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AN EMPIRICAL INVESTIGATION OF THE SECURITY PRICE IMPACT OF THE FASB'S R & D POLICY INTERVENTION

by

Wahjudi P. Benjamin and
John E. McEnroe

A number of empirical accounting research studies from the late 1960's to the present have been concerned with the effects of the policy behavior of accounting rule-making bodies on the behavior of security prices affected by the accounting pronouncement, and are occasionally referred to as "policy intervention studies." Some of the more recent examples are those of Dyckman and Smith (1979), Collins and Dent (1979), Lev (1979), and Benjamin and McEnroe (1981, 1983), which have all focused on the ramifications of the Financial Accounting Standard Board (FASB) Exposure Draft (ED), "Financial Accounting and Reporting by Oil and Gas Producing Companies," which was dated July 15, 1977 and released on July 18, 1977 . The earlier policy intervention studies by Stigler (1964), Friend and Herman (1964), Benston (1969a, 1969b, 1973), Friend (1972), Patz and Boatsman (1972), and Deakin (1976) have examined the effects of accounting mandates associated with the Securities and Exchange Commission (SEC) or the American Institute of Certified Public Accountants (AICPA). The majority of the studies subsequent to 19691, however, have applied some form of the basic methodology developed by Fama, Fisher, Jensen and Roll (FFJR, 1969). Nevertheless, a problem remains unsolved with respect to the possible effects of certain cross-temporal and cross-sectional correlations in paralleled time series realizations of the observed regression residuals that are usually too significant to properly use this model (often referred to as the "traditional market model"). For example, as noted by Gujarati (1978, p. 225) and Pindyck and Rubinfeld (1976, p. 106), although the problem of autocorrelation is usually more common in time series data, it also occurs in cross-sectional data.

If, in fact, the degree of positive temporal correlation is significant, and ignored, the following consequences (among others) can occur if the classical Ordinary least Squares (OLS) formulas are applied (Gujarati, 1978 p. 226):

1. The residual variance σ^2 is likely to underestimate the true σ^2.

2. Even if the σ^2 is not understated, the variances and standard errors of the OLS estimators are likely to underestimate the true variances and standard errors.

3. The usual t and F test are no longer valid. If they are utilized, they are likely to give seriously misleading conclusions about the statistical significance of the estimated regression coefficients. As a

result, they will have a tendency to reject the null hypothesis when in fact it should not be rejected.

4. Although the OLS estimators are unbiased (this is a repeated sampling property), they are likely to render a distorted indication of their true population values.

This problem of temporal correlations among the residual returns has been reported, among other, by Deakin (1976) and Larcker et al (1980). It has also been reported by lev (1979) and Benjamin (1980), using daily data. The problem of cross-sectional correlation among residual returns of oil companies' stock, on the other hand, has been reported by Farrell (1974) and Martin and Klemkosky (1976). It has also been reported by Benjamin and McEnroe (1981, 1983), using cross-sectional security returns' data.

While the problem of cross-temporal correlations might be treated properly by means of intervention analysis (Larcker et al, 1980), the problem of cross-sectional correlations has often not been properly taken into account.2

To overcome these problems, we employed the model utilized by Benjamin and McEnroe (1981, 1983), which is described in the methodology section of this paper. The model materially improves the ability to make statistical inferences in policy intervention studies.3

Given the growing interest in intervention analysis and the macroeconomic impacts of accounting numbers,4 the paramount objective of the current research is to apply the above model to the policy intervention situation precipitated by the FASB's ED, "Accounting for Research and Development Costs," dated and issued on June 5, 1974. The rationale for the study, as well as the brief synopsis of the issues and other studies associated with accounting for research and development costs, are explained in the following section.

LITERATURE CHRONOLOGY

For a long time, there has been debate in the accounting for R&D expenditures. For instance, an early reference was that of Hatfield in Modern Accounting (1909). he referred to R&D costs as "expenses of experimentation" and cited the difficulty of ascertaining the degree of the fruition of the experiments. The controversy continued throughout this century, however, and in 1973, Gellein and Newman, commissioned by the AICPA to study the accounting issues related to R&D expenditures, released Accounting Research and Development Costs. Basically, the authors dichotomized R&D expenditures into two classifications:

1. Continuing research (basic and applied). Funds budgeted not only to preserve current levels of income but also to create higher levels.

