AN EMPIRICAL EVALUATION OF THE ASSOCIATION OF RECENT CHANGES IN THE SECURITIES' REGULATORY ENVIRONMENT WITH THE PREDICTIVE ABILITY OF QUARTERLY EARNINGS

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PREFACE

This study is concerned with the possible association between changes in the time series pattern of quarterly earnings numbers (specifically, predictability using a model relying on past quarterly data) with the effective dates of two accounting pronouncements. These are Accounting Principles Board Opinion #28 and Securities and Exchange Commission Accounting Series Release #177, both influencing the quarterly reporting process. The objective is to determine the possible effects of regulation upon an item of interest to investors, namely predictability.

The author wishes to express his appreciation to Dr. C. Dwayne Dowell and Dr. Elba F. Baskin for their guidance, assistance and motivation throughout this study.

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A special note of thanks is given to Dr. Don Holbert for his assistance in the choice of statistical tests and to Stanley C. Harris for his advice on computer programming.

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CHAPTER I

INTRODUCTION AND OVERVIEW

The purpose for conducting the research reported in this dissertation was to infer empirically whether two recent authoritative accounting pronouncements had a statistically significant impact on the predictability of future quarterly financial statement data. The authoritative pronouncements of concern were Accounting Principles Board Opinion #28 (APB #28)(1) and Securities and Exchange Comission (SEC) Accounting Series Release #177 (ASR #177)(42).

Background

The objectives of all external financial reporting center on one important idea. The idea is that external financial reports should be useful to investors in predicting future financial data. The idea exists and is said to be important because usefulness of external financial reports in the prediction sense can be related to high levels of social welfare (see for example, Ferguson and Gould [19] and Ball and Brown [51]) and high levels of social welfare are perceived as desirable. Accordingly, to the extent that external financial reports are not useful to investors, attempts to improve the reports are important.

By 1972 evidence existed suggesting that quarterly financial statements were of limited help to investors in their role as predictors. For example, research by Green and Segall (25, 26, 27, 28),

Niederhoffer (13, 40), and Reilly, Morgensen, and West (41) each concluded that quarterly financial statement data were marginally useful at best. The accounting profession responded with efforts to increase the utility to investors of quarterly reports. First, in mid-1973 the Accounting Principles Board, the profession's private sector rule making body at that time, issued its Opinion #28 entitled "Interim Financial Reporting" (1). Approximately two years later, the profession's public sector regulatory agency, the SEC, issued its ASR #177 entitled "Notice of Adoption of Amendments to Form 10-Q and Regulation S-X Regarding Interim Financial Reporting" (42).

The objective of APB #28 was to make quarterly reporting more compatible, in a sense, with annual reporting. The conceptual vehicle for accomplishing the objective was authoritative adoption of a comprehensive integral philosophy for interim reports. The philosophy was stated as follows:

> The usefulness of [interim] information rests on the relationship that it has to the annual results of operations. Accordingly, the Board has concluded that each interim period should be viewed primarily as an integral part of the annual period ([1] Part I, para. 9, p. 3).

The objective of ASR #177 was less obvious. Maybe the objective was APB #28 enforcement. Maybe the objective was simply full disclosure. But if the objective of the SEC mandate was unclear, its requirements were not. ASR #177 required auditor involvement with interim financial data through footnote disclosure of summarized quarterly data in the annual report. And while this footnote could be designated "unaudited" certain review procedures were required. The procedures included a review of internal accounting controls, a reading of corporate minutes,

and an inquiry of company executives as to questions that arose during the conduct of the other procedures. In this regard, Statement on Auditing Standards #10 (2) also called for

> . . . a systematic comparison of current financial information with that anticipated for the current period, with that of the immediately preceding interim period, and with that of the corresponding interim period of the previous year (para. 19).

Again, both APB #28 and ASR #177 were attempts by the accounting profession to improve external quarterly financial reports, particularly as those reports relate to the needs of investors to predict future financial data. To know whether the attempts were successful is important. To the extent that the attempts were successful, the direction for other reporting inprovement attempts may have been identified. To the extent that the attempts were not successful, efforts to undo the wrong may need to be inaugurated or supported. The implication was that a post APB #28/ASR #177 evaluation was necessary. A review of the accounting literature indicated that no such evaluation had been published. As stated earlier, the purpose of the research reported in this dissertation was related directly to that post evaluation need.

