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**An examination of the market reaction to a mandated
accounting change: The case for the costs of computer software**

Finn, Philip Morton, Ph.D.

City University of New York, 1990

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A

**AN EXAMINATION OF THE MARKET REACTION TO A MANDATED
ACCOUNTING CHANGE:
THE CASE FOR THE COSTS OF COMPUTER SOFTWARE**

by
Philip M. Finn

A dissertation submitted to the Graduate Faculty in
Business in partial fulfillment of the requirements
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Abstract

**AN EXAMINATION OF THE MARKET REACTION TO A MANDATED
ACCOUNTING CHANGE: THE CASE FOR THE COSTS OF COMPUTER
SOFTWARE**

by

Philip M. Finn

Adviser: Professor Victor Pastena

This study extends market event and market return research on mandated accounting changes to the changes in accounting for computer software costs (SFAS 86). Empirical tests were performed on a sample that included both listed firms and over the counter (OTC) firms. Several events leading to the issuance of SFAS 86 were found significant. Cross-sectional tests on abnormal returns for the significant events supported leverage and exchange listing as explanatory variables. Proxy variables for computer software costs were also significant but there was inconclusive support for underlying theories related to research intensity.

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CHAPTER 1

Introduction

Numerous studies have investigated the stock market reaction to mandated accounting changes and, more importantly, tested explanatory theories linking economic consequences with the effects of accounting procedure change [Collins, Rozeff & Dhaliwal (1981), Leftwich (1981), Lys (1984), Salatka (1989)]. On August 13, 1985, the Financial Accounting Standards Board (FASB) issued its Statement of Financial Accounting Standards No. 86, Accounting for the Costs of Computer Software to Be Sold, Leased, or Otherwise Marketed (SFAS 86), ending several years of controversy by changing the predominant¹ method of accounting from expensing all such costs to a tiered system of expensing certain costs and capitalizing others. The net effect of the accounting change for a majority of firms is to increase current earnings, increase retained earnings, and increase assets. Statement No. 86 was criticized as leading to 1) diverse reporting practices resulting in a lack of financial statement comparability, 2) management flexibility in determining what and when to capitalize certain costs, 3) additional administrative and audit

1. McGee (1984) found 90% of surveyed public firms and 78% of private firms followed an expense only policy for internally developed software.

costs, particularly for small firms, in developing systems to determine which costs to capitalize, and 4) increased risk of subsequent surprise asset write-offs similar to those that preceded Statement of Financial Accounting Standards No. 2, Accounting for Research and Development Costs (SFAS 2) adding volatility to earnings and lowering their quality in the process.

Several researchers have studied management "choice" associated with accounting for computer software costs. Kandiel (1985) studied the characteristics of management choice between expensing and capitalizing internally developed software costs prior to SFAS 86 while Trombley (1989) studied the characteristics of firms electing early adoption of SFAS 86. Both used explanatory variables consistent with positive accounting theory.

The purpose of this paper is to extend event and market based research to a recent accounting procedure change affecting an industry characterized on the one hand by numerous small, high technology, Over the Counter (OTC) firms, and on the other hand by a smaller group of large, sometimes multiproduct, New York Stock Exchange (NYSE) and American Stock Exchange (ASE) listed ones. The dichotomy in the sample permits testing and differentiating elements of the positive theory of accounting using a classification of firms (OTC firms)

not included in previous event or market return studies. It also affords the researcher an opportunity to test in a market return setting, the "differential information hypothesis" [Atiase, (1985, 1987)] that exchange listing provides information aside from that provided by firm size. In addition, the magnitude of R&D and capitalized software will be tested as explanatory variables for changed investor expectations arising from significant events.

The researcher will address the following:

1. Did the market react to the events leading up to and including SFAS 86?
2. What were the determinants and how do they explain any significant market reaction to the event(s)?
3. Does exchange listing contribute to an explanation of market reactions to events?
4. Does the level of computer software development activity affect investor expectations?
5. Was the market reaction to "capitalizers" different from "expensers"?

The remaining chapters are organized as follows:

Chapter 2 provides background on the institutional issues that give rise to the research, Chapter 3 examines the market reaction to selected events and tests related hypotheses, Chapter 4 examines several theories intended to explain the significant market

reaction to certain events and tests various hypotheses related to explanatory theories, and Chapter 5 summarizes the results of the research with recommendations for future study.

CHAPTER 2

Institutional Aspects

The rapid development of the computer software industry during the late 1970's and early 1980's was not accompanied by concurrent authoritative pronouncements focusing on the specific nature of the software development process. Firms relied on existing accounting literature to determine how costs incurred in the development process should be reflected in financial statements. For the large majority of firms this meant treating all such costs as research and development (R&D) and expensing them as period costs in accordance with the provisions of SFAS 2. While this was the predominant view, a small but growing number of others concluded that the successful development of computer software represented the development of an asset and accordingly be reflected on the Balance Sheet. One notable firm following the latter policy was IBM.

To better understand the issues surrounding the disparity in accounting treatment for the costs of developing computer software, a summary of the software development process as outlined in Lhotka & Erickson (1984), follows.

Software Development Process

Although the software development process varies somewhat from firm to firm, most include the activities

set forth below.

The first phase is usually referred to as planning and design and consists of product planning, construction planning, financial planning, and the establishment of feasibility.

Product Planning would consist of several product development, market and financial activities. These would include:

- 1) describing the product feature requirements including all the functions that need be performed,
- 2) evaluation of technical constraints to determine the required technical characteristics,
- 3) specifying the software design in sufficient detail to assist in the technological feasibility determination and in construction planning,
- 4) describing the requirements for documentation and customer support,
- 5) market and environmental analyses, and
- 6) defining the business or consumer needs which the product will meet.

Construction planning entails the following activities:

- 1) how to transform product specifications into a detail program design,
- 2) evaluating the complexity manpower requirements and skill levels needed to construct the product as well as

- the hardware and software requirements,
- 3) determining whether required resources are available,
 - 4) setting a timetable for the project, and
 - 5) assessing the availability of financial resources.

Financial planning would include forecasting sales and costs associated with the product as well as an assessment of the risks of failure in light of the expected return on investment.

Feasibility need be assessed from a technological, financial and market perspective. Technological feasibility occurs when it is probable the product can be built to meet design specifications established in the product, construction, and financial activities described above. Financial and market feasibility usually occurs when management determines it can commit what ever is necessary to build the product and cover its costs.

The next phase in the development process is the construction phase. Usually this begins with the preparation of a detail program design serving the lowest possible level for constructing the product. Test plans and test data that will be used in coding and testing the product must also be developed. After the detail program design occurs specification coding must take place followed by appropriate testing to provide quality assurance of the product. Errors are corrected

and documentation amended. A product master is prepared as is the documentation and supporting training materials necessary to complete the package for customer delivery.

Evolution of Accounting for Computer Software

SFAS 2 recognized that the costs of developing computer software might constitute R&D. That, however, was left to a case by case determination based on the guidelines established for defining "research" and defining "development".

SFAS 2 defines "research" as planned search for new knowledge that will be useful in developing new products or processes and "development" as the translation of research findings into a plan or design for a new product that includes the conceptual formulation, design, testing, prototypes, and pilot plants associated therewith. In making reference to computer software, the Standard states that the nature of the computer software activity must be considered in relation to the above definitions to determine whether these costs are R&D or not. For example, developing a new or higher level of computer software capability for sale would be R&D. SFAS 2 left unanswered how to account for costs that did not meet the above definitions.

Questions persisted in search for a better understanding of the software development process. The

FASB subsequently issued several pronouncements whose purpose was to clarify the definition of R&D as it relates to computer software costs. FASB Interpretation No. 6 [February 1975] indicates that programming and testing software in the search for evaluating product or process alternatives or in the design of preproduction models constitutes R&D; however, routine efforts to improve existing products do not. FASB Technical Bulletin No. 79-2 [December 1979] indicates that not all costs incurred to produce computer software constitute R&D but that didn't necessarily mean they are deferrable or inventoriable, either. Those decisions would be made in light of the specific facts and circumstances of each situation.

In 1981, however, the FASB issued statements on accounting for record masters and films; products whose development processes parallel, in many respects, those of computer software. SFAS 50, Financial Reporting in the Record and Music Industry [November 1981] provides that the cost of a record master is an asset if the past performance and current popularity of the artist provides a sound basis for estimating that the cost will be recovered from future sales. SFAS 53, Financial Reporting by Producers and Distributors of Motion Picture Films [December 1981] provides for capitalization of film production costs inventory,

subject to a net realizable valuation each period. The implication of these standards to the computer software industry was the sanctioning of asset treatment for costs incurred in developing a "master" from which copies could be produced and sold. More software firms began to reflect this thinking in changed accounting procedures.

By April 1983, the Securities and Exchange Commission (SEC) began observing an increasing number of registrants capitalizing internally generated computer software costs. They became concerned that this change in accounting practice would lead to a lack of comparability in financial reporting. Unable to determine from the literature any clear guidance for capitalizing these costs, they imposed a temporary moratorium on the practice [SEC Release No. 33-6461, April 14, 1983] permitting only those firms that capitalized such costs in financial statements issued prior to April 14, 1983 and who disclosed such practice in either audited financial statements, a report or registration statement filed with the SEC, or an offering of securities other than a registration statement issued prior to April 14, 1983, to continue the practice. Those permitted to continue the practice were obliged to disclose in subsequent financial statements the capitalized computer software costs less

amortization. By prohibiting companies from capitalizing future R&D unless specific requirements of prior accounting treatment were met, the SEC implied a bias against capitalization. The SEC formally adopted the proposed regulation on August 4, 1983 [SEC Release No. 33-6467] with the moratorium to remain effective until authoritative literature was issued specifying the appropriate accounting treatment.

Subsequently, the Accounting Standards Division (AcSEC) of the American Institute of Certified Public Accountants (AICPA) established a task force to prepare an issues paper on accounting for costs of software for sale or lease. The report, dated February 17, 1984, reached the following advisory conclusions: 1) all costs incurred to produce computer software for sale or lease needn't be charged to R&D as incurred, 2) even if technological feasibility is established no costs can be capitalized until market and financial feasibility is established (before the end of planning and design), 3) construction costs incurred after the planning and design phase can be capitalized if recoverability of such costs is probable, and 4) existing literature provides sufficient guidance to evaluate recoverability and the types of construction costs that should be capitalized.

On March 13, 1984, the FASB established a project to study the issues. Under date of August 31, 1984, they issued an Exposure Draft (ED) containing conclusions similar to those of the AcSEC task force with but few exceptions. According to the ED, all costs of planning, designing, and establishing technological feasibility of a computer software product to be sold, leased or otherwise marketed would be expensed as R&D. Costs of producing production masters would be capitalized if recoverability is established. Some of the costs that would be capitalized would include coding, testing and the completion of documentation and training materials. The ED is more specific than the AcSEC report in stating those activities which constitute R&D and those which constitute production costs. For example, detail program design constitutes R&D. Finally, the ED has a more stringent ongoing recoverability test than did AcSEC, by adopting provisions similar to those required in valuing inventory at net realizable value. The AcSEC valuation approach was based on impairment as described in Statement of Accounting Standard No. 5, Accounting for Contingencies (SFAS 5).

Over 200 responses to the ED were received by the FASB with others made at public hearings held on May 2 and May 3, 1985. Primary among the proponents of the ED were the accounting profession and several large

industrial firms such as IBM and ITT, who argued that construction costs are assets and should be capitalized. Some firms in the industry also expressed concern that an "expense all" policy understated assets and earnings thereby limiting their access to much needed outside financing. Small technology based firms rely much more heavily on external sources of financing than small non technology based firms. For example, at the time of their first public offering less than 1% of funding was generated internally by small technology firms compared to 25% by non technology ones. In addition, 48% of the funding of small technology firms came from equity compared to 14% for non technology ones [National Bureau of Standards, 1976]. Kandiel (1985) found that 69% of his sample of computer software firms financed 50% or more of their operations from the equity market. Some surveys of financial analysts have shown little institutional interest in small high technology firms making it likely that these firms obtain a higher proportion of their equity from "unsophisticated" investors. Thus, inability to capitalize computer software costs put them at a decided disadvantage in competing for capital.