2. Substantial development projects. Efforts to

develop new products that have already proven to be technically feasible.

The authors stated that although there was sound theoretical merit for deferring at least some portion of continuing research programs and allocating them over future periods, the benefits are usually uncertain. Furthermore, Gellein and Newman concluded that even if they are reasonably assured, they are, by nature, "diffused and unquantifiable." For this reason they recommend that all costs of continuing research programs be recognized as expenses at the time incurred, reasoning, that their "conclusion is primarily practical."

In regard to substantial development projects. Gellein and Newman set forth certain criteria that must be met before deferral is warranted, one of which was that "a high probability of future revenue should be evident. Projects meeting the authors' criteria would be amortized over future periods, although the costs of relatively minor development projects would be recognized as current expenses in the same manner as continuing research programs.

A year later, on June 5, 1974, the FASB released its R&D ED (FASB, 1974a), recommending the current expensing of most R&D expenditures. The reason given by the Board was that "a causal relationship between expenditures and specific future revenues can seldom be demonstrated, even with the benefit of hindsight, and the cost of a particular research and development project is not indicative of the amount of future income" (emphasis added). Thus the exposure draft virtually ignored the proposals set forth in ASR 14.

The final statement (SFAS No. 2) was released in 1974 (FASB, 1974b), and as in the case of the ED, basically called for the expensing of all R&D expenditures. In the official release, the FASB stated that in 1973 over 30 billion dollars had been spent on R&D projects, approximately two-thirds by businesses, and the remainder by government and universities. In arriving at its decision, the FASB indicated that significant measurement problems existed in the area of R&D costs, stating, "...at the time most research and development costs are incurred, the future benefits are at best uncertain. In other words, there is no indication that an economic resource has been created." The Board also cited the empirical studies conducted by Johnson (1976), Newman (198=68), and Milburn (1971), which failed to indicate any benefits to accounting information users from capitalizing R&D costs in lieu of expensing them. Lastly, a recent study by Dukes et al, (1980) found no support to conclude that SFAS No. 2 affected the research and development expenditures of the firms they sampled.

Vigeland (1981) studied four critical dates involving SFAS No. 2, namely, the release of: the Discussion Memorandum (December 31, 1973), the Exposure Draft (June 5, 1974), the final Statement (October 10, 1974), and the effective date of the Statement (January 1, 1975). Basically, Vigeland utilized a research design developed by Gonedes (1975) in testing for the information content of SFAS No. 2. First, he categorized his

sample into an accounting change group (those deferring R&D costs) and a nonchange group (those currently expensing them). These two groups were matched on the three dimensions of relative risk, industry classification, and size. His final sample then consisted of 195 firms (95 matched pairs).

Next, Vigeland subgrouped the two main groups into high and low risk categories, and further weighted and combined them to yield a portfolio with a relative risk (beta) equal to the mean relative risk of the overall risk class (high and low). The author used the beta estimates provided by Merrill Lynch, Pierce, Fenner and Smith's Security Risk Evaluation (Merrill Lynch, 1974) as a surrogate of the individual firms's relative risk. Also, the data pertaining to size were taken from the COMPUSTAT tape. Vigeland concluded that his final sample was closely matched in terms of industry classification and relative risk, while somewhat more loosely matched in terms of firm size, as measured by total assets and total sales. (p. 319)

To test for the market reaction, Vigeland calculated the mean returns for each portfolio for each of the 52 weeks surrounding the focal date of the test. Then, using the Hotelling T^2 statistic, he preformed three tests for each of the four focal dates, a comparison of the mean returns of the accounting change firms with those of the nonchange firms 1) over the 26 week period up to and including the focal date, 2) a 26 week period following the focal date, and 3) the entire 52 week period.

The only significant difference found by Vigeland (at the .05 level) occurred in the 26 week period prior to the release of the exposure draft of SFAS No. 2. In fact, in ten of the twelve tests, the sample F statistic was less than its expected value of 1.0. Thus, the results led Vigeland to conclude "...no market reaction was observed which could be attributed to this policy intervention by the FASB." (p. 324) Lastly, he recommended further research regarding SFAS No. 2, stating, "Replication of these tests on a new sample would help to validate these results, but data availability problems would make this an onerous task." (p. 324)

HYPOTHESIS AND METHODOLOGY

Gonedes and Dopuch (1974) posit that an accounting change can affect capital market equilibrium by either providing new information that was not previously available, being associated with another change in the operating or financing activities of the firms, or being a significant economic event in its own right. Vigeland (1981) provides an excellent analysis within the Gonedes-Dopuch framework as to why any market reaction associated with SFAS No. 2 could conceivably be attributed to the effects of new information or the anticipated changes in management actions resulting from the intervention. Since Vigeland did not examine any dates corresponding to annual reports, and instead focused on dates progressing in the issuance of SFAS No. 2, he concluded that any observed market reaction would likely be the result of changes in management decisions

rather than the result of new information (p. 316).