Scope

Ideally, a post evaluation of APB #38 and ASR #177 would have been in the nature of a complete cost versus benefit analysis, i.e. two-sided. The research reported in this dissertation was one-sided. The benefit side was examined. The cost side was ignored.

The cost side was ignored because of problems regarding cost identification and measurement. Regulation costs are unlike most

other costs in one major particular. Most other costs, at least those for which identification and measurement problems have been "resolved," relate to a circumscribed area of interest of manageable size. Consider manufacturing costs of an accounting entity as an example. In contrast, the area of interest for regulation costs is virtually unlimited. Put another way, the identification and measurement of all regulation costs associated with APB #28/ASR #177 would have required examination of all members of society or their agents. That task seemed unmanageable.

Obviously, to argue in the fashion above for the omission of cost considerations was dangerous since that argument could have been evoked against examining benefits as well. The argument was not evoked against the benefit side for two reasons. First, with cost considerations omitted, benefits did not have to be "valued" for the purpose of cost comparison. Second, benefits from improvement attempts of the sort under investigation stem largely if not entirely from a change in the predictability characteristic of future financial data. Therefore, the benefit analysis was reduced to the problem of inferring whether the improvement attempts had had an impact on that characteristic. That task seemed manageable.

Methodology and Sample

At least two approaches to benefit analysis were available. One of the approaches was to determine whether the underlying earnings process was mean reverting or martingale and whether managements

attempted to "smooth" reported earnings before APB #38 and ASR #177. Then, the post evaluation could have been done analytically. For example, to the extent that earnings were mean reverting and smoothed, a curtailment of smoothing by APB #28 or ASR #177 would have reduced predictability. However, a review of the accounting literature indicated that others had been unsuccessful in their attempts to identify the underlying earnings process conclusively and little, if any, reason existed for believing that another such attempt would be successful.

Another approach was chosen. That approach involved (1) identifying a reasonable prediction model, (2) using the model to generate predictions (or prediction errors) for a large cross-section of firms during periods before and after APB #28 and ASR #177, and (3) analyzing the prediction errors to infer empirically whether APB #28 or ASR #177 or both, had an impact on the predictability of future financial data.

The model which appeared most reasonable for this dissertation was $E(Q_t) = (Q_{t-1} - Q_{t-5}) + Q_{t-4}$ where E was the expectation operator and Q_t was a quarterly income statement item at time t. The income statement items, i.e. Q's, investigated were sales, income available to common, and primary earnings per share. Justifications for the model and the chosen income statement items are contained in Chapter II.

The model was applied to more than 500 COMPUSTAT firms for which 38 continuous quarters of data were available starting with the first quarter of 1969. The data were treated as if they conformed

to a randomized complete block design with subsampling. Analysis of variance (ANOVA) was used to make the desired statistical inferences.

Results and Conclusions

The results of the various data analyses were uniformly significant at the .01 level. In general, those results suggested that APB #28 alone was unsuccessful with regard to improving the predictability of future quarterly financial statement data. Predictability even appeared to decline during the time between the issuance of APB #28 and ASR #177. In contrast, after the issuance of ASR #177 predictability apparently increased to its highest level, i.e. APB #28 and ASR #177 operating in tandem seem to have been successful.

Limitations

Strictly speaking the results of this research are not generalizable. First, a population of firms rather than a sample of firms was examined. The population examined may not be representative of any larger population. Further, for the sake of analysis the data were treated as if they conformed to a randomized complete block design with subsampling, yet to be truthful no randomization procedures were possible.

Second, a single static prediction model was used. Investors may use other models, models for which the one used in this research are not representative.

Finally, this research was a benefit analysis only. Costs were ignored. And while technically the omission of cost considerations was a scope limitation rather than a limitation of the research that was conducted, that omission must be acknowledged as a limitation

of this research as this research relates to the overall scheme of post evaluations for authoritative pronouncements.

Summary of Chapters

Chapter I contains an introduction and overview of the research. Included in the chapter are background material, a statement of purpose, a scope description, a brief description of methodology and a discussion of the limitations of this research effort.

Chapter II contains a detailed description of the research methodology. Chapter III follows with a complete report of the data analyses originally proposed. Chapter IV is composed of an extension of the data analyses originally proposed, conclusions and suggestions for further research.