The financial community voiced strong opposition to capitalizing any costs associated with developing computer software drawing a parallel with the market

volatility associated with large asset write offs of R&D that preceded (and precipitated) SFAS 2. More specifically, the provisions of the ED would lead to less comparability of financial statements and more opportunities for management maneuvering of earnings. The tests for capitalizing software costs are subjective allowing management flexibility in determining when to report expenses. For example, the recoverability test can be used by management to justify expensing or capitalizing costs depending on how management wishes to report earnings in a particular period [Morgan Stanley, 1984]. Since the development process is not the same for all firms, some will capitalize certain costs at one stage while others will capitalize them at another stage making comparability among firms difficult. In addition, detailed internal audit systems will have to be developed and then the process audited by outside accountants, a particularly expensive additional cost for small firms [Kidder Peabody, 1984]. Finally, some expressed concern that capitalization would conflict with the current tax treatment resulting in the loss of tax benefits [Morgan Stanley, 1984]. Of particular concern was belief the Internal Revenue Service (IRS) would require tax treatment to follow accounting treatment.

Uncertainty of future earnings streams and the

reduced quality of earnings led these financial analysts to forecast increased volatility of stock prices and lower price/earnings multiples paid by investors should the ED be adopted in its present form. Predictions, based on the provisions of the ED, were that upwards of 50% of then current R&D expenditures would now be capitalized (Kidder Peabody, 1984).

In August, 1985, the FASB issued its Statement No. 86 in substantially the same form as the ED. It did, however, alter the ED by permitting capitalization of coding and testing only after either a detail program design or working model is developed. As a result of this change, several financial analysts revised their prediction of the amount of current R&D most firms would probably capitalize to perhaps 5-10% of current R&D with more aggressive ones capitalizing upwards of 25%. The Statement became effective for financial statements whose fiscal years begin after December 15, 1985 although prior adaptation is permitted. Retroactive treatment for prior costs of continuing projects is not required. Financial statements issued after applicability of SFAS 86 must disclose the unamortized computer software costs included in each balance sheet and the total charge to expense each year for amortization or for write down to net realizable value. Those costs deemed R&D should follow the disclosure

requirements of SFAS 2.

As a consequence of SFAS 86, the large majority of firms who previously expensed all costs associated with developing computer software for sale or lease will now capitalize some portion of the ongoing costs with a resultant increase in reported earnings (although direct cash flows would remain unaffected).

Summary

The moratorium imposed by the SEC provided the impetus necessary for the accounting profession to focus on the diverse accounting practices of firms that develop computer software for sale or lease. Obtaining a clearer understanding of the development process enabled the profession to address the issues of when to recognize an asset. The climate had also changed from that which preceded SFAS 2. During the intervening period accounting standards were promulgated for other analogous processes, such as record masters and films. The underlying principles of SFAS 50 and SFAS 53 helped shape the approach taken to account for computer software costs. The decision to require capitalization had theoretical events leading to SFAS 2. Capitalization of computer software costs met with a chorus of disapproval from the financial community who forewarned of lower quality reported earnings and higher volatility in stock prices. The FASB deliberations following the

public hearings led to a tightening of their previous position on what constituted a capitalizable software cost.

CHAPTER 3

Research Hypotheses- Market Event Study

Accounting changes, even though cash flow neutral, may have economic consequences due to a linkage between the accounting numbers used in the financial statements and economic consequences resulting from contracting and monitoring costs of management compensation contracts and lending agreements, and from political costs [Watts and Zimmerman (1986)]. Debt covenants, for example, frequently use numbers from audited financial statements to restrict management activities. Management compensation plans frequently base incentive schemes on accounting earnings. Accounting changes, therefore, may alter, for example, the probability of debt covenant violation, thereby inducing management to change what might otherwise be optimal production/investment decisions. Previous studies of the impact of mandated accounting policy decisions on the capital markets include accounting changes for oil and gas (SFAS 19) [Collins and Dent (1979), Dyckman and Smith (1979), Lev (1979)], for foreign currency translation (SFAS 8) [Dukes (1978), Shank, Dillard and Murdock (1979)], for R&D costs (SFAS 2) [Dukes (1976), and Vigeland (1981)], and for capitalization of interest cost (SFAS 34) [Hughes and Ricks (1986)]. These market based studies were followed by cross-sectional tests of hypotheses on

the association between accounting policy changes and economic determinants; for example, oil and gas producing companies - SFAS 19 [Collins, Rozeff and Dhaliwal (1981), and Lys (1984)], business combinations (APB 16) [Leftwich (1981)], retail land sales [Hughes and Ricks (1984)], long term investments (APB 18) [Ricks and Hughes (1985)], and translation of foreign currency financial statements (FASB 8) [Salatka (1989)].

SFAS 86 is a cash flow neutral mandated accounting change that will result in an increase in reported earnings, an increase in total assets, and an increase in retained earnings for the preponderance of companies that develop computer software for sale or lease. Several events beginning with the SEC moratorium and ending with the issuance of SFAS 86 could have affected investors' prior expectations and thus firms' market share prices.

Events leading up to the accounting change

A determination of whether the stock market reflected changed expectations will be based on an analysis of selected events. The events are selected from a review of the Wall Street Journal Index, the New York Times Index, and the public records of the FASB.

Chronology of Events Leading to Issuance of SFAS 86

1. April 8, 1983. The Wall Street Journal states SEC is considering restrictions on capitalization of computer software costs. (WSJ, p. 4)

2. April 14, 1983. SEC announces temporary moratorium on capitalizing computer software costs. (SEC Release No. 33- 6461)
3. August 4, 1983. SEC adopts moratorium to last until authoritative accounting literature issued. (SEC Release No. 33-6476)
4. February 17, 1984. AcSEC presents "issues paper" recommending capitalization of some computer software costs. (AICPA)
5. March 13, 1984. FASB agrees at March 7, 1984 Board meeting to make accounting for computer software costs a project with AcSEC report as starting point. (FASB Board minutes)
6. March 19, 1984. Business Week magazine carries article noting FASB project and AcSEC issues paper recommendations. (Business Week, p. 71-72)
7. August 31, 1984. FASB issues ED subscribing to most views expressed in issues paper of AcSEC. (WSJ, p. 10)
8. May 2-3, 1985. FASB holds public hearing on ED.
9. August 13, 1985. FASB issues SFAS 86. (WSJ, p. 60)

The selection of event dates is usually a matter of judgment [Ricks (1982)] for which no theory exists. Several of the above chronologized events occurred within days of each other and market reaction thereto may be captured in the test period framework of the earlier event while others are of a nature unlikely to affect expectations.

Events 1 and 2. On April 8, 1983 a Wall Street Journal article stated that the SEC was considering restrictions on the capitalization of computer software costs. The change, if enacted, would remove management flexibility in selecting among accounting procedures and

reflects an apparent bias of the SEC against the capitalization practice. On April 14, 1983, the SEC announced a temporary moratorium on capitalizing computer software costs by firms who heretofore did not do so or did not disclose their capitalization policy properly. "Expensers", while seemingly not immediately affected by the moratorium, will be unable to proceed with any contemplated accounting changes until and unless the FASB provides specific guidance permitting the practice. "Capitalizers" that met disclosure requirements might continue the practice but face the prospect of FASB action prohibiting its continuation. "Capitalizers" that did not meet disclosure requirements would have to expense all such costs in the future. Investors, regardless of the prior firm accounting practice, should perceive this event as "bad news" resulting in a negative market reaction.

Event 3. The SEC, after reviewing 49 letters of comment formally adopted on August 4, 1983, the temporary regulations on the capitalization of computer software. The event represents "bad news" but may not have significantly affected expectations since it reaffirmed previously stated policy. A weak negative market reaction is expected for the same reasons discussed for events 1 and 2.

Event 4. Under date of February 17, 1984, the AcSEC presented its "issues paper" recommending capitalization of some computer software costs. The AcSEC action represents the first recognized accounting body specifically recommending capitalizing some software costs. While their recommendation hasn't the weight of an FASB pronouncement, it should be perceived as a rejection of the implied SEC bias toward capitalization and be viewed as "good news". However, little immediate publicity surrounded its issuance raising uncertainty about when the event actually occurred. In addition, a Wall Street Journal feature article appeared on February 23, 1984 predicting a shakeout of software firms due to overproliferation. While occurring after the event date test period, its contents could have leaked earlier, confounding the results. Expectation is for a positive market reaction although this may be tempered by the impending negative Wall Street Journal article.

Event 5 & 6. On March 13, 1984 the FASB agreed to make a project using the AcSEC issues paper its starting point. This was followed shortly on March 19, 1984, by a Business Week article noting the FASB action of March 13, 1984. This probably represents the first "publicity" of the AcSEC recommendation and thus might be the first time the information is impounded in market prices. Although the FASB is not bound by the

recommendations of AcSEC, it is likely to have considerable weight. While the event itself would be perceived as "good news" it may be hard to determine when the information was impounded in stock prices. Expectations would be for a weak positive reaction.

Event 7. On August 31, 1984, the FASB issued its ED subscribing to the recommendations of AcSEC and to the capitalization of certain computer software costs. Expectations about the market reaction depend upon whether the result was predictable based on the AcSEC recommendation or whether the FASB is unlikely to be influenced by other accounting institutions. If the former view dominates then no market reaction is expected; if the latter view, then a weak positive reaction is expected.

Event 8. Public hearings on the ED were held on May 2 and 3, 1985, with both proponents and opponents publicly expressing views similar to those previously contained in written responses to the ED and more thoroughly described in Section 1. It is difficult to predict the effect, if any, these hearings had on expectations.

Event 9. On August 13, 1985, the FASB issued Statement No. 86 formally prescribing the capitalization practice in spite of public condemnation of the practice by the financial community. Some may argue that no

reaction is forthcoming since the FASB has historically followed the position of its ED (Collins & Dent [1979], Lev [1979], Collins, Rozeff & Dhaliwal [1981]). However, doubts may have persisted over pressure from the financial community to amend the ED, in which case the final outcome may have exceeded expectations of those who feared the FASB would abandon the capitalization of any costs. This seems unlikely considering the strong support for the ED from the accounting profession.

A likelier market reaction would be of reduced expectations (bad news) owing to revised financial analyst predictions of the effect of SFAS 86 on future reported earnings. At the time of the ED, financial analysts estimated upwards of 50% of R&D would be capitalized if the ED was approved as is. However, be redefining when coding and testing becomes capitalizable, financial analyst estimates were reduced substantially. A FASB technical staffer, quoted by the Wall Street Journal (August 13, 1985), estimated SFAS 86 would result in capitalizing 5-10% of current R&D whereas quoted financial analysts thought it might go as high as 25% for some firms; in either case, well below the 50% predicted after the ED was issued. Additionally, some analysts estimated a decline in the amount IBM would capitalize because the implementation of SFAS 86 differs from their then current practice.

Accordingly, the following hypothesis is developed.

Hypothesis 1:

There is a positive market reaction to events classified as "good news" and a negative market reaction to events classified as "bad news".

Although the preponderance of firms developing computer software expensed all such costs prior to SFAS 86, a segment of the sample capitalized them. The financial statements of those firms who capitalized costs prior to SFAS 86 would not be impacted in the same magnitude as those who previously expensed these costs. The moratorium permitted capitalizers to continue the practice if disclosure requirements were met, although the implication was that capitalization may not be acceptable accounting, at least as far as the SEC was concerned. If this interpretation were to prevail it would lead to reduced earnings for capitalizers.

Expensers would not be affected by the moratorium except to the extent they contemplated changing their accounting method to capitalization.

The question is whether these two groups of firms reacted similarly to the events.

Hypothesis 2:

There is no significant difference between the abnormal returns of firms who capitalized computer software costs prior to SFAS 86 and those firms who expensed computer software costs prior to SFAS 86.

Trombley (1989), extending the line of research begun by Ayres (1986) found that the characteristics of early adopters of SFAS 86 differed from those of late adopters, particularly in terms of firm size and auditor selection. Both Trombley and Ayres found early adopters to be smaller in size and closer to covenant restrictions (measured by the ratio of long term debt to total assets for firms with restrictive debt covenants) than late adopters. A test of differential stock price reaction to the events on firms that adopted early from those that adopted later could provide further insight into the characteristics of late and early adopters.

Hypothesis 3:

There is no significant difference in abnormal returns of early adopters of SFAS 86 and later adopters.

Sample Selection Procedures

In order to test the hypotheses set forth above, data must be collected from a sample of firms who engaged in developing computer software for sale or lease at the time of the Event and who would therefore be affected by any changes in accounting procedure. One possible basis for selection is from firms with SIC Code listings describing computer software such as from the three digit code 737 (Computer Services). However, an estimated 38% of 1983 software sales were accounted for by computer hardware manufacturers whose SIC Code is 357 (Office and Computing Machines) [WSJ, February 23, 1984]. This selection procedure would exclude firms who develop computer software but have a primary SIC Code other than either 737 or 357. In addition, not all firms listed with either SIC Code 737 or 357 develop computer software for sale or lease. Additionally, many firms with primary SIC Codes unrelated to computer hardware or software develop computer software such as McDonnell Douglas, Dun & Bradstreet, Combustion Engineering, to name a few. As a result, selection of firms on the basis of SIC Code would not insure that all firms selected were engaged in these activities nor that firms with these primary SIC Codes were the only ones engaged in developing computer software for sale or lease.