One reason that managerial actions might be perceived to be affected is that although the "real" earnings (cash flow) of the firms that capitalize R&D costs are not debilitated by the ruling, there might be future adverse consequences due to certain contractual agreements (i.e. debt covenants) based on historical cost earnings. Accordingly, investors might gauge the accounting intervention as to its impact on the future "states of nature" of the firms. The term "state of nature" is borrowed in this contest from the quantitative decision-making literature and might be viewed as a particular condition or combination of qualities encompassing an economic entity or perhaps as a particular probability point on an economic plane. It is used extensively in the decision-making literature to determine optimal strategies in light of the existing conditions relating to the entity (the probability of a particular state of nature occurring). In the current research, it is used in the context of investors' future expectations regarding an entity's economic outcome(s).

Given this background, and the results of the Vigeland study, we decided to examine the impact of the release of the Exposure Draft of SFAS No. 2 (the focal point prior to which Vigeland found a significant difference) on the security prices of certain firms affected by the ruling. Specifically, the null hypothesis developed to empirically test the effects of the policy intervention was:

> H_O: The FASB's ED, "Accounting for Research and Development Costs," did not have a significant effect on the behavior of security returns of the firms that capitalize R&D expenditures relative to those that expends them.

However, our methodology was somewhat different than that employed by Vigeland.

First, a combined ITS and SUR model proposed by Benjamin and McEnroe (1981, 1983), was used to investigate the alleged impact of the FASB's ED, "Accounting for Research and Development Costs," on the behavior of the security returns. This model possesses, among others, the following advantages over the use of the certain methodologies:

1. The explanatory power of the model is enhanced by incorporating an industry factor.

2. The problem of cross-temporal correlations is attenuated by incorporating the ITS model.

3. The problem of cross-sectional correlations is attenuated by incorporating an industry factor and the SUR model.[5]

4. The alleged reactions are sensitized by incorporating daily instead of weekly or monthly security price

data.

In order to accomplish the intervention analysis, three levels of estimation were employed; the individual security, portfolio, and inter-portfolio levels. Each will be discussed in the ensuing paragraphs.

Individual Security Level

Two concepts of security returns were defined:

1) y^*_{it}, return net of industry factor of security i at time t, computed by using the following equations:

$$y_{it} = \beta_o + \beta_n x_{nt} + y^*_{it} \quad (1)$$

$$y^*_{it} = y_{it} - (\hat{\beta}_o + \hat{\beta}_n x_{nt}) \quad (2)$$

Thus, y^*_{it} is the residual obtained by regression y_{it}, return of security i at time t, on x_{nt}, return net of general market factor of industry n at time t. β_o and β_n ($\hat{\beta}o$ and $\hat{\beta}n$) are the regression parameters (estimated regression parameters).

2) y^{**}_{it}, return net of industry and autoregressive (AR) factors of security i at time t, computed by using equation (1) and the following set of equations:

$$y^*_{it} = \varepsilon_{it} - \rho_1 y^*_{it-1} - \cdots - \rho_q y^*_{it-q} \quad (3)$$

$$\hat{y}_{it} = \hat{\beta}_o + \hat{\beta}_n x_{nt} + \sum_{j=1}^{q} \hat{\rho}_j (y_{it-j} - \hat{\beta}_n x_{it-j}) \quad (4)$$

$$y^{**}_{it} = y_{it} - \hat{y}_{it} \quad (5)$$

In this case, y^*_{it} is assumed to be autoregressive or generated by a random disturbance (ε_{it}) and a weighted average of previous observation going back q periods $(\rho_1 y^*_{it-1} - \cdots - \rho_q y^*_{it-q})$ where is the weight of the AR parameter and q, the order of the AR process. For the purposes of the current study, the Generalized least Square (GLS) equation, which is accomplished via a combined Ordinary Least Square (OLS) and the AR procedure, was run with the AR order up to lag 30 (q=30), using the SAS Autoreg Procedure.[6] However, only the significant AR coefficients of certain lags (t-value $\geq$ 1.90) were selected to compute y^{**}_{it}.