CHAPTER II

RESEARCH METHODOLOGY

This chapter contains a detailed specification and justification of the methodology employed to accomplish the purpose of the research underlying this dissertation. As outlined in Chapter I, the methodology involved (1) identifying a reasonable prediction model, (2) using the model to generate predictions (or prediction errors) for a large cross-section of firms during periods before and after APB #28 and ASR #177, and (3) analyzing the prediction errors to infer empirically whether APB #28 or ASR #177 or both had an impact on the predictability of future financial data. In addition, specific income statement items had to be chosen for prediction and appropriate means (error metrics) devised to measure and analyze changes in predictability.

Model Identification

To put the model identification problem in perspective, as that problem related to data availability, refer to Figure 1. The figure shows that only seven quarters of data were available between the effective dates of APB #28 and ASR #177. Only ten quarters of data were available after the effective date of ASR #177. Accordingly, an important characteristic of the model was that it had to be frugal in data requirements since to have employed a model that

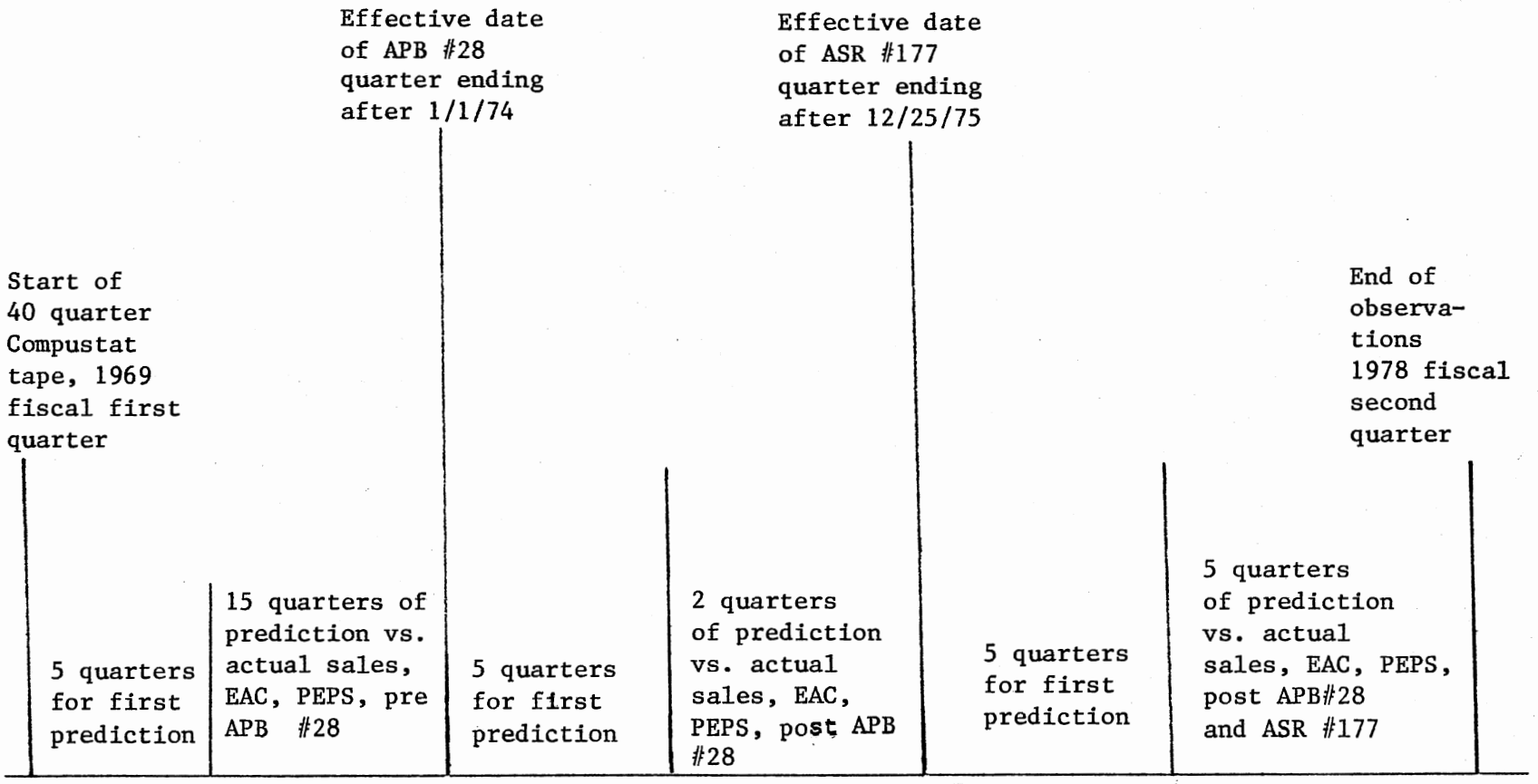

Figure 1. Time Line

used data from before APB #28 (ASR #177) to generate a prediction after APB #28 (ASR #177) would have led to confounding effects and corresponding difficulties of interpretation of results.