Firms were not required, prior to SFAS 86, to

disclose their accounting methods for costs of developing computer software for sale or lease, therefore searching financial statements of firms during periods prior to SFAS 86 would not result in a reliable sample.

In order to overcome these shortcomings the sample was selected from a search of footnotes contained in the financial statements of those firms included in the National Automated Accounting Retrieval Service (NAARS) data base with fiscal years ending after August 31, 1985 and before December 1, 1987 and where the footnote referred to either the capitalization or deferral of software. (The NAARS data base contains financial statements of about 4,200 NYSE, ASE, and OTC firms). The provisions of SFAS 86 require all firms who develop computer software for sale or lease to make appropriate disclosure in footnotes to the financial statements. The effective date for implementing SFAS 86 was fiscal years beginning after December 15, 1985 although early adoption was permitted. The search period described above should capture the first disclosure of each firm for which the provisions of SFAS 86 were applied.

This procedure is not without its shortcomings. Firstly, there is no assurance that firms identified from this search conducted similar activities during the event periods. Additionally, firms that conducted

these activities during the event periods may have subsequently abandoned them and were thereby omitted from the search. Finally, there is a "survivorship" bias in that firms who were affected by the events may not have survived to the test period and would thereby be excluded from the sample.

Notwithstanding these shortcomings, the procedure selected appears more likely to result in a representative sample of affected firms.

The NAARS search of the above noted period resulted in identifying 341 financial statements with footnotes containing the search terms. Firms who adopted SFAS 86 early would have issued several financial statements during the search period. Elimination of duplicated firms reduced the sample to 250. A review was made of each footnote to determine whether the reference to capitalized or deferred software was in the context described in SFAS 86, and if not, they were eliminated, as were financial institutions.

Firms identified by the NAARS search were also required to satisfy the following criteria:

1. Complete financial data for all the independent variables contained in the cross-sectional multivariate regressions are included on the 1989 COMPUSTAT Annual Industrial, Annual OTC, or Research files.

2. Daily returns of New York Stock Exchange (NYSE) and American Stock Exchange (ASE) firms for the entire estimation and test period of an event are contained on the 1989 Center for Research in Security Prices (CRSP) daily stock returns file - NYSE/AMEX.

3. Daily closing or bid prices, cash dividends, stock dividends, and stock splits for the entire estimation and test period of an event are contained in the Standard and Poor's Daily Stock Price Record-Over the Counter.

These additional criteria resulted in reducing the sample to 98 firms. Table 1, contains a listing of the firms comprising the test sample including their industry code, exchange listing, accounting policy for computer software costs prior to SFAS 86 (expenser/capitalizer), and timeliness of adopting the provisions of SFAS 86 (early/late).

Methodology for Event Testing

The existence of abnormal returns during each event period is tested to determine the significance of the event. A single factor market model (1) is used to predict each firms' return during the test period. In the case of NYSE and ASE firms, the parameters of the market model are estimated by regressing the value weighted market return against each sample firm's actual return for 50 days (estimation period) prior to the

beginning date of the test period using returns from the CRSP Daily NYSE/AMEX Return File. For OTC firms, daily returns during the estimation period will be calculated using daily bid prices (or closing prices, if available), cash dividends, stock dividends, and stock splits gathered from the Standard and Poor Daily Stock Price Record-Over the Counter. The value weighted market return from the CRSP daily return file is then regressed against the daily returns calculated for each OTC firm.

$$(1) R_{it} = a_i + b_i R_{mt} + e_{it}$$

R_{it} = return on the stock of the i th firm on the t th day

R_{mt} = return on CRSP value weighted market index on the t th day

a_i = intercept

b_i = measure of systematic risk for the i th firm

e_{it} = disturbance term for the i th firm

Daily abnormal returns (2) for the test period are the difference between actual and predicted returns.

$$(2) u_{it} = R_{it} - [\hat{a}_i + \hat{B}_i R_{mt}] \quad t = -5 \dots, +1 \quad \text{where:}$$

R_{it} = return of the i th firm on the t th day

\hat{a}_i and \hat{B}_i = intercept and slope coefficients estimated

from market model regression using 50 daily returns up to -6 days prior to the event. The Scholes-Williams (1977) procedure is used to adjust for nonsynchronous trading problems.

u_{it} = abnormal return of the i th firm on the t th day

Abnormal returns are averaged across the sample firms to form average abnormal returns of each day in the test period of each event. The average abnormal return (AR_t) for each day t for a sample of N firms is defined as follows:

$$(3) \quad AR_t = \frac{1}{N} \sum_{i=1}^N e_{it} \quad N=98$$

These averages are cumulated over the test period of each event by summing the AR_t 's to form cumulative average abnormal returns (CAR_t) as follows:

$$(4) \quad CAR_t = \frac{1}{N} \sum_{t=p}^q AR_t \quad p = -5, \quad q = +1$$

The average abnormal return (AR_t) and cumulative average abnormal return (CAR_t) are tested for significance based on the average standardized abnormal return (SAR_t) and the average standardized cumulative abnormal return ($SCAR_T$) due to possible cross-sectional dependence of residuals. The test statistics, Z_t and Z_T , which follow a unit-normal distribution [Dodd and Warner (1983)], are as follows:

$$(5) \quad SAR_t = \frac{1}{N} \sum_{i=1}^N \frac{e_{it}}{s_{it}} \quad N=98$$

$$(6) \quad SCAR_T = \sum_{T=p}^q SAR_t \quad p = -5, \quad q = +1$$

$$(7) \quad Z_t = \sqrt{N} * SAR_t \quad N=98$$

$$(8) \quad Z_T = \frac{\sqrt{N}}{\sqrt{p-q+1}} \sum_{T=p}^q SCAR_T \quad p= -5, q= +1$$

where N is the number of securities and S_{it} is the square root of firm i's estimated forecast variance from Patell (1976).

$$S_{it} = [s_i^2 \{ 1 + \frac{1}{T} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{i=1}^T (R_{mt} - \bar{R}_m)^2} \}]^{1/2}$$

where:

s_i^2 = residual variance for firm i's market model regression

T = Number of days in estimation period (50 days)

R_{mt} = market return for tth day of estimation period

\bar{R}_m = average market return during estimation period

N = number of securities

To compare abnormal returns between two portfolios, as when testing hypotheses with expensers/capitalizers or early/late adopters of SFAS 86, the mean differences are derived by subtracting the associated average abnormal returns [Travlos (1987)]. The appropriate Z-statistic is:

$$(9) \quad Z = \frac{SAR_1 - SAR_2}{\sqrt{1/N_1 + 1/N_2}}$$

$$(10) \quad Z = \frac{SCAR_1 - SCAR_2}{\sqrt{1/N_1 + 1/N_2}}$$

Results of Event Date Testing

The CAR's for the entire sample on each of the nine events was standardized, according to Patell (1976), and a resultant Z-score calculated. The abnormal returns for each event are shown in Table 2. The direction of the abnormal returns of the entire sample for each event is as predicted and consistent with Hypothesis 1; there is a positive market reaction to events classified as "good news" and a negative market reaction to events classified as "bad news". However, the abnormal returns were only statistically significant for three events. For the sample as a whole, the Z-score was significant at less than 0.01 for events 1 (the SEC moratorium) and 9 (the issuance of SFAS 86) and at less than 0.100 for event 8 (public hearings on ED) (Table 2). None of the other events produced statistically significant abnormal returns.

For comparative purposes, Z-scores were also calculated on the CAR's of each of two portfolios formed from the sample; one of listed firms and the other of

OTC firms. For the portfolio of listed firms, the direction of the abnormal returns on each event were as predicted (except for event 7; issuance of ED) but was significantly so only for event 1. For the portfolio of OTC firms, the Z-score was significant at less than 0.01 for event 9 and at less than 0.05 for event 1.

Although the preponderance of firms developing computer software expensed all such costs prior to SFAS 86, a segment of the sample capitalized them (Table 1). The sample was segmented into two portfolios based on pre-SFAS 86 accounting policy; capitalizers (14 firms) and expensers (84 firms). CAR's were accumulated for each portfolio for each of the nine events with the results standardized according to Patell (1976). The mean differences were derived by subtracting the associated average abnormal returns and a Z-score derived according to Travlos (1987). The results are shown in Table 3 for each event, none of which is statistically significant with a probability of less than 0.100. The results suggest accepting hypothesis 2 that there are no significant differences between the abnormal returns of capitalizers and expensers. However, the small number of firms forming the portfolio of capitalizers (14 firms) limits the inferences that can be drawn from the results.

To test for any differences between mean abnormal

returns of firms who ultimately adopted SFAS 86 early as compared with those adopting later, two portfolios were created; early adopters (30 firms) and late adopters (68 firms) (Table 1). Procedures similar to those used in testing portfolio differences between capitalizers and expensers was employed. The results are contained in Table 3 and indicate no significant difference in the abnormal returns of early and late adopters. This suggests the acceptance of hypothesis 3 that there is no significant difference in abnormal returns of early and late adopters. It would appear that although early and late adopters of accounting procedure changes may have differing characteristics as indicated in prior research (Ayres, 1986, Trombley, 1989), their reaction to events occurring prior to the adoption period is not significantly different.

A comparison of mean Beta's for the overall firm sample as well as for the portfolio of listed firms and the portfolio of OTC firms for the three significant events is reported in Table 2A. The results indicate that the Beta's of the entire sample increased from 1.12 in 1983 (event 1) to 1.27 in 1985 (event 9) reflecting a perceived increase in riskiness. For each of the three significant events, the Beta's of listed firms was, on average, larger than those of OTC firms. The increase in the average Beta of listed firms between event 8 (1.18)

and event 9 (1.44) is unusually large and may be the result of using a short (50 days) estimation period when estimating the firm parameters from the market model.

Summary

The market event study examined the investor reaction to 9 selected events thought by the researcher to affect expectations of stock prices at that time. A single factor market model was used to estimate stock returns of affected firms to determine, by comparison with actual returns during the test period, whether significant abnormal returns occurred. The abnormal returns for each event were tested for statistical significance. Testing identified 3 significant events; hypothesis 1 was accepted for event 1 (SEC moratorium), event 8 (public hearings on ED), and event 9 (issuance of SFAS 86). The significance of event 8 was somewhat unexpected given that public hearings are just a forum to express views and not a decision making time.

In order to determine whether the market reaction of firms who capitalized (capitalizers) some computer software prior to the moratorium were affected differently than those expensing such costs, two portfolios were created and tested for mean differences. The test results confirmed hypothesis 2 that there was no significant difference in the abnormal returns of capitalizers and expensers.

To provide some additional evidence, portfolios of firms that ultimately adopted SFAS 86 earlier than required were compared with firms adopting on the effective date to see if there were any mean differences in their abnormal returns. Prior research found evidence of differing characteristics of early and late adopters but no attempt was made to see if different market reactions to events could be detected. Test results confirmed hypothesis 3 that there were no mean differences between these two groups.

CHAPTER 4

Research Hypotheses - Market Return Study

The more interesting research task, according to Foster (1980), is not so much the identification of events which result in significant abnormal returns, as it is the testing of theories explaining market reaction. A significant body of literature has reported testing various theories where the consequences of an event are cash flow neutral, such as the case under study. Several of these theories will be tested in connection with the significant events leading to the issuance of SFAS 86.

Contracting Costs

Both contracting and agency theory provide bases to explain the existence of abnormal returns resulting from mandated accounting changes [Watts and Zimmerman (1986)]. Covenants are generally written into debt agreements to restrict the potential wealth transfer between parties. These covenants generally use accounting numbers found in audited financial statements as a determinant of whether the contracting parties have maintained their obligations. Typically, these covenants include dividend and share repurchase restrictions, maintenance of working capital, restriction of merger and other types of investment activities, restrictions

on the disposition of assets, and restrictions on incurring additional debt. The closer a firm comes to the restrictions in the covenant(s) the likelier a change in accounting policy will impact its optimum investment and financing decisions and, therefore, its respective share price.