The industry factor, x_{nt}, was defined as the industry return net of the general market factor:

$$y_{nt} = \beta_o + \beta_m x_{mt} + x_{nt} \quad (6)$$

$$x_{nt} = y_{nt} - (\hat{\beta}_o + \hat{\beta}_m x_{mt}) \quad (7)$$

Thus, x_{nt} is the residual obtained by regression y_{nt}, the equally weighted security return of the industry n at time t, on x_{mt}, the equally weighted market return at time t.

Portfolio Level

Two regression models were developed in conformity with the two concepts of individual security returns as defined above. An equally weighted portfolio return for the experimental and control groups' (EG and CG) securities was constructed for each model. Thus, the portfolio return net of industry (y^*_{pt}) and the portfolio return net of industry and AR factors (y^{**}_{pt}) were respectively regressed on the equally weighted market return (x_{mt}) and a dummy variable, with the assigned value of one for each observation during the announcement (intervention) period and the assigned value of zero for each observation during the remaining periods. The significant portfolio's temporal correlations were then eliminated by using the GLS procedure described above. Finally, the original values of all variables were transformed.[7] The transformed regression models would then be:

$$\text{Model 1:}\quad y^{*\tau}_{pt} = \beta^{p}_{o1} + \beta^{p}_{m1}x^{p\tau}_{m1t} + \delta^{p}_{1}x^{p\tau}_{d1t} + \mu^{p}_{1t} \tag{8}$$

$$\text{Model 2:}\quad y^{**\tau}_{pt} = \beta^{p}_{o2} + \beta^{p}_{m2}x^{p\tau}_{m2t} + \delta^{p}_{2}x^{p\tau}_{d2t} + \mu^{p}_{2t} \tag{9}$$

where: (1) subscript 1 and 2 denote Model 1 and Model 2, respectively, (2) p=e for EG's portfolio and p=c for CG's portfolio; (3) $x_{d.t}$ denotes a dummy variable; (4) β o., β m. and δ denote the regression parameters; and (5) τ denotes transformed variables.

Inter-portfolio Level

The EG and the CG's regression equation in each model were then estimated as a system (System Estimation Method) by using the SUR equations originally proposed by Zellner (1962).

ANALYSIS

The R&D accounting methods adopted by the sample firms used in this study were identified from the "Summary of Account Policy" section of their Annual Reports. Initially, a sample of 57 New York Stock Exchange (NYSE) firms derived from 37 different industries (based on a three-digit SIC code) which deferred their R&D expenditures (DF method) was obtained. This EG was then paired with a CG's sample of equal size consisting of 57 firms which charged their R&D expenditures directly to expense (EX method). The following criteria were used in the selection of the CG's firms: (1) listed in the NYSE; (2) disclosed their accounting methods in the "Summary of Accounting Policy" section

of their Annual Reports; (3) same SIC codes as those assigned to the EG's firms; and (4) closest beta (risk) coefficients.

The data were obtained from the CRSP Daily Stock Returns File.8 The daily stock returns and the equally weighted market returns (adjusted for dividends and splits) covering a period of 401 trading days (June 1, 1973 to December 31, 1974) were retrieved from the CRSP tapes. The daily stock returns of 944 companies were also retrieved from the tapes over the same period to compute the beta coefficients of the individual securities and the equally weighted returns of the 37 industries. The missing values were omitted in these computations. However, securities which had too many consecutive missing values (greater than 20) were excluded in both the EG and the CG's samples. For the selected sample firms, each missing value was treated as the average of the previous and the following day's values. All types of returns were then calculated in terms of the natural logarithm of the link (price) relative, i.e., ln(1 + return).