The data frugality requirement was the only model requirement uniquely imposed by the purpose of the research underlying this dissertation. All other model requirements were implied by published research on financial data prediction models. That research, discussed below, suggested that the model contain a seasonality component and an adjacent quarter component.

Lorek (34) investigated the time-series behavior of quarterly earnings of 30 firms over the 1958-73 period using the Box-Jenkins (36) methodology of Identification, Estimation, and Diagnostic checking. Box-Jenkins uses a recommended 50 minimum observations to establish the underlying process and then assumes the process does not change in the period(s) being predicted although mergers, acquisitions and management changes, among other things, may alter the process and render it less capable of prediction. Lorek found that:

> . . . Moving average models with seasonality factors were the more common identified model, followed by a sharp decrease in frequency to the mixed models (auto-regressive-moving average) with seasonality, autoregressive models with seasonality and purely seasonal models . . . . The time series properties of quarterly earnings data are at variance with the results of research concerned with the time series properties of annual earnings data. That is, the simple mean-revision model or the random walk model were not identified as the most appropriate model for any of the sample firms. . . . Seasonality factors were determined to be pervasive in the description of the quarterly earnings time series (p. 85).

Foster (21) tested the time series of quarterly sales, earnings and expenses (defined as sales less earnings) for 69 firms during 1946-74. He found the most commonly identified processes for all three series (sales, expenses and earnings) were:

> . . . consistent with quarterly series having an adjacent quarter-to-quarter component and a seasonal component. However, not all firms exhibit these two components.
>
> Either the first-differencing or seasonal-differencing is necessary to achieve stationarity for the sales series of all firms, the expense series of all but one firm and the earnings series of all but seven firms.
>
> Seasonal terms appear in most identified models. The earnings series of 64 firms, the sales series of 59 firms and the expense series of 54 firms included seasonal terms or seasonal differencing (p. 9).

He contrasted various models against Box-Jenkins models, and found his Box-Jenkins model six, incorporating up to 12 lagged variables, lacking in predictive ability compared to a more restricted model (five) relying on two variables. This was true for each of the three income statement components. He attributed the phenomenon to:

> . . . the problem of identifying Box-Jenkins models in finite samples. Some observed patterns in, say, the auto-correlation function may represent sampling variation rather than a component of the underlying time-series model. This sampling variation may lead to "overfitting" the sample data. . . . A second factor is the problem of estimating Box-Jenkins models in finite samples. Model five (the restricted Box-Jenkins model) usually involves fewer parameters than model six (the expanded Box-Jenkins model). Thus, model five has more degrees of freedom in the estimation of its parameters. A third factor is structural change (in the underlying process)(p. 17).

The possibility and problem of model misspecification was examined by Gonedes-Roberts (24). Using simulation, they designated an underlying model of $\tilde{y}_t = B_1 \tilde{y}_{t-1} + \tilde{e}_t$ and then predicted subsequent y_t using a random walk model ($\tilde{y}_t = \tilde{y}_{t-1} + \tilde{e}_t$). With B_1 set at .70 for

samples of 20 and .90 for samples of 60, they found a lower prediction error using the random walk model than when the true process was used in prediction. Foster (21) inferred from this that ". . . parsimonious models may perform very well, even though they may be an "incorrect" description of the underlying time series" (p. 4).

Griffin (29) also used Box-Jenkins applied to quarterly earnings for 94 firms over 1958-71. He did not mention any testing of his derived firm-specific models but did allude to ". . . an extreme risk of overfitting and overusing the data" (p. 75). Based on cross-sectional autocorrelation and partial autocorrelation functions, he suggested:

> Quarterly earnings may be . . . described as a . . . combination of two processes: one reflects the adjacent quarter movement, and the other reflects the . . . seasonality component (pp. 80, 81).