Rather than test hypotheses about specific debt covenants, researchers have used proxy variables to explain the effect of accounting policy changes on share prices. Leverage has frequently been used to proxy for the possible costs of default and renegotiation [Collins, Rozeff & Dhaliwal (1981), Leftwich (1981), Lys (1984), Salatka (1989)]; the higher the leverage the higher these costs [Leftwich (1981)]. Recent studies in which specific debt covenants were examined suggest an association between leverage level and closeness to covenant constraints [Press & Weintrop (1990), Duke & Hunt (1990), El-Gazzar & Pastena (1989)]. The results of studies using leverage as a proxy have been inconsistent across studies. In addition, the significance of leverage after controlling for the presence of accounting constraints "...suggest that leverage may proxy for factors in addition to the existence of accounting constraints..." [Press & Weintrop (1990)]. This study will use leverage to proxy for the possible

costs of debt default and renegotiation.

Differences exist across studies on the definition of leverage. Some use book value of long term debt divided by market value of equity [Collins, Rozeff & Dhaliwal (1981), Lys (1984)], long term debt divided by total tangible assets [Daley & Vigeland (1983), Johnson & Ramanan (1988)], total debt divided by total assets [Zmijeski & Hagerman (1981), Pastena & Ruland (1986)], and long term debt divided by total assets [Ayres (1986)]. This study defines leverage (LMDE) as book value of long term debt divided by market value of common equity plus book value of preferred stock.

Hypothesis 4:

Abnormal security returns due to SFAS 86 of firms with leverage (LMDE) exhibit greater stock price (declines)/increases than firms with lower leverage.

Although researchers have found an association between leverage level and closeness to covenant constraints [Press & Weintrop (1990), Duke & Hunt (1990), El-Gazzar & Pastena (1989)] no market return studies have used the tightness (slack) of specific debt covenant restrictions to explain abnormal returns. Following the methodology suggested by El-Gazzar & Pastena (1989), the tightness (slack) can be calculated of individual restrictions on dividends, debt, and

working capital level² within an agreement. Moody's Industrial Manual for each of 1983, 1984 and 1985 will be used to determine the amount and the nature of restrictive covenants. The tightness (slack) of the entire agreement will be that of the most restrictive covenant. As the covenant restriction (as defined earlier) approaches zero, the tighter the constraint. Firms with tighter debt covenant constraints should exhibit greater abnormal returns than firms with less tight debt covenant restrictions.

Hypothesis 4A:

Abnormal security returns due to SFAS 86 of firms with tighter (TITE) debt covenant constraints specified in Bond agreements exhibit greater stock price (declines)/increases than firms with less tight debt covenant constraints.

More recently, Lys [1984], Hughes and Ricks [1984], and Salatka [1989] have argued that not only the debt equity ratio but the risk of the firm is necessary to model the bond covenant effects of the accounting policy change. The argument posits that in order for leverage to properly proxy for debt risk, total firm risk must be held constant. Lys [1984] shows that firms with higher

2. El-Gazzar & Pastena (1989) found these to be the most common restriction of a firm's production/investment options.

probability of debt default. The proxy variable for total firm risk is based on the standard deviation of firm security returns (SDRV).

Hypothesis 5:

Abnormal security returns due to SFAS 86 of firms exhibiting higher total firm risk (SDRV) exhibit greater stock price (declines)/increase than firms with lower total firm risk.

Research Intensity

A primary purpose of R&D activity is to promote the growth of the firm through new and innovative products. R&D intensity is positively and significantly related to subsequent relative sales growth and market share [Franko, 1989].

The relationship between firm size and innovations as well as between firm size and R&D spending has been the subject of much literature without widespread agreement. Both Schumpeter (1950) and Galbraith (1957) hypothesized that large firms generate a disproportionately larger share of technological advances primarily because of the high costs of technological invention. However, current research has both supported and refuted this hypothesis. The disparity in results stems, in part, from differing definitions of R&D intensity and of firm size as well as

differing sample sources and industries. In addition, the source of R&D funding (internal vs. governmental) can confound the results.

In a report on research and innovation prepared for the Joint Economic Committee of the Congress of the United States (1980) researchers concluded that small firms that perform R&D activities do so more efficiently than large firms. However, many of these inventions require resources of large firms for commercialization. Small firms make significant contributions in less costly phases of innovation and in industries not particularly capital intensive. Freeman (1982) theorized that the ability to solve resource problems influenced the innovativeness of small firms, a finding confirmed in a recent study by Ettlief & Rubenstein (1987).

The implications of these findings to the computer software industry is that small firms with access to financial resources should produce more innovations more efficiently than large firms. The large proportion of small firms in the software industry, in terms of number of firms, is a testament to Freeman's theory.

Smaller sized firms, however, have frequently had difficulty obtaining debt to finance investment activities and have resorted, therefore, primarily to equity capital. Treating all costs of developing

computer software as R&D results in lower earnings and lower retained earnings thereby making financial statements less attractive to potential investors. This, in turn, could reduce a firms' ability to attract capital and thereby reduce future expenditures on R&D. Several similar issues were studied in connection with the accounting for R&D and SFAS 2 with mixed results. Vigeland (1981) found no significant market reaction to the imposition of SFAS 2 based on a limited sample of NYSE and ASE firms. Similarly, Dukes (1976) could find no significant abnormal stock price effect on NYSE firms due to expensing R&D. Also, Dukes, Dyckman and Elliott (1980) found no significant changes in R&D decisions made by firms as a result of the mandated change to expensing all R&D. However, Horowitz and Kolodny (1980)(1981) found evidence supporting the premise that SFAS 2 caused a relative decline in R&D for small high technology OTC firms who previously deferred these costs. The significance of this finding is related to the notion that smaller firms produce more technological innovations than larger firms and these (innovations) are generally more significant than those produced by large firms. Although Elliott, Richardson, Dyckman and Dukes (1984) partially confirm the size effect of Horowitz and Kolodny, the implications are not that

clear.

If investment decisions are affected by accounting procedures, then the level of a firms' cost of developing computer software may differentially affect its market prices. To test these implications, R&D intensity (RD) may proxy the possible affect on future investment decisions as well as the level of R&D expenditure that may be capitalized. Firms with higher R&D intensity are more likely to be affected by SFAS 86 than less R&D intense firms.

R&D intensity during the event periods will initially be measured both as a percentage of sales and as a percentage of income before extraordinary items.

Ideally, the measure of R&D intensity would be the actual amount of R&D expended on developing computer software during the event periods either as a percent of total R&D, a percent of sales or as a percent of income before extraordinary items. However, financial statement disclosure of the practice and the amount incurred in developing computer software was not required prior to SFAS 86. A proxy for the actual amount of capitalizable costs incurred during the event periods could be the actual amount capitalized in the first year SFAS 86 was effectuated by the firm; a random walk in reverse. Although there is no way to determine the accuracy of

this assumption, it appears a reasonable one- more so for the events closer the actual expenditure (8 & 9) than the first event. Alternative measures of R&D intensity using post SFAS 86 data on capitalized software include the percent capitalized to total R&D (RDR), the amount capitalized as a percent of income before extraordinary items (RDCI), and the amount capitalized as a percent of sales (RDCS).

Hypothesis 6:

Abnormal security returns due to SFAS 86 of firms with greater research and development (RD) intensity exhibit greater stock price (declines)/increases than firms with less research and development intensity.

Predisclosure Information

Atiase (1987) found an "exchange effect" in studying the differential market reaction to earnings announcements of OTC firms compared with NYSE and ASE listed firms. The "exchange effect" went beyond the "size effect" delineated in the Atiase (1985) finding that the degree of unexpected security price change due to earnings announcement is inversely related to firm size. The driving theory is that more predisclosure information exists for listed firms. Earnings announcements of OTC firms would contain more new

information than do earnings announcements of listed ones thereby resulting in larger stock price changes. The conflicting results of studies on the implications of SFAS 2 (discussed above) could also be related to the exchange listing of sample firms and the notion that smaller firms (as evidenced by exchange listing) produce more significant technological innovations.

To test these implications, a 0-1 dummy variable (EXCH) will dichotomize firms listed on the NYSE and ASE on the one hand and firms listed on OTC on the other hand.

Hypothesis 7:

Abnormal security returns due to SFAS 86 are not related to stock exchange listing (EXCH).

Firm size (MV) has frequently been used as an explanatory variable of the political cost hypothesis [Watts & Zimmerman (1978), Leftwich (1981), Collins, Rozeff & Dhaliwal (1981), Zimmerman (1983)]. The theory posits that the larger the firm the more politically sensitive and the relatively larger wealth transfers imposed on them [Watts & Zimmerman (1986)]. Included in the small percentage of firms that capitalized some computer software costs prior to SFAS 86 are IBM and ITT, two of the largest U. S. industrial firms. It is

unlikely, therefore, that political costs motivated their accounting practice.

Size has also proxied for firm leverage with larger firms likelier to take on debt to capture the tax advantage of interest deductibility [Collins, Rozeff & Dhaliwal (1981)]. For this explanation to be valid MV should be correlated with leverage (LMDE), one of the debt constraint/contracting cost variables.

Firm size has also been associated with predisclosure information. Atiase (1985) found that the degree of unexpected security price changes in response to actual earnings reports was inversely related to the capitalized value of firms (market value of common stock). This phenomenon was attributed to different levels of predisclosure information and dissemination for firms of different capitalized values. Atiase (1987) also found an exchange effect beyond the size effect when testing the differential effects of earnings announcements on OTC and listed firms. The researcher hypothesizes that MV reflects the size effect of predisclosure information; smaller firms will have greater abnormal returns on information disclosure than large firms.

Hypothesis 8:

Abnormal security returns due to SFAS 86 are negatively associated with firm size (MV).

Research Design for Cross-Sectional Model

The cross-sectional regression model necessary to test the above hypotheses with the expected sign for each coefficient takes the following form when CAR is positive; however, the coefficients change signs when the CAR is negative:

$$(11) \text{ CAR}_{it} = a_0 - a_1 \text{LMDE}_i - a_2 \text{SDRV}_i - a_3 \text{EXCH}_i - a_4 \text{RD}_i - a_5 \text{MV}_i + e_i$$

$$(12) \text{ CAR}_{it} = a_0 + a_1 \text{TITE}_i - a_2 \text{SDRV}_i - a_3 \text{EXCH}_i - a_4 \text{RD}_i - a_5 \text{MV}_i + e_i$$

LMDE_i = long term debt / (market value of common equity + preferred stock)

SDRV_i = standard deviation of market returns / $(1 + \text{LMDE})^{1/2}$
(total firm risk)

$\text{TITE}_i = \text{MIN}$	or	$\frac{1 - \text{Restricted retained earnings}}{\text{Total retained earnings}}$
		$\frac{\text{Agreement defined debt/net worth} - \text{Agreement designated value for debt/net worth}}{\text{Agreement designated default value for debt/net worth}}$
		or
		$\frac{\text{Agreement defined working capital} - \text{Agreement default value for working capital}}{\text{Agreement designated default value for working capital}}$

EXCH_i 1=Listed on NYSE or ASE

0=Otherwise

RDS_i =R&D expense/sales

RDI_i =R&D expense/income before extraordinary items
 RDR_i =capitalized software/(capitalized software+R&D)
 $RDCI_i$ =capitalized software/income before extraordinary
items
 $RDCS_i$ =capitalized software/sales
 MV_i =ln (market value of common stock at beginning
of year)

A multiple regression of model (11) will be estimated using ordinary least squares (OLS) for the each of events 1, 8 and 9, the events which showed a significant market reaction.

Data Collection for Market Return Study

Data for the independent variables defined by model (11) come from several sources.

Data for the independent variables LMDE, RDI, RDS and MV used to explain the abnormal returns of events 1, 8 and 9 are contained in the COMPUSTAT 1989 Annual Industrial and Annual OTC tapes as well as the COMPUSTAT Industrial and OTC Research tapes (for firms no longer existent). Data contained in the annual COMPUSTAT file preceeding the year of the event is used for the variable in question. For example, the cross-sectional analysis of the abnormal returns during event 1 (April 8, 1983) will be based on data for each firm contained in the COMPUSTAT file covering 1982.

The standard deviation of market returns used to calculate SDRV is obtained from the program deriving the daily abnormal returns used in the event part of the study. The standard deviation of market returns is adjusted for the firm debt/equity ratio as suggested by Lys (1984) and Salatka (1989). EXCH is based on whether the firm was listed on either the NYSE or ASE, or whether it is traded OTC.