The entire period under study was broken down in to the following: 1) Pre-Announcement (Pre-A) Period = 255 days (June 1, 1973 to May 31, 1974), 2) Announcement Period - 5 days (June 3 to June 7, 1974), and 3) Post-Announcement (Post-A) Period -141 days (June 10 to December 31, 1974). The Intervention Period of three trading days was also defined commencing with day zero, the ED issuance date (Wednesday, June 5, 1974). Schematically, the four sub-periods are depicted in the following diagram:

Pre-A Period	Announcement Period					Post-A Period
			Int. Period			
	M	T	W	T	F	
	-2	-1	0	1	2	

June 5, 1974

The public announcement of the ED was evaluated in terms of its impact during the Announcement and Intervention periods. Therefore, the dummy variables in equations (8) and (9) assumed the assigned value of one's during these periods and the assigned values of zeroes during the remaining periods. General Linear Tests (F-tests) were performed for testing the following hypotheses: (1) H_o: δ_5 (DF) = δ_5 (EX) and (2) Ho: δ_3 (DF)=δ_3(EX) where the subscripts 5 and 3 denote five-days announcement and three-days intervention periods, respectively. Also, it should be noted that our sample periods (three and five days) are much shorter than those of Vigeland's (26 and 52 weeks) and thus more sensitive to a market reaction for the period investigated versus Vigeland's. For example, the market effects might reverse during this 26 week and 52 week periods, thus yielding an insignificant difference in the mean values. In other words, a "short term" effect is less likely to be detected vis-a-vis our methodology.

The statistical results of the study are summarized in Table 1 and Table 2. As shown in Table 1, no $\hat{\delta}$ - coefficients are statistically significant at the 0.05 level. The results of the F-tests in Table 2 also show that all F-values are not

statistically significant at the 0.05 level. Thus the null hypotheses constructed for either the five-days announcement period and the three-days intervention period cannot be rejected at the -.05 level of significance.

DISCUSSION OF RESULTS

The results of the study fail to provide evidence that the policy of accounting for R&D expenditures possesses information content. In general, then, our findings agree with those of Vigeland, in the sense that no market reaction was found after the release of the Exposure Draft. Our methodology in contrast, however, was more sensitive than his to an immediate reaction (our test period focused on five days, whereas Vigeland's encompassed 26 weeks). One reason for such results may have been that the market anticipated the provisions of the Exposure Draft and impacted the security prices of the affected firms prior to its official release. Indeed, Vigeland's results appear to partially support this thesis, for his significant findings occurred in the 26-week period prior to the issuance of the Exposure Draft.

Another potential reason for our findings is that, in contrast to such ED's as "Financial Accounting and Reporting by Oil and Gas producing Companies," very little public attention had been given to the FASB's Exposure Draft "Accounting for Research and Development Costs." For example, the Wall Street Journal reference to the issuance of the statement by the FASB was not released until June 10, 1974, five days after the issue date. Thus, the results might be a function of the degree of political exposure and the media discussion focused on the formulation of the ED.

In summary, our results do not indicate that this mandatory accounting change affected the market equilibrium of the sampled firms. Thus it appears that the release of the Exposure Draft did not engender a change in investors' expectations regarding the future prospects or operating policies of the affected firms. Or, perhaps to put it more succinctly, it was not perceived to affect their future "states of nature."

ENDNOTES

1 Two exceptions are those of Deakin (1976) who used intervention analysis, and of Benjamin and McEnroe (1981, 1983), who used a combined Interrupted Time Series (ITS) and Seemingly Unrelated Regression (SUR) model.

2 Exceptions are studies employing the use of the Hotelling T statistic as introduced by Gonedes (1975).

3 These advantages will be discussed in a later section of this work.

4 For example, see Buckley (1976), Rappaport (1977), Swieringa

(1972), Wyatt (1977), Berton (1978), Solomon (1978), Zeff (1978), and Gellein (1978).

5 Vigeland (1981), through incorporating the use of the Hotelling T2, addressed the issue of cross-sectional correlation. The advantage of the SUR over the Hotelling T2 is the ability to construct the regression models. If one can remove the cross-temporal correlation from the returns and is able to match the portfolios on industry, risk, etc., factors, the SUR and Hotelling T^2 should give comparable results. However, it should be noted that the T^2 will only state that the different reaction is either significant or insignificant. It will not say, for example, that a significant increase in one portfolio (i.e. deferred) rather than a significant decrease in the other portfolio (i.e. current expense), as the current methodology allows.

6 SAS user's Guide, 1979 Edition (Raleigh, North Carolina: SAS Institute Inc.), p. 131-36.

7 Ibid. p. 131.

8 Center for Research in Security Prices, Graduate School of Business, University of Chicago.

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