Lorek, McDonald and Patz (35) determined:

> . . . pervasive evidence of seasonality in the models. Thirty-five of the 40 time series (companies) analyzed required either seasonal parameters or seasonal differencing of the data (p. 328).

Watt's 175 firms (as referenced in Foster (21) showed (1) strong indications of seasonality in quarterly earnings and (2) evidence that adjacent quarterly earnings are dependent.

The interaction of the above seasonal and adjacent quarter component requirements with the data frugality requirement, suggested the following naive model:

$$E(Q_t = (Q_{t-1} - Q_{t-5}) + Q_{t-4}$$

where E is the expectation operator, and Q_t is a quarterly Income statement item at time t.

The seasonal component was captured via Q_{t-4} and the adjacent quarter requirement by Q_{t-1}. The term $(Q_{t-1} - Q_{t-5})$ incorporated trend over time in the income statement item. The model was sufficiently frugal in data requirements to permit the generation of two prediction errors per company between the effective dates of APB #28 and ASR #177 and five prediction errors per company after the effective date of ASR #177 (see Figure 1).

Income Statement Data Predicted

As indicated in Chapter I, the objective of APB #28 was to make quarterly reporting more compatible, in a sense, with annual reporting by adopting an integral philosophy for interim reports. This led to acceptance of expense allocation between or among quarters within a year, a procedure which had the potential for changing significantly the judgmental impact of management on the magnitude of total expense per quarter. In contrast, GAAP for quarterly revenues were the same as GAAP for annual revenues; i.e. APB #28 allowed much less room for managerial discretion on revenues than on expenses. Accordingly, reason existed to suspect that APB #28 and ASR #177, an SEC enforcement mechanism for APB #28, had an impact on the "top" of the income statement different from the impact on the "bottom" of the income statement. To gather evidence on this potentiality gross revenue (sales), earnings available for common stockholders (EAC), and primary earnings per share (PEPS) calculated according to APB Opinion 15 were chosen as the quarterly financial statement data to study.

Sample and Results of Model Application

The prediction model identified above was applied to the sales, EAC, and PEPS data of 549, 548, and 526 companies, respectively, for each of the quarters identified in Figure 1. Each of the companies appeared on the COMPUSTAT Quarterly Industrial Tape. Moreover, except as noted below, each COMPUSTAT company was included in the study if the company had 38 continuous quarters of sales, EAC and PEPS data available, starting with the first quarter of 1969. The result of applying the model was a set of paired observations, actual and predicted data, for each selected company for each income statement item for each of 22 quarters, arrayed in such a fashion as to allow references regarding predictability before APB #28, between APB #28 and ASR #177, and after ASR #177.

A problem existed for companies for which either a predicted or actual quarterly sales, EAC, or PEPS number was equal to zero. Since dividing by zero was undefined, some measures of prediction error, discussed below, were undefined. To remedy this situation, the small number of companies for which this occurred were excluded from the research effort.

One additional comment about the companies included in the research effort is important. The selected companies were treated as if they were a sample of companies. Yet to be truthful, the companies constitute a population rather than a sample and the population included in the study may or may not be representative of any larger population.

Error Metrics and Analysis

A large number of ways of measuring prediction errors existed and no obviously compelling, theoretical reason existed for choosing one or some and excluding others. However, to use all of the possible metrics seemed unmanageable. Accordingly, four representative metrics were chosen. The metrics were chosen based largely on their prominence in the predictability literature. The choice of four rather than one was justified on the grounds that more than one metric would provide greater insight than a sole measure, particularly in the absence of knowledge regarding investors' utility functions. The chosen metrics were:

$$E1_{ijk} = \left| \frac{P_{ijk} - A_{ijk}}{P_{ijk}} \right|$$

$$E2_{ijk} = \left(\frac{P_{ijk} - A_{ijk}}{A_{ijk}} \right)^2 \quad \text{(from Foster (21))}$$

$$E3_{ijm} = \frac{\sqrt{\frac{1}{n} \sum_{1}^{n} \left(P_{ijk} - A_{ijk} \right)^2}}{\sqrt{\frac{1}{n} \sum_{1}^{n} P_{ijk}^{\,2} + \frac{1}{n} \sum_{1}^{n} A_{ijk}^{\,2}}}$$

$$E4_{ijk} = \left| P_{ijk} - A_{ijk} \right|$$

where

$E(1,2,4)_{ijk}$ = error component (1, 2, 4) for income statement item i (sales, EAC, PEPS) and company j at quarter k,