A search of Moody's Industrial Manual (Moody's) for 1983-1985 to obtain restrictive debt covenant information capable of translation into the independent variable TITE was available for less than 17% of the firms in the sample (14 listed and 2 OTC firms), too small a sample to be useful. In most cases, either the debt covenant information was not specific or it was not in quantifiable form. The only reliable debt covenant restriction contained in Moody's was the amount of unrestricted retained earnings (URE) available for dividends. Press and Weintrop (1990) found the URE covenant to be the most frequently used covenant of all covenants examined. In light of the above, URE will proxy for TITE. COMPUSTAT provides a separate line item in their data base for URE of those firms who report such covenant restriction. Of the total sample, 34 firms were found to contain COMPUSTAT data for URE.

Results of Market Return Regressions

Summary statistics for the components of each independent variable as well as the calculated variable, as defined by model (11), is shown in Tables 4-6. These statistics confirm prior expectations. In 1982, for example, listed firms were considerably larger in size having a mean share market value of \$1,642 million compared to \$126 million for OTC firms. In addition, listed firms were more highly leveraged (28%) on average than OTC firms (5%). However, OTC firms displayed more research intensity in 1982 than listed firms; 12% of sales for OTC firms and 6% for listed ones.

The results from estimating the OLS cross-sectional regression (model (11)) for each of the three significant events (events 1, 8 and 9) using the data collected as described above are reported in Tables 7.

A univariate analysis of the data comprising the independent variables indicated the existence of outliers which could affect inferences drawn from the results. For example, firms with negative income would have a negative ratio of R&D to income before extraordinary items (RDI). In order to test the sensitivity of the results to the existence of outliers the model was reestimated with outliers winsorized. The winsorization procedure took the following form:

1. LMDE greater than 2 is reduced to 2.
2. RDI less than 0 is increased to 0.
3. RDI greater than 4 is reduced to 4.
4. RDS greater than 0.4 is reduced to 0.4.

The results, using winsorized data, are reported in Table 8. These results are comparable to those without winsorization. All significant variables using winsorized data are also significant when the data is not winsorized. In addition, one variable in testing event 9, RDI, becomes significant when the data is winsorized. To insure that outliers do not contribute to inaccurate inferences, the analysis of results to follow for each event will be based on winsorized data.

For comparative purposes, separate regressions were also estimated for the portfolio of listed firms and the portfolio of OTC firms. The results for events 1, 8 and 9 are reported in Tables 9-10. The model (11) is particularly significant in explaining the abnormal returns of OTC firms during event 9; the R^2 is 0.34 and F-value is 5.63 (significant at 0.001).

The Pearson Correlation Coefficients for the significant events are presented in Tables 11-12. No unusually large correlations between the independent variables is evident from a review of the results. The largest correlation exists between MV (market value of

the firm) and EXCH (exchange listing) at 0.43 for event 1 and 0.49 for events 8 and 9. These results suggest multicollinearity may not be a significant problem.

A review of the OLS results indicate EXCH to be a significant variable for some events but MV is not significant for any event tested. If multicollinearity were to be a problem it would normally lead to higher standard errors and lower significance of the independent variable. To test whether multicollinearity affects inferences about MV, model (11) was reestimated without EXCH as an explanatory variable (Table 13). MV remains statistically insignificant even after EXCH is removed from the model. Multicollinearity does not seem to be a serious problem.

Cross-sectional Dependency

Considerable literature has been generated concerning inferences drawn from ordinary least squares (OLS) regressions in event and cross-sectional return studies where the event date and/or industry are clustered for all firms [Brown & Warner (1980)(1985), Collins & Dent (1984), Christie (1987), Bernard (1987)]. These factors can lead to cross-sectional correlation of the dependent variable thereby biasing standard errors used in statistical tests. The potential for bias is greater in event studies than in cross-sectional

return studies. The extent of bias due to cross-sectional dependency is, in part, a function of the time interval of data being used with the bias increasing as the time interval increases from daily to weekly to monthly, etc.[Bernard (1987)].

In the case of event studies, several alternatives have been suggested to avoid bias assuming there is serial homoscedasticity in returns. These include aggregation of firms into a portfolio basing tests on the time series variance in the portfolio return, generalized-methods-of-moments estimation, randomization, and generalized least squares (GLS) regressions [Bernard (1987)]. Solutions to bias in cross-sectional return studies are complicated by cross correlation among regressors as well as covariation between regressors and residuals. Bias in cross-sectional returns is usually much smaller than in event studies, but, nonetheless, can be serious in some cases. Narrowing the return interval and diversifying the sample are suggested bias reducing techniques for market return studies [Bernard (1987)].

Some researchers such as Sefcik and Thomson (1986) have suggested use of generalized least square (GLS) regressions as a method of accounting for cross-sectional correlations in abnormal returns. However,

Chandra and Balachandran (1989) indicate that results from these techniques may be more sensitive to misspecification of the model. Conceding that a well specified GLS linear model using explanatory variables measured without error is optimal, these researchers state that no well accepted theory yet exists for selecting the independent variables. Even if the variables are known, questions about their measurement persist. The risks of misspecification and the sensitivity of t-tests to errors in selecting the appropriate model raise doubts about its (GLS) use compared with a OLS portfolio time series approach.

Christie (1987) concluded that residual dependency may have a relatively small influence on significance levels of return studies, particularly those using daily or weekly returns and that include a spectrum of industry. Even where industry clustering exists, researchers have not found dependence among residuals a serious problem [Collins, Rozeff and Dhaliwal (1981), Lys (1984)].

To mitigate the potential bias resulting from cross-sectional dependency, this researcher employs a daily return interval, averaging all firm excess returns for a given time. Significance of abnormal returns in the event study will be tested using the standardized

residuals calculated from models (5) through (8) as suggested by Patell (1976). In addition, the sample was not selected from only industries with primary SIC codes associated with computer software. Therefore, there is no pure industry clustering similar to those that troubled other researchers. A review of primary SIC codes of sample firms is found in Table 1.

Analysis of Findings

Event 1 (SEC Moratorium)

The explanatory power of the model (Table 8) is reflected in an R^2 of 0.21 and an F-value of 4.27. The regression results reflect three significant explanatory variables, LMDE, RDI and EXCH. However, the sign for the parameter of RDI and EXCH is opposite that which had been expected. The significance of LMDE tends to confirm contracting theory and hypothesis 4; the higher firm leverage the more adverse the effect the SEC moratorium had on investor expectations. LMDE proxies for the costliness of debt contracting the closer a firm approaches its debt covenants.

Although RDI is a significant explanatory variable it did not react in the expected direction. Expectations were for firms with higher R&D intensity as measured by

income before extraordinary items to be more severely affected by non-capitalization due to a reduction in reported earnings and fewer assets or retained earnings. There are several possible explanations for this result. Assume, for the moment, those firms who capitalized R&D prior to SFAS 86 are the ones most likely to have adverse financial statement effects were capitalization no longer permissible. Capitalizers would report lower R&D intensity than noncapitalizers because part of their R&D is being capitalized rather than reported as R&D. Therefore, low R&D intensity may represent the impact of capitalizers, such as IBM and ITT, who have the most to lose should capitalization no longer be acceptable accounting practice. An analysis of univariate tests provide some support for this explanation. Approximately 85% of the capitalizers in the sample comprised those firms with less than the median R&D intensity and 50% of the capitalizers were among the 20 firms with the lowest R&D intensity. However, a sample consisting of only 14 capitalizers out of 98 firms may be too small to be used to draw reliable inferences.

Another possible explanation is that RDI, rather than proxying for research intensity, proxies for current firm profitability. One reason a firm may have high research intensity is its low income (the

denominator in the ratio). A high RDI might signify a less profitable firm. Note that the other measure of research intensity, RDS (as a percent of sales), is not significant, lending support to the notion that RDI is a measure of current profitability rather than of research intensity. Those investors who choose to interpret the SEC moratorium as a forerunner to no more capitalization would lower expectations of future reported income with a consequential reduction in market value.

The explanatory variable EXCH, although significant was also not in the expected direction. Instead of larger abnormal returns being driven by OTC firms they were driven by listed ones. It appears, at least in analyzing the regression estimation for event 1, that extending the theory of predisclosure information to event consequences is not supported by the results. To the contrary, it would appear that investors reacted more strongly to the effect on larger, better known firms such as those listed on NYSE and ASE. The results do reflect EXCH as a significant explanatory variable and support rejection of hypothesis 7; abnormal returns due to SFAS 86 are related to exchange listing. The notion that the amount, or lack, of predisclosure information infers larger abnormal returns for events affecting OTC firms is rejected with regard to this

event.

Event 8 (Public Hearings on ED)

Although event 8 resulted in significant abnormal returns the regression model (11) had considerably less explanatory power than for event 1; R^2 is only 0.05 and the F-value, 1.05. The only significant explanatory variable is SDRV, which is a measure of total firm risk. The variable parameter is of predicted sign and supports hypothesis 5; firms with higher total firm risk exhibit greater stock price changes to an event than do firms with lower total firm risk.

The lack of explanatory power and low significance of the model suggest that other theories and variables might better explain the stock price reaction evidenced by this event.

Event 9 (Issuance of SFAS 86)

The cross-sectional results from testing the abnormal returns attributed to event 9 are consistent with expectations. The explanatory power of the model is better than for event 8 with an R^2 of 0.08 and F-value of 1.59. All the explanatory variables have their predicted sign, with the exception of RDI. As noted in discussing the results of event 1, RDI may be proxying for something other than research intensity.

Several of the independent variable were

statistically significant. RDI, rather than proxying for research intensity may, because of its sign, proxy for firm profitability for the reasons discussed in analyzing event 1 results. Event 9 caused reduced expectations as to the amount that can be capitalized and therefore reduced expectations about firm stock prices. Firms with lower profitability would exhibit larger price declines. The significance of both EXCH and SDRV support acceptance of hypotheses 5 and 7 although the significance levels are slightly above 0.10. Contrary to the findings in event 1, the EXCH variable does reflect a stronger market reaction of OTC firms to the issuance of SFAS 86 and supports the theory that a lack of predisclosure information results in stronger market reactions to events. The significance of the intercept suggests some omitted explanatory variable.

Results When Using TITE

Included in the sample are 35 firms who reported restricted retained earnings related to debt covenants. While the researcher intended to select the most restrictive debt covenant as a proxy variable for debt contracting costs, limitations on information availability from Moody's restricted the intended use of this variable to the amount of unrestricted retained earnings as contained in the COMPUSTAT tapes for the 35

firms. OLS regressions were estimated using the percent unrestricted retained earnings to total retained earnings (TITE) as an explanatory variable; both in addition to LMDE (leverage) and in place of LMDE. The results are contained in Tables 16-17. In neither case is this variable (TITE) or LMDE, significant. No meaningful inferences can be drawn from a comparison of this model (12) and that of model (11) since the former is based on only the 35 firms with data on restricted retained earnings while model (11) is based on the entire 98 firm sample.

Results of Alternative Definitions of R&D Intensity

Although the amount of R&D incurred during the event periods is unknown, alternative proxy variables for R&D intensity were developed using the actual amounts capitalized during the first year SFAS 86 was effectuated by the firm to proxy for the amounts that would have been capitalized during the event periods. A search of footnotes for firms in the sample resulted in quantifiable information about the actual amounts capitalized during the first year SFAS 86 was effectuated for 69 firms (70.4% of the sample). Model (11) was estimated using three alternative definitions of research intensity based on the amount of computer software capitalized as described above; RDR

(capitalized software/total R&D before capitalization), RDCS (capitalized software/sales), and RDCI (capitalized software/income before extraordinary items). The results are contained in Tables 18-20.

The most significant difference when using RDR as the explanatory variable occurs for event 9. The explanatory power of the model improves considerably; R^2 is 0.21 with an F-value of 3.32 (significant at 0.010). Three of the explanatory variables are significant, EXCH, SDRV and RDR; however RDR is not of expected sign.

When RDCS is used as the explanatory variable, the most significant difference also occurs in event 9. The estimated regression results in an R^2 of 0.24 and an F-value of 3.89 (significant at 0.004). Again, EXCH, SDRV and RDCS are significant although the sign for RDCS is opposite expectations.

The estimated regression when using RDCI as the explanatory variable also shows improvement over the regressions using either RDI or RDS. The explanatory power of the model is reflected in an R^2 of 0.21 and an F-value of 3.25 (significant at 0.012). Using this definition for research intensity four variables are significant; LMDE, EXCH SDRV and RDCI. Again, only the sign of RDCI is opposite expectations.

It would appear that using any three of the

alternative definitions improves the explanatory power of the model when examining event 9. The validity of using post event date amounts to proxy for what might have been capitalizable during the event period(s) is more supportable for those events closer to the time these costs were incurred. Therefore, it is not surprising that these alternative definitions did not improve the regression results for an event three years prior to the occurrence of the actual costs used to proxy similar costs.

