NYSE |
| Napco Industries Inc. | ASE |
| National Can Company | NYSE |
| P & F Industries | ASE |
| Puerto Rican Cement Company | NYSE |
| Raymond Precision Industries | ASE |
| Roblin Industries | ASE |
| The Signal Companies | NYSE |
| Sundstrand Corporation | NYSE |
| Superscope Inc. | NYSE |
| United Industrial Corporation | NYSE |
| UOP | NYSE |
| Western Union Corporation | NYSE |
| Weyerhaeuser Company | NYSE |
| White Consolidated Industries Inc. | NYSE |

## APPENDIX B

### Control Sample

| | Stock Exchange |
|---|---|
| Allis Chalmers Corporation | NYSE |
| American Petrofina Inc. | ASE |
| Anchor Hocking Corp. | NYSE |
| Athlone Industries | NYSE |
| Barry Wright Corporation | ASE |
| Bertea Corporation | ASE |
| Boeing Company | NYSE |
| Boise Cascade Corporation | NYSE |
| Borg-Warner Corporation | NYSE |
| Burroughs Corporation | NYSE |
| Cincinnati Milacron Inc. | NYSE |
| Citation Companies | ASE |
| Cleveland Cliffs Iron Company | NYSE |
| Conrac Corporation | NYSE |
| Continental Telephone Company | NYSE |
| Dynalectron Inc. | ASE |
| Eastern Company | ASE |
| Federal Signal Corporation | NYSE |
| Florida Gas | NYSE |
| Gabriel Industries Inc. | ASE |
| Gillette Company | NYSE |
| Hastings Manufacturing Company | ASE |
| Ideal Basic Industries Inc. | NYSE |
| International General Industries | ASE |
| Kaiser Cement and Gypsum Co. | NYSE |
| LaMaur Inc. | ASE |
| Northrop Corporation | NYSE |
| Questor Corporation | NYSE |
| Revere Copper and Brass Inc. | NYSE |
| Sargent-Welch Scientific | NYSE |
| Scovill Manufacturing Company | NYSE |
| Smith International Inc. | NYSE |
| TRW Inc. | NYSE |
| Tech-Sym Corporation | NYSE |
| Texasgulf Inc. | NYSE |
| Thiokol Inc. | NYSE |
| Torin Corporation | NYSE |
| Triangle Industries | NYSE |
| Uniroyal | NYSE |
| Watkins-Johnson | NYSE |

LIST OF REFERENCES


Ball, Ray. "Changes in Accounting Techniques and Stock Prices," Empirical Research in Accounting: Selected Studies, 1972. Supplement to Journal of Accounting Research, 1-38.

Ball, Ray and Brown, Philip. "An Empirical Evaluation of Accounting Income Numbers," Journal of Accounting Research (Autumn 1968), 159-177.

Bar-Yosef, Sasson and Brown, Lawrence. "A Reexamination of Stock Splits Using Moving Betas," Journal of Finance (September 1977), 1069-1080.

Bierman, Harold, Jr., and Dukes, Roland E. "Accounting for Research and Development Costs," Journal of Accountancy (April 1975), 48-55.

Booz-Allen and Hamilton, Inc. Management of New Products. Booz-Allen and Hamilton, Inc., 1968.

Chow, Gregory. "A Test of Equality Between Sets of Observations in Two Linear Regressions," American Economic Review (July 1960), 591-605.

Collins, Daniel and Simonds, Richard. "SEC Line of Business Disclosure and Market Risk Adjustments" (unpublished manuscript, Michigan State University), 1977.

Corbin, Donald A. "Accounting Standards for Research and Development," Management Accounting (October 1975), 47-48.

Dukes, Roland E. Market Evaluation of Accounting Information: A Cross Sectional Test of Investor Response to Expensing Research and Development Expenditures (unpublished Ph.D. dissertation, Stanford University), 1974.

Fama, Eugene. "Efficient Capital Markets: A Review of Theory and Empirical Work," Journal of Finance (May 1970), 383-417.

Fama, E., Fisher, L., Jensen, M., and Roll, R. "The Adjustment of Stock Prices to New Information," International Economic Review (February 1969), 1-21.