$E3_{ijm}$ = error component 3 for income statement item i and company j at time period m where m can be either for quarters before APB #28 became effective ("prior"), after APB #28 became effective but before ASR #177 was required ("during"), or after both were effective ("post"),

P_{ijk} = predicted income statement item i for company j at quarter k (corresponding to "$E(Q_t)$" referred to previously), and

A_{ijk} = actual income statement item i for company j at quarter k (corresponding to "Q_t" referred to previously).

Identical calculations were performed on each of the three income statement items discussed above (sales, EAC, and PEPS). An individual error metric was computed for each company and each quarter with the exception of the metric E3 which was computed once for each company's "prior," "during," and "post" time periods.

In testing the hypothesis of no significant difference in predictability among the three aforementioned time segments, the analysis of variance (ANOVA) for a randomized complete block design with subsampling (30) was employed. "Blocks" corresponded to one company's data, "treatment" to the three time segments and "subsamples" to the computed quarterly error terms within a company's time period. Error terms E1, E2, and E4 were each evaluated with a separate randomized complete block ANOVA with subsampling. Due to the aggregate nature of its computation (Only one E3 term computed for each time period within a company), the analysis of E3 used a randomized complete block ANOVA without subsampling.

The AVOVA test assumes normality. To the extent the normality assumption is violated, the results may be misleading. In this research effort large deviations were possible for E1 and E2 when the denominator value was small. Consistent with others (e.g., Green and

Segall (26)) variation in E1 and E2 were damped arbitrarily by assigning a maximum possible value of 1.00.

The ANOVA test also assumes randomization procedures were employed; but no randomization procedures were possible in this study. Accordingly, for the sake of ANOVA applications, the data in this study simply were treated as if they conformed to a randomized complete block design with subsampling, a design for which ANOVA is conceptually applicable.

Summary

The purpose of this chapter was to specify and justify the methology employed in this predictability study. The chapter contained a discussion of (1) the prediction model chosen, with reasons for its choice, (2) the income statement items chosen for study and their justification, (3) the sample, (4) the prediction error metrics, and (5) the statistical tool chosen to analyze the error metrics. The results of applying the methodology are presented in Chapter III.

CHAPTER III

Chapter II contained a detailed specification of the methodology employed to accomplish the purpose of the research. This chapter contains a report of the results of applying that methodology.

Analysis of Variance Test: Sales

Table I is a reproduction of the Statistical Analysis System's Analysis of Variance procedure pertaining to sales as examined for 549 companies. The model was:

E1 = ICNUM + IPERD + ICNUM * IPERD + ERROR.

E1 was an error term defined briefly as (Expected Sales - Actual Sales)/Expected Sales. ICNUM was the qualitative or dummy variable for the four to six digit Compustat company numbers. IPERD was the qualitative or dummy variable for the three periods before the effective data of APB #28 ("1"), after APB #28 became effective but before ASR #177 was effective ("2") and after both had become required ("3"). The ICNUM *IPERD term was to account for interaction of the company and the period.

The model had 1,646 degrees of freedom, consisting of 548 for companies (549 companies less one for the company mean), two for periods (three periods less one for the period mean), and 1,096

TABLE I

ANOVA OF E1'S SALES TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 2

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	60.37053742	0.03667712	3.07	0.0001	0.326103	122.1587
ERROR	10431	124.75690385	0.01196021		STD DEV		E1 MEAN
CORRECTED TOTAL	12077	185.12744127			0.10936272		0.08952510

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	548	41.09636185	6.27	0.0001
IPERD	2	0.44100243	18.44	0.0001
ICNUM*IPERD	1096	18.83317314	1.44	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	0.44100243	12.83	0.0001

interaction terms (548 * 2). The model terms had an estimated variance as measured by their mean square error of .0366712. In comparison, the "Error" term, which measured variation other than among model terms, had an estimated variance as computed from its mean square error of .01196021. The ratio of the above mean square error was 3.07 which indicated that the estimated model variance was more than three times the unexplained variance. That computed F statistic, or one larger, had a probability of occurrence of less than .0001. Those results suggested that E1 varied significantly among companies or among periods or among company by period groupings.