Impact of ASE Firms on Results

A regression was estimated with the EXCH variable used to compare NYSE as one group with ASE and OTC firms as another group. Not surprisingly, the results were similar to those reported when the ASE firms were grouped with NYSE firms. The summary statistics of ASE firms provides a profile more similar to OTC firms than to NYSE ones.

Summary

The purpose of the market return study was to test several theories intended to explain why investors might react to a cash flow neutral change in accounting. The results are supportive of some explanations but not others.

In testing explanations for investor reaction to

event 1 (SEC moratorium) several proxy variables were found to be significant; LMDE, EXCH and RDI. The significance of LMDE (firm leverage) supports the costly contracting theory (hypothesis 4) the closer firms get to restrictions in debt covenants. Exchange listing (EXCH) is also a significant explanation for investor reaction to the event. However, it was the listed firms, not OTC firms, that drove the results. The theory that predisclosure information (hypothesis 7) should result in greater price reactions to OTC firms is not supported. While RDI (research intensity) was also significant, the results did not support the theory that current research intensity (hypothesis 6) foreshadows consequences of future investment and growth. This variable may proxy another theory, perhaps one related to firm income. The results provide no support for the theories that total firm risk (hypothesis 5) or firm size (hypothesis 8) explain abnormal returns.

The weak explanatory power of the model in testing explanations for significant reactions to event 8 (public hearings on the ED) suggest that other variables and theories need be tested.

Tests of the model in evaluating event 9 (issuance of SFAS 86) provided support for all the explanatory theories except for research intensity (hypothesis 6).

Again, this latter variable may proxy another explanation. Alternative definitions of research intensity based on actual post event date capitalized software data considerably improved the power of the model (for this event) and while a significant explanatory variable (research intensity), it did not support the theory encompassed by hypothesis 6. Exchange listing (EXCH) was also significant with OTC firms driving the results. This provides support for the theory that the amount of predisclosure information affects the relative reaction to events by listed firms, on the one hand, and OTC firms on the other (hypothesis 7).

CHAPTER 5

Conclusions and Recommendations

Statement of Financial Accounting Standard No. 86 (SFAS 86) changed the predominant method of expensing all costs of developing computer software, thereby ending years of controversy. Previous research on SFAS 86 included a study on the characteristics of management choice of accounting methods (expensing or capitalizing) prior to SFAS 86 (Kandiel, 1985) and a study on the characteristics of firms electing early adoption of SFAS 86 (Trombley, 1989). However, none of the previous market event and market return research has been based on SFAS 86. Thus, one motivation for this research is to extend the literature on market events and market returns to the market consequences of the change in accounting subsumed in SFAS 86.

The software industry is characterized by numerous smaller sized firms many of whom are traded on the over the counter (OTC) market. This presents the researcher with an opportunity to include a class of firms not previously included in market event or market return studies. The results will contribute to a better understanding of event market reactions to OTC firms and to the applicability of explanatory theories previously tested on samples of only listed firms. The researcher

can test the impact of exchange listing on explaining abnormal returns.

The inclusion of OTC firms in the sample also permits the researcher to test, in a market event setting, an extension of the theory of predisclosure information previously applied to an analysis of reactions to earnings announcements.

The research consisted of two interrelated studies: a market event study and a market return study. The market event study examined the market reaction to several "events" thought to have affected or changed investors' previous expectations and the related stock market prices. The study bases its results on a sample of both listed and OTC firms selected from examining footnotes describing activities subject to the provisions of SFAS 86 as contained in the NAARS data bank. Tests indicate that three events (SEC moratorium, public hearings on ED, and issuance of SFAS 86) resulted in significant abnormal returns. Although the other events tested did not result in significant abnormal returns, those for all but one event were as predicted (positive or negative).

Tests to determine if there were any significant mean differences between the returns of a portfolio of firms who capitalized costs of developing computer

software prior to SFAS 86 and that of a portfolio of firms who expensed them resulted in accepting the hypothesis of no significant mean differences between the portfolios.

The second phase of the research study tested several theories of explanation for the significant abnormal returns of events 1, 8 and 9, as determined in the market event phase of the study. A OLS multiple regression model comprising several variables proxying for underlying theories was estimated and tested for significance.

The debt contracting theory hypothesizes that firms closer to debt covenant restrictions have larger abnormal returns than firms not as close to these restrictions. The debt equity ratio was used to proxy the consequences of costly debt contracting. Test results provide support for the theory, particularly in explaining event 1 abnormal returns.

Total firm risk as measured by the standard deviation of market returns (during the estimation period) was also determined to be a significant variable, particularly in explaining abnormal returns in 1985 (events 8 and 9). The results lend support for the hypothesis that firms with higher total firm risk experience larger abnormal returns than do firms with

lower total firm risk.

The impact of exchange listing in explaining abnormal returns was tested by including a dummy variable in the model to distinguish listed firms from OTC firms. The theory of predisclosure information hypothesizes that OTC firms have less periodic disclosure and fewer analyst followings than listed firms suggesting that disclosures provide more new information on OTC firms than listed ones, thereby resulting in OTC firms having larger abnormal returns. The results suggest that exchange listing is a significant variable in explaining the abnormal returns of event 1 and, to a lesser extent, event 9. However, the theory of predisclosure information is only supported by the results of event 9. Although exchange listing was a significant explanatory variable in testing event 1 abnormal returns, it was the listed firms who drove the results. While a significant variable, the inconsistency of the direction of the correlation with the abnormal return (between event 1 and 9 results) suggest that further research be done to better explain the significance of the findings.

The results provide no support for the hypothesis that size, as measured by firm market value, explains abnormal returns.

The results do provide support for variables proxying for R&D intensity as an explanation for abnormal returns, particularly when measured as a percent of net income before extraordinary items. Several alternative R&D proxies using post SFAS 86 data on amounts of capitalized software development costs significantly improved the explanatory power of the model in testing event 9, and were themselves an significant explanatory variable. It was hypothesized that firms with higher R&D intensity would have relatively more to gain or lose by the events leading to SFAS 86 and would experience higher abnormal returns than less R&D intense firms. To the contrary, the results indicate that low R&D intense firms had larger abnormal returns. Alternative explanations for this phenomena were discussed. Future research is needed to test alternative theories supporting the empirical results.

In addition to those discussed earlier in this chapter, several other opportunities exist for future research. Little has been undertaken using samples of OTC firms. Recently developed CRSP tapes for NASDAQ firms should facilitate research needed to develop a better understanding of the interrelationship between market returns and exchange listing. The differences in

the determinants of market reactions, as between those of listed firms and those of OTC firms, should be examined in order to develop models better suited for explaining the market reaction to events affecting OTC firms. Also, the differences between sample Beta's of listed and OTC firms used in this study as well as the stationarity of Beta's between event dates suggest other areas of research in order to control for the apparent differences based on exchange listing.

Table 1
List of Sample Firms

<u>Company Name</u>	<u>SIC Code</u>	<u>Exchange Listing</u>	<u>C=Capitalizer X=Expenser</u>	<u>E=Early L=Late</u>
AGS Computers Inc	5045	NYSE	C	E
ASK Computer	7372	OTC	X	E
Adac Laboratories	3844	OTC	X	L
Allen Group	3714	NYSE	C	L
Alpha Microsystems	3571	OTC	X	E
Amdahl Corp	3571	ASE	X	L
American Management Systems	7370	OTC	X	L
American Software	7372	OTC	X	L
American Telephone & Telegraph	4813	NYSE	X	E
Analogic Corp	3825	OTC	X	L
Anacomp Inc	3861	NYSE	C	E
Apollo Computer Inc	3571	OTC	X	L
Applied Biosystems Inc	3826	OTC	X	L
Bolt Beranek & Newman	7373	NYSE	X	E
CMX Corp	3861	ASE	X	E
Cipher Data Products Inc	3572	OTC	X	L
Combustion Engineering	3569	NYSE	X	E
Computer Associates	7372	OTC	X	L
Computer Automation Inc	3825	OTC	X	L
Computer Language Research	7374	OTC	X	L
Computer Sciences Corp	7373	NYSE	X	L
Computervision Corp	7373	NYSE	X	L
Comshare Inc	7372	OTC	X	E
Convergent Inc	3571	OTC	X	L
Cullinet Software Inc	7372	NYSE	X	L
Daisy Systems Corp	7373	OTC	X	E
Data General Corp	3570	NYSE	X	L
Data I/O Corp	3825	OTC	X	L
Datapoint Corp	7373	NYSE	X	E
Dataproducs Corp	3577	ASE	X	L
Diasonics Inc	3845	OTC(a)	X	L
Diebold Inc	3578	NYSE	X	L
Digilog Inc	3825	OTC	X	L
Digital Equipment	3570	NYSE	X	L
Dun & Bradstreet Corp	8700	NYSE	C	E
EECO Inc	3577	ASE	X	L
Emhart Corp	3452	NYSE	X	L
Esterline Corp	3823	NYSE	X	E
Floating Point Systems	3571	NYSE	X	L
Fonar Corp	3845	OTC	X	L

List of Sample Firms
(Continued)

<u>Company Name</u>	<u>SIC Code</u>	<u>Exchange Listing</u>	<u>C=Capitalizer X=Expenser</u>	<u>E=Early L=Late</u>
General Automation	7373	OTC(a)	X	L
General Datacomm Industries Inc	3661	NYSE	X	E
Gerber Scientific Inc	7373	NYSE	X	L
HBO & Co	7373	OTC	X	L
Hathaway Corp	3825	OTC	C	L
Hewlett-Packard Co	3570	NYSE	X	L
Hogan Systems Inc	7372	OTC	X	L
ICOT Corp	3578	OTC	X	L
IMS International Inc	8700	NYSE	C	E
IRT Corp	3844	OTC(a)	X	E
ISC Systems Corp	3575	OTC	X	E
ITT Corp	6199	NYSE	C	E
Infodata Systems Inc	7372	OTC	C	L
Infotron Systems Corp	3661	OTC	X	L
Interface Systems Inc	3577	OTC	X	E
International Business Machines Corp	3570	NYSE	C	L
KLA Instruments Corp	3825	OTC	X	L
Kevox Corp	3826	OTC	X	E
LTX Corp	3825	OTC	X	L
Lodgistic Inc	7373	OTC	C	E
MPSI Systems Inc	7370	OTC	C	L
Macneal-Schwendler Corp	7372	OTC(a)	X	L
Management Science America	7372	OTC	X	L
Matrix Corp-N J	3861	ASE	X	E
McDonnell Douglas Corp	3721	NYSE	X	L
Measurex Corp	3823	NYSE	X	E
Munford Inc	5412	NYSE	C	E
NBI Inc	3571	NYSE	X	L
NCR Corp	3570	NYSE	X	L
National Data Corp	7374	OTC	C	E
National Semiconductor	3674	NYSE	X	L
Network Systems Corp	3577	OTC	X	L
On-Line Software Intl	7372	OTC	X	L
Pansophic Systems Inc	7372	OTC	X	L
Par Technology Corp	3578	OTC	X	L
Paradyne Corp	3661	NYSE	X	L
Perkin-Elmer Corp	3826	NYSE	X	L
Policy Management Systems Corp	6411	OTC	X	L
Porta Systems Corp	3661	ASE	X	L
Prime Computer Inc	7373	NYSE	X	L
Quixote Corp	3089	OTC	X	L

List of Sample Firms
(Continued)

<u>Company Name</u>	<u>SIC Code</u>	<u>Exchange Listing</u>	<u>C=Capitalizer X=Expenser</u>	<u>E=Early L=Late</u>
Ramtek Corp	3577	OTC	X	L
SEI Corp	6282	OTC	X	L
Smith (A.O.) Corp	3714	ASE	X	E
Softech Inc	7371	OTC	X	L
Stanwood Corp	2250	ASE	X	L
Sterling Software Inc	7372	ASE	X	L
Systematics Inc	7370	OTC	X	L
Tandem Computers Inc	3571	NYSE	X	E
Timeplex Inc	3661	NYSE	X	E
Tokheim Corp	3580	NYSE	X	L
Triad Systems Corp	7373	OTC	X	L
UCCEL Corp	7372	NYSE	X	L
Ungermann-Bass Inc	7373	OTC	X	L
Unisys Corp	3570	NYSE	X	L
United Telecommunic- ations	4813	NYSE	X	L
Wang Laboratories	3570	ASE	X	E
Weldotron Corp	3560	ASE	C	E

NYSE=38	C=14	E=30
ASE=11	X=84	L=68
OTC=49		
--	--	--
98	98	98
==	==	==

(a) Switched to ASE in 1985

Table 2
Average Cumulative Excess Returns
Events Leading to SFAS 86
(Patell Z-score in Parenthesis)