Financial Accounting Standards Board. Statement of Financial Accounting Standards No. 2 - Accounting for Research and Development Costs, 1974.

Foster, George. "Stock Market Reaction to Estimates of Earnings per Share by Company Officials," Journal of Accounting Research (Spring 1973), 25-37.

Gee, Robert E. "A Survey of Current Project Selection Practices," Research Management (September 1971), 38-45.

Gerlach, John and Wainwright, Charles Anthony. Successful Management of New Products. Hasting House Publishers, Inc., 1968.

Gonedes, Nicholas. "Risk, Information, and the Effects of Special Items on Capital Market Equilibrium," Journal of Accounting Research (Autumn 1975), 220-256.

Gonedes, Nicholas J., and Dopuch, Nicholas. "Capital Market Equilibrium, Information Production, and Selecting Accounting Techniques: Theoretical Framework and Review of Empirical Work," Studies of Financial Accounting Objectives: 1974. Supplement to Journal of Accounting Research, 48-129.

Grant, Edward B. Interim Information and the Information Content of Annual Earnings Announcements (unpublished Ph.D. dissertation, Michigan State University), 1977.

Harrison, Tom. "Different Market Reactions to Discretionary and Non-discretionary Accounting Changes," Journal of Accounting Research (Spring 1977), 84-107.

Harvey, A. C. "An Alternative Proof and Generalization of a Test for Structural Change," The American Statistician (August 1976), 122-123.

International Accounting Standards Committee. International Accounting Standard 9: Accounting for Research and Development Activities, 1978.

Jensen, Michael. "Capital Markets: Theory and Evidence," Bell Journal of Economics and Management Science (Autumn 1972), 357-398.

Johnson, Orace. "A Consequential Approach to Accounting for R & D," Journal of Accounting Research (Autumn 1967), 164-173.

Johnson, Orace. "Contra-Equity Accounting for R & D," The Accounting Review (October 1976), 808-822.

Johnston, J. Econometric Methods. McGraw-Hill Book Company, 1972.

Kaplan, Robert and Roll, Richard. "Investor Evaluation of Accounting Information: Some Empirical Evidence," Journal of Business (April 1972), 225-257.

Kiger, J. "Empirical Investigation of NYSE Volume and Price Reactions to the Announcement of Quarterly Earnings," Journal of Accounting Research (Spring 1972), 113-128.

Lev, Baruch. "On the Association Between Operating Leverage and Risk," Journal of Financial and Quantitative Analysis (September 1974), 627-639.

Mansfield, Edwin. "Industrial Research and Development: Characteristics, Costs, and Diffusion of Results," American Economic Review, Paper and Proceedings (May 1969), 65-71.

May, Robert. "The Influence of Quarterly Earnings Announcements on Investor Decisions as Reflected in Common Stock Price Changes," Empirical Research in Accounting: Selected Studies, 1971. Supplement to Journal of Accounting Research, 119-163.

Milburn, Alex J. "An Empirical Study of the Relationship of Research and Development Expenditures to Subsequent Benefits," (Unpublished Research Study, University of Illinois), 1971.

Newman, Maurice S. "Equating Return from R & D Expenditures," Financial Executive (April 1968), 26-33.

Rubinstein, Mark. "A Mean-Variance Synthesis of Corporate Financial Theory," Journal of Finance (March 1973), 167-181.

Schiff, Michael and Fabricant, Solomon. "Comments on Proposed Statement of Financial Accounting Standards -- Accounting for Research and Development Costs," Faculty Working Paper, College of Business and Public Administration, New York University, 1974.

Siegel, Sidney. Nonparametric Statistics. McGraw-Hill Book Company, Inc., 1956.

Sunder, Shyam. "Relationship Between Accounting Changes and Stock Prices: Problems of Measurement and Some Empirical Evidence," Empirical Research in Accounting: Selected Studies 1973. Supplement to Journal of Accounting Research, 1-45.

Sunder, Shyam. "Stock Price and Risk Related to Accounting Changes in Inventory Valuation," The Accounting Review (April 1975), 305-315.