Next, each of the above model terms were examined to see specifically where the variation existed. Companies differed significantly since the ANOVA produced an F statistic of 6.27 with an associated probability of less than .0001. The company by period interaction term differed significantly from the background level of variation though by a lesser amount. The F statistic of 1.44 was interpreted as meaning there was a 44 percent greater variation in the interaction than in variation accounted for by the model. With such a large number of observations and consequent degrees of freedom (1,096, 10,431), that F value was statistically significant at the .0001 level.

The period test was of primary interest. That test measured association between time periods which differed with respect to accounting or auditing constraints. For that test, the F value of 18.44 was highest of the three terms in the model. The resulting significance was at the same .0001 level. Thus, as E1 measured

predictability, sales were "predictable" from past data during the three periods of concern in significantly different degrees. The F value of 18.44 suggested that period to period comparisons were over 18 times as variable as the background variation.

The IPERD, or period test, also was performed with the ICNUM * IPERD, or company by period, interaction value as the error term. In this research project block effects were companies (or industries), treatment effects were periods, experimental error was the company by period interaction term (company by period within industry for industry tests) and sampling error was the residual error in the model. Under the assumption that company and period effects were fixed, the residual error term was the appropriate one to use for testing significance. The tests above reflect the use of residual error. However, since company and period effects were not necessarily fixed, the optional tests using interaction terms were also employed.

For the IPERD tests on data with E1 as the error metric, the F value continued to result in a high level of significance when the interaction term was used for error. The F value was 12.83. This was less than the 18.44 when this IPERD test was run using sampling error, though it was still at a high (.0001) level of significance. In general all tests demonstrated this same pattern of high significance no matter which error term was used, though significance dropped slightly under the assumption of a random effects model. Incidentally, the R-Square value indicated that the model accounted for approximately 32.6 percent of the variability in E1 with the remaining 67.4 percent unexplained.

Table II contains results regarding the variability of E1 with respect to Compustat industries. The 549 companies sampled were partitioned into 151 industries. The model became:

E1 = IDNUM + IPERD + IDNUM * IPERD + ERROR

where E1 was the previously defined measure of predictability for sales, IDNUM was the dummy variable for Compustat industries, IPERD was the previously defined code for "pre," "during," and "post" time periods, and IDNUM * IPERD was the interaction term for industry variability within a period.

Since the same companies were being tested, with only qualitative variables changed, the total sum of squares, R-square error, and other statistics remained the same as in the company test. Industries differed more than companies as shown by the F value which was 10.20 for industries, but only 6.27 for companies. This was confirmed when industries were tested with a new error term, ICNUM (IDNUM) from the estimated variance of companies within their respective industries. For this test, the F value was 2.13, interpreted as meaning the variability between industries was more than twice the variability of companies within a given industry. All the above tests were at the .0001 level of significance. The industry by period interaction was 1.73, greater than the company by period interaction of 1.44. This result was expected since industries (without reference to periods) were more variable than companies, also without considering periods. Lastly, even within an industry and a period, companies still were 32 percent more variable than

TABLE II

ANOVA OF E1'S SALES TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 6

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	60.37053742	0.03667712	3.07	0.0001	0.326103	122.1587
ERROR	10431	124.75690385	0.01196021		STD DEV		E1 MEAN
CORRECTED TOTAL	12077	185.12744127			0.10936272		0.08952510

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	18.41673057	10.20	0.0001
ICNUM(IDNUM)	397	22.67963128	4.78	0.0001
IPERD	2	0.44100243	18.44	0.0001
IDNUM*IPERD	302	6.25077125	1.73	0.0001
ICNUM*IPERD(IDNUM)	794	12.58240189	1.32	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	18.41673057	2.13	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	0.44100243	13.91	0.0001

the variation unexplained by the model. Even this relatively low F value of 1.32 was significant at the .0001 level.

E2 was another indicator of predictability, defined summarily as ([Expected Sales - Actual Sales]/Actual Sales)^2. The same tests were carried out on E2 as were carried out on E1, as shown by Tables III and IV. Results remained highly significant, with the primary "period" (IPERD) test being most significant, as before. All F values were at the .0005 level or less except when testing industry with the variation of companies within industries as an error term; for this the figure was .0012, still well within the generally accepted .01 to .05 range. R-Square was down a bit to .293 from the last mentioned .326 signifying the model "explained" a slightly smaller portion of total variation in E2 than in E1.