<u>Event</u> (expectation)	<u>Entire Sample</u> (N=98)	<u>Listed Firms</u> (N=49)	<u>OTC Firms</u> (N=49)
1 (-)	-0.0457 (-4.2055)***	-0.0606 (-3.8292)***	-0.0298 (-2.0891)**
2 (-)	-0.0013 (-0.3861)	-0.0190 (-0.8725)	0.0177 (1.4586)
3 (-)	0.0018 (0.0776)	0.0032 (0.4279)	0.0004 (0.3103)
4 (+)	0.0116 (0.9514)	0.0061 (0.4308)	0.0165 (0.9008)
5 (+)	0.0065 (0.5579)	0.0200 (1.4477)	-0.0055 (-0.5957)
6 (+)	0.0008 (0.3653)	0.0212 (1.4411)	-0.0172 (-0.8541)
7 (+)	0.0035 (0.0966)	-0.0021 (-0.1384)	0.0087 (0.0011)
8 ?	0.0149 (1.7041)*	0.0145 (0.9887)	0.0154 (1.4211)
9 (-)	-0.0216 (-3.0858)***	-0.0131 (-0.9632)	-0.0301 (-3.4009)***

*** Pr < 0.01
** Pr < 0.05
* Pr < 0.10

Table 2A

Mean Sample Beta's From Estimating Market Model
Scholes-Williams Procedure

	E V E N T		
	1	8	9
Total Sample	1.12	1.16	1.27
Listed Firms	1.20	1.18	1.44
OTC Firms	1.04	1.13	1.11

Table 3

Significance of Mean Differences
Between Average Cumulative Excess Returns of Portfolios
Z-Score

<u>Event</u>	<u>Capitalizers/ Expensers</u>	<u>Early/Late Adopters</u>
1	0.8642	0.2206
2	0.8627	1.3023
3	0.1265	-0.7124
4	0.2938	0.6185
5	-1.4890	-0.1122
6	-0.7194	0.2527
7	-0.6679	-0.8131
8	-1.0098	-0.4192
9	-0.2206	1.5919

*** Pr \leq 0.01
** Pr \leq 0.05
* Pr \leq 0.10

Table 4

Summary Statistics
(1982)

	All Firms	Listed Firms	OTC Firms
	<u>\$(000,000)</u>		
Long Term Debt	562	1143	4
Net Sales	1641	3296	51
Income Before Extraordinary Items	150	301	4
Research & Development	58	114	5
Preferred Stock (BV)	24	49	0
Common Stock (Mkt)	711	1642	126

(Regression Variables)

MV	5.21	5.84	4.57
LMDE	0.20	0.28	0.05
RDI	1.06	0.82	1.40
RDS	0.09	0.06	0.12

MV = Log of Market Value of Common Stock
 LMDE = Long Term Debt/(Market Value of Common +
 Preferred Stock)
 RDI = Research & Development/Income before
 Extraordinary Items
 RDS = Research & Development/Net Sales
 MKT = Market Value

Table 5

Summary Statistics
(1983)

	<u>All Firms</u>	<u>Listed Firms</u>	<u>OTC Firms</u>
	<u>\$(000,000)</u>		
Long Term Debt	561	1140	4
Net Sales	1771	3546	66
Income Before Extraordinary Items	149	301	4
Research & Development	72	139	7
Preferred Stock (BV)	20	40	0
Common Stock (Mkt)	970	2214	204
	<u>(Regression Variables)</u>		
MV	5.43	6.10	4.82
LMDE	0.11	0.18	0.03
RDI	2.40	2.23	2.67
RDS	0.09	0.07	0.12

MV = Log of Market Value of Common Stock
LMDE = Long Term Debt/(Market Value of Common +
 Preferred Stock)
RDI = Research & Development/Income before
 Extraordinary Items
RDS = Research & Development/Net Sales
BV = Book Value
MKT = Market Value

Table 6

Summary Statistics
(1984)

	<u>All Firms</u>	<u>Listed Firms</u>	<u>OTC Firms</u>
	<u>\$(000,000 omitted)</u>		
Long Term Debt	208	418	6
Net Sales	1757	3943	87
Income Before Extraordinary Items	120	241	4
Research & Development	101	197	9
Preferred Stock (BV)	19	39	0
Common Stock (Mkt)	764	1839	145
	<u>(Regression Variables)</u>		
MV	5.16	5.97	4.43
LMDE	0.18	0.26	0.09
RDI	1.46	1.06	1.92
RDS	0.09	0.06	0.13

MV = Log of Market Value of Common Stock
LMDE = Long Term Debt/(Market Value of Common + Preferred Stock)
RDI = Research & Development/Income before Extraordinary Items
RDS = Research & Development/Net Sales
BV = Book Value
MKT = Market Value

Table 7

Cross-Sectional Parameter Estimates
(t-values)

E V E N T			
Variable	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0052 (-0.9435)	0.0050 (1.2720)	-0.0106 (-1.9397)*
MV	0.0004 (0.5698)	0.0001 (0.2095)	0.0002 (0.3365)
LMDE	0.0097 (2.8351)***	-0.0035 (-1.1635)	0.0001 (0.0430)
RDI	-0.0007 (-2.1240)**	-0.0001 (-0.0231)	-0.0002 (-0.8308)
EXCH	-0.0072 (-2.9163)***	0.0002 (0.0913)	0.0040 (1.5786)
SDRV	-0.0259 (-0.2908)	-0.1136 (-1.8986)*	0.1773 (1.5731)
R ²	0.20	0.06	0.06
F-Value	3.94	1.07	1.16
(Significance)	(0.003)	(0.385)	(0.337)
Intercept	-0.0042 (-0.7499)	0.0048 (1.1733)	-0.0110 (-2.0135)**
MV	0.0001 (0.1851)	0.0001 (0.2002)	0.0001 (0.1803)
LMDE	0.0099 (2.7981)***	-0.0035 (-1.1529)	0.0001 (0.0312)
RDS	0.0051 (0.4900)	0.0015 (0.1228)	0.0077 (0.5366)
EXCH	-0.0065 (-2.4921)**	0.0003 (0.1304)	0.0047 (1.8144)*
SDRV	-0.0655 (-0.7063)	-0.1141 (-1.9039)*	0.1589 (1.2932)
R ²	0.15	0.06	0.06
F-Value	2.93	1.07	1.07
(Significance)	(0.017)	(0.383)	(0.382)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 8

Cross-Sectional Parameter Estimates
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0022 (-0.4144)	0.0053 (1.3028)	-0.0097 (-1.7546)*
MV	0.0003 (0.3903)	0.0002 (0.2701)	0.0004 (0.5163)
LMDE	0.0088 (2.5942)**	-0.0036 (-1.0512)	0.0011 (0.3192)
RDI	-0.0024 (-2.4357)**	-0.0004 (-0.4078)	-0.0016 (-1.6467)*
EXCH	-0.0077 (-3.1148)***	0.0001 (0.0381)	0.0037 (1.4957)
SDRV	-0.0217 (-0.2450)	-0.1158 (-1.9289)*	0.1700 (1.5266)
R ²	0.21	0.05	0.08
F-Value	4.27	1.05	1.59
(Significance)	(0.002)	(0.396)	(0.171)
Intercept	-0.0042 (-0.7385)	0.0046 (1.0938)	-0.0117 (-2.1289)**
MV	0.0002 (0.2473)	0.0001 (0.2288)	0.0002 (0.3302)
LMDE	0.0097 (2.7116)***	-0.0034 (-0.9952)	0.0018 (0.5005)
RDS	0.0006 (0.0318)	0.0027 (0.1749)	0.0078 (0.4426)
EXCH	-0.0067 (-2.5513)**	0.0003 (0.1173)	0.0043 (1.6306)*
SDRV	-0.0562 (-0.5946)	-0.1149 (-1.9112)*	0.1617 (1.3071)
R ²	0.15	0.05	0.06
F-Value	2.88	1.02	1.05
(Significance)	(0.019)	(0.413)	(0.392)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 9

Cross-Sectional Parameter Estimates
Listed Firms
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0066 (-0.6375)	-0.0023 (-0.3588)	0.0029 (0.3316)
MV	0.0002 (0.1686)	0.0004 (0.5897)	-0.0004 (-0.4310)
LMDE	0.0049 (1.0080)	-0.0040 (-1.1304)	-0.0043 (-1.0345)
RDI	-0.0019 (-1.2506)	0.0005 (0.3927)	0.0002 (0.1092)
SDRV	-0.1108 (-0.5520)	0.1128 (0.8129)	-0.0765 (-0.3717)
R ²	0.12	0.08	0.03
F-Value	1.42	0.96	0.29
(Significance)	(0.246)	(0.442)	(0.885)
Intercept	-0.0062 (-0.5805)	-0.0018 (-0.2837)	0.0025 (0.2783)
MV	0.0000 (0.0008)	0.0005 (0.6918)	-0.0002 (-0.2251)
LMDE	0.0050 (1.0044)	-0.0046 (-1.2818)	-0.0054 (-1.2500)
RDS	-0.0105 (-0.2561)	-0.0147 (-0.4289)	-0.0313 (-0.7547)
SDRV	-0.1264 (-0.5288)	0.1453 (0.9236)	0.0094 (0.0407)
R ²	0.09	0.08	0.04
F-Value	1.00	0.96	0.43
(Significance)	(0.418)	(0.437)	(0.786)
***	Pr <	0.01	
**	Pr <	0.05	
*	Pr <	0.10	

Table 10

Cross-Sectional Parameter Estimates
OTC Firms
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	0.0009 (0.0945)	0.0009 (0.1369)	-0.0172 (-2.5191)**
MV	-0.0002 (-0.1759)	0.0015 (1.1896)	0.0018 (1.6895)*
LMDE	0.0014 (0.0800)	0.0111 (1.2630)	0.0248 (3.3495)***
RDI	-0.0025 (-1.7372)*	-0.0012 (-0.9535)	-0.0029 (-2.5863)**
SDRV	-0.0384 (-0.3815)	-0.1582 (-2.2615)**	0.1857 (1.5148)
R ²	0.10	0.17	0.34
F-Value	0.92	2.20	5.63
(Significance)	(0.464)	(0.085)	(0.001)
Intercept	-0.0037 (-0.3670)	0.0007 (0.1010)	-0.0216 (-3.0536)***
MV	0.0001 (0.0704)	0.0015 (1.1901)	0.0017 (1.4763)
LMDE	-0.0020 (-0.1126)	0.0121 (1.3487)	0.0243 (3.0102)***
RDS	0.0065 (0.2777)	-0.0123 (-0.6669)	-0.0003 (-0.0180)
SDRV	-0.0072 (-0.7281)	-0.1503 (-2.1432)**	0.2484 (1.7767)*
R ²	0.02	0.16	0.24
F-Value	0.17	2.06	3.42
(Significance)	(0.952)	(0.103)	(0.016)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 11

Pearson Correlation Coefficients

Event 1

	<u>MV</u>	<u>LMDE</u>	<u>RDI</u>	<u>EXCH</u>
<u>LMDE</u>	-0.12			
<u>RDI</u>	0.06	-0.09		
<u>EXCH</u>	0.43	0.23	-0.08	
<u>SDRV</u>	-0.38	-0.27	0.13	-0.26

	<u>MV</u>	<u>LMDE</u>	<u>RDS</u>	<u>EXCH</u>
<u>LMDE</u>	-0.12			
<u>RDS</u>	-0.02	-0.24		
<u>EXCH</u>	0.43	0.23	-0.25	
<u>SDRV</u>	-0.38	-0.27	0.27	-0.26

MV = Log of Market Value of Common Stock
LMDE = Long Term Debt/(Market Value of Common + Preferred Stock)
RDI = Research & Development/Income before Extraordinary Items
RDS = Research & Development/Net Sales
EXCH = Exchange listing or OTC

Table 12

Pearson Correlation Coefficients

Event 8 & 9

	<u>MV</u>	<u>LMDE</u>	<u>RDI</u>	<u>EXCH</u>
<u>LMDE</u>	-0.19			
<u>RDI</u>	0.03	-0.02		
<u>EXCH</u>	0.49	0.16	-0.10	
<u>SDRV</u>	-0.21	-0.18	-0.03	-0.32

	<u>MV</u>	<u>LMDE</u>	<u>RDS</u>	<u>EXCH</u>
<u>LMDE</u>	-0.19			
<u>RDS</u>	-0.11	-0.19		
<u>EXCH</u>	0.49	0.16	-0.39	
<u>SDRV</u>	-0.21	-0.18	0.21	-0.32

MV = Log of Market Value of Common Stock
LMDE = Long Term Debt/(Market Value of Common + Preferred Stock)
RDI = Research & Development/Income before Extraordinary Items
RDS = Research & Development/Net Sales
EXCH = Exchange listing or OTC

Table 13

Event 1
Cross-Sectional Parameter Estimates With Alternative Models
Winsorized Data
(t-values)

Variable (expectation)	Full Model	w/o MV	w/o EXCH
Intercept	-0.0023 (-0.4144)	-0.0006 (-0.1711)	-0.0012 (-0.2105)
MV (+)	0.0003 (0.3903)		-0.0007 (-1.0134)
LMDE (+)	0.0088 (2.5942)**	0.0084 (2.6263)**	0.0059 (1.7210)*
RDI (+)	-0.0024 (-2.4357)**	-0.0024 (-2.4314)**	-0.0019 (-1.8444)*
EXCH (+)	-0.0077 (-3.1148)***	-0.0073 (-3.2859)***	
SDRV (+)	-0.0217 (-0.2450)	-0.0352 (-0.4351)	-0.0277 (-0.2978)
R ²	0.21	0.21	0.12
F-Value (significance)	4.27 (0.002)	5.36 (0.001)	2.64 (0.040)
Intercept	-0.0042 (-0.7385)	-0.0031 (-0.8800)	-0.0034 (-0.5801)
MV (+)	0.0002 (0.2473)		-0.0007 (-0.9871)
LMDE (+)	0.0097 (2.7116)***	0.0094 (2.7783)***	0.0076 (2.1130)**
RDS (+)	0.0310 (0.0318)	0.0014 (0.0731)	0.0135 (0.6912)
EXCH (+)	-0.0067 (-2.5513)**	-0.0064 (-2.7522)***	
SDRV (+)	-0.0234 (-0.5946)	-0.0659 (-0.7705)	-0.0729 (-0.7487)
R ²	0.15	0.15	0.08
F-Value (significance)	2.88 (0.019)	3.62 (0.009)	1.85 (0.128)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 14

Event 8
Cross-Sectional Parameter Estimates With Alternative Models
Winsorized Data
(t-values)

Variable (expectation)	Full Model	w/o MV	w/o EXCH
Intercept	0.0053 (1.3023)	0.0061 (2.2874)**	0.0053 (1.3112)
MV (-)	0.0002 (0.2701)		0.0002 (0.3380)
LMDE (-)	-0.0036 (-1.0512)	-0.0039 (-1.1999)	-0.0036 (-1.0904)
RDI (-)	-0.0004 (-0.4078)	-0.0004 (-0.3917)	-0.0004 (-0.4126)
EXCH (-)	0.0001 (0.0381)	0.0004 (0.2047)	
SDRV (-)	-0.1158 (-1.9289)*	-0.1176 (-1.9827)*	-0.1162 (-1.9825)*
R ²	0.05	0.05	0.05
F-Value (significance)	1.05 (0.396)	1.30 (0.275)	1.32 (0.268)
Intercept	0.0046 (1.0938)	0.0053 (1.8000)	0.0046 (1.1058)
MV (-)	0.0001 (0.2288)		0.0002 (0.3330)
LMDE (-)	-0.0034 (-0.9952)	-0.0037 (-1.1278)	-0.0033 (-1.0012)
RDS (-)	0.0027 (0.1749)	0.0029 (0.1924)	0.0020 (0.1434)
EXCH (-)	0.0003 (0.1173)	0.0006 (0.2680)	
SDRV (-)	-0.1149 (-1.9112)*	-0.1166 (-1.9654)*	-0.1159 (-1.9587)*
R ²	0.05	0.05	0.05
F-Value (significance)	1.02 (0.413)	1.27 (0.287)	1.28 (0.283)

*** Pr < 0.01
 ** Pr < 0.05
 * Pr < 0.10

Table 15

Event 2
Cross-Sectional Parameter Estimates With Alternative Models
Winsorized Data
(t-values)

Variable (expectation)	Full Model	w/o MV	w/o EXCH
Intercept	-0.0097 (-1.7546) *	-0.0076 (-2.0121) **	-0.0094 (-1.6827) *
MV (+)	0.0004 (0.5163)		0.0008 (1.2979)
LMDE (+)	0.0011 (0.3192)	0.0006 (0.1635)	0.0026 (0.7659)
RDI (+)	-0.0016 (-1.6467) *	-0.0015 (-1.6279) *	-0.0017 (-1.7231) *
EXCH (+)	0.0037 (1.4957)	0.0043 (1.9256) *	
SDRV (+)	0.1700 (1.5266)	0.1538 (1.4452)	0.1306 (1.1985)
Adjusted R ²	0.08	0.08	0.06
F-Value (significance)	1.59 (0.171)	1.93 (0.112)	1.40 (0.239)

Intercept	-0.0117 (-2.1289) **	-0.0103 (-2.8193) ***	-0.0114 (-2.0636) **
MV (+)	0.0002 (0.3302)		0.0008 (1.2246)
LMDE (+)	0.0018 (0.5005)	0.0014 (0.4210)	0.0033 (0.9423)
RDS (+)	0.0078 (0.4426)	0.0089 (0.5176)	-0.0010 (-0.0564)
EXCH (+)	0.0043 (1.6306) *	0.0047 (2.0290) **	
SDRV (+)	0.1617 (1.3071)	0.1480 (1.2763)	0.1464 (1.1761)
Adjusted R ²	0.06	0.05	0.03
F-Value (significance)	1.05 (0.392)	1.30 (0.275)	0.64 (0.635)
***	Pr ≤ 0.01		
**	Pr ≤ 0.05		
*	Pr ≤ 0.10		

Table 16

Model Including Dividend Constraint (TITE)
Cross-Sectional Parameter Estimates
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
Intercept	-0.0008 (-0.0541)	0.0163 (2.3685)**	0.0015 (0.1368)
MV	-0.0011 (-0.7177)	0.0002 (0.1969)	0.0002 (0.1964)
LMDE	0.0052 (0.8384)	-0.0070 (-1.2456)	-0.0016 (-0.2279)
RDI	-0.0014 (-0.6062)	-0.0017 (-1.3234)	-0.0009 (-0.6262)
EXCH	-0.0026 (-0.5074)	-0.0058 (-1.6041)	0.0006 (0.1342)
SDRV	-0.0447 (-0.1350)	-0.2347 (-3.9086)***	-0.0749 (-0.3413)
TITE	-0.0050 (-1.2059)	-0.0031 (-0.6749)	-0.0050 (-0.9042)
R ²	0.17	0.39	0.07
F-Value	0.96	2.83	0.32
(significance)	(0.472)	(0.029)	(0.921)
Intercept	0.0004 (0.0264)	0.0116 (1.5865)	0.0008 (0.0768)
MV	-0.0013 (-0.8512)	0.0001 (0.0809)	0.0005 (0.4507)
LMDE	0.0049 (0.7809)	-0.0049 (-0.8258)	-0.0021 (-0.3035)
RDS	-0.0110 (-0.3081)	0.0232 (0.7340)	-0.0439 (-1.2667)
EXCH	-0.0017 (-0.3422)	-0.0043 (-1.0697)	-0.0008 (-0.1996)
SDRV	-0.1242 (-0.4194)	-0.2203 (-3.5996)***	0.0059 (0.0268)
TITE	0.0080 (1.4580)	-0.0030 (-0.6212)	-0.0043 (-0.7828)
R ²	0.16	0.36	0.11
F-Value	0.90	2.52	0.53
(significance)	(0.507)	(0.046)	(0.779)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 17

Model Including Dividend Constraint (TITE)
Without (w/o) LMDE
Cross-Sectional Parameter Estimates
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
Intercept	0.0078 (0.7327)	0.0129 (2.0230) *	0.0001 (0.0103)
MV	(-0.0017) (-1.2073)	0.0004 (0.3665)	0.0003 (0.2400)
RDI	-0.0014 (-0.5937)	-0.0015 (-1.1586)	-0.0008 (-0.6118)
EXCH	-0.0019 (-0.3751)	-0.0069 (-1.9524) *	0.0005 (0.1182)
TITE	0.0052 (0.9737)	-0.0010 (-0.2224)	-0.0044 (-0.9222)
SDRV	-0.1950 (-0.7033)	-0.2250 (-3.7425) ***	-0.0522 (-0.2717)
R ²	0.15	0.35	0.06
F-Value (significance)	1.02 (0.425)	3.02 (0.027)	0.39 (0.854)
Intercept	0.0084 (0.7919)	0.0090 (1.3705)	-0.0010 (-0.1119)
MV	-0.0018 (-1.2815)	0.0090 (0.1535)	-0.0010 (0.5033)
RDS	-0.0143 (-0.4063)	0.0301 (0.9938)	-0.0426 (-1.2595)
EXCH	-0.0012 (-0.2500)	-0.0047 (-1.1883)	-0.0009 (-0.2185)
TITE	0.0062 (1.2574)	-0.0015 (-0.3465)	-0.0035 (-0.7368)
SDRV	-0.2550 (-1.0516)	-0.2134 (-3.5396) ***	0.0329 (0.1644)
R ²	0.14	0.34	0.10
F-Value (significance)	0.97 (0.450)	2.92 (0.031)	0.64 (0.670)
***	Pr < 0.01		
**	Pr < 0.05		
*	Pr < 0.10		

Table 18

Cross-Sectional Parameter Estimates
R&D Intensity Proxy Based on Post Event Actual
Capitalized Software
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0074 (-0.5986)	-0.0045 (-0.6830)	-0.0113 (-1.5868)
MV	0.0001 (0.0816)	0.0012 (1.3725)	0.0001 (0.0663)
LMDE	0.0080 (1.8700) *	-0.0058 (-0.8644)	0.0083 (1.2907)
RDR (a)	0.0022 (0.3664)	-0.0043 (-0.7782)	-0.0114 (-1.9534) *
EXCH	-0.0071 (-2.3148) **	0.0006 (0.2383)	0.0065 (2.3023) **
SDRV	-0.0402 (-0.4116)	0.0745 (0.6106)	0.2403 (1.9246) *
R ²	0.15	0.09	0.21
F-value (Significance)	1.94 (0.102)	1.16 (0.341)	3.32 (0.010)

(a) RDR=percent capitalized software of total R&D

*** Pr < 0.01
 ** Pr < 0.05
 * Pr < 0.10

Table 19

Cross-Sectional Parameter Estimates
R&D Intensity Proxy Based on Post Event Actual
Capitalized Software
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0036 (-0.5043)	-0.0061 (-1.0298)	-0.0138 (-2.1766)**
MV	-0.0001 (-0.0699)	0.0013 (1.4999)	0.0002 (0.1919)
LMDE	0.0080 (1.8907)*	-0.0058 (-0.8542)	0.0065 (0.9532)
RDCS (b)	0.0198 (0.9079)	-0.0251 (-0.7319)	-0.0860 (-2.4867)**
EXCH	-0.0063 (-1.9914)*	0.0003 (0.1265)	0.0057 (2.0760)**
SDRV	-0.0638 (-0.6372)	0.1149 (0.9306)	0.3341 (2.7390)**
R ²	0.16	0.09	0.24
F-Value	2.10	1.14	3.89
(Significance)	(0.079)	(0.348)	(0.004)

(b) RDCS=capitalized software as percent of sales

*** Pr < 0.01
** Pr < 0.05
* Pr < 0.10

Table 20

Cross-Sectional Parameter Estimates
R&D Intensity Proxy Based on Post Event Actual
Capitalized Software
Winsorized Data
(t-values)

Variable	E V E N T		
	1	8	9
(expectation of variables)	(+)	(-)	(+)
Intercept	-0.0032 (-0.4548)	-0.0063 (-1.0706)	-0.0147 (-2.2541)**
MV	0.0000 (0.0158)	0.0013 (1.6234)	0.0004 (0.4689)
LMDE	0.0079 (1.9020)*	-0.0044 (-0.6234)	0.0116 (1.6959)*
RDCI (c)	-0.0018 (-1.4375)	-0.0009 (-0.7743)	-0.0022 (-1.8766)*
EXCH	-0.0078 (-2.5523)**	0.0002 (0.0831)	0.0053 (1.8683)*
SDRV	-0.0147 (-0.1508)	0.0901 (0.7523)	0.2456 (1.9679)*
R ²	0.18	0.09	0.21
F-Value	2.39	1.16	3.25
(Significance)	(0.049)	(0.341)	(0.012)

(c) RDCI=capitalized software as percent of income

*** Pr < 0.01
 ** Pr < 0.05
 * Pr < 0.10

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