Another predictability indicator, E4 was defined as |Expected Sales - Actual Sales|. As such, it was not scaled by a divisor, and therefore, had a larger range, such that differences in variation were accentuated. Results (Tables V and VI) remained highly significant for all tests. The important IPERD test had an extremely high F statistic of 137.13, made possible due to the estimate of the variance between periods being over 137 times as large as the estimate of the unexplained variance. R-Square rose, also, for the first time going above 50 percent to .534. Thus, over half of the total variation was explained by modeled terms.

The term E3 was a summary measure and was specified in capsule form as follows:

TABLE III

ANOVA OF E2'S SALES TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 3

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	19.56606022	0.01188704	2.63	0.0001	0.293025	336.4156
ERROR	10431	47.20658257	0.00452560		STD DEV		E2 MEAN
CORRECTED TOTAL	12077	66.77264279			0.06727261		0.01999688

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	548	11.32761450	4.57	0.0001
IPERD	2	0.11272262	12.45	0.0001
ICNUM*IPERD	1096	8.12572309	1.64	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	0.11272262	7.60	0.0005

TABLE IV

ANOVA OF E2'S SALES TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 7

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	19.56606022	0.01188704	2.63	0.0001	0.293025	336.4156
ERROR	10431	47.20658257	0.00452560		STD DEV		E2 MEAN
CORRECTED TOTAL	12077	66.77264279			0.06727261		0.01999688

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	4.09420591	5.99	0.0001
ICNUM(IDNUM)	397	7.23340859	4.03	0.0001
IPERD	2	0.11272262	12.45	0.0001
IDNUM*IPERD	302	2.22362297	1.63	0.0001
ICNUM*IPERD(IDNUM)	794	5.90210012	1.64	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	4.09420591	1.49	0.0012

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	0.11272262	7.58	0.0005

TABLE V

ANOVA OF E4'S SALES TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 4

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	3103387.50626971	1885.41160770	7.27	0.0001	0.534335	183.3328
ERROR	10431	2704552.37393539	259.28025826		STD DEV		E4 MEAN
CORRECTED TOTAL	12077	5807939.88020510			16.10218179		8.78303342

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	548	2334015.51402751	16.43	0.0001
IPERD	2	71136.35587177	137.12	0.0001
ICNUM*IPERD	1096	698265.63637043	2.46	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	71136.35587177	55.80	0.0001

TABLE VI

ANOVA OF E4's SALES TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 8

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1646	3103387.59626969	1885.41160770	7.27	0.0001	0.534335	183.3328
ERROR	10431	2704552.37393541	259.28025826		STD DEV		E4 MEAN
CORRECTED TOTAL	12077	5807939.88020510			16.10218179		8.78303342

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	1048396.69176730	26.77	0.0001
ICNUM(IDNUM)	397	1285918.91226021	12.49	0.0001
IPERD	2	71106.35587177	137.12	0.0001
IDNUM*IPERD	302	363582.81891121	4.64	0.0001
ICNUM*IPERD(IDNUM)	794	334682.81745919	1.63	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	1048396.60176730	2.14	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	71106.35587177	84.35	0.0001

$$E3 = \frac{\sqrt{\frac{1}{n}(\text{Expected Sales} - \text{Actual Sales})^2}}{\sqrt{\frac{1}{n}(\text{Expected Sales})^2 + \frac{1}{n}(\text{Actual Sales})^2}}$$

where n was the number of observations for a company within a time period (15 for the "pre" period, two for the "during" period and five in the "post" time period) and summation was over these n observations. Thus, one E3 term was computed for each company's time period. The other measures (E1, E2 and E4) were computed several (15, five and two) times during each period ("pre," "during," and "post," respectively). Since a single E3 value was computed for a time period within a company, a company by period interaction term was not in the model. Instead, the model was:

E3 = company number ("ICNUM") + period ("IPERD") + error

As shown in Table VII, companies differed significantly with respect to E3 (F = 11.76) as did periods (F = 63.48).

Per Table VIII, the "industry" model was:

E3 = industry number ("IDNUM") + period ("IPERD")
+ IDNUM * IPERD + error

Variation among industries was significant both when the residual error term was used (F = 19.67) and when the variation of companies within an industry was used to test significance F = 1.70). Companies also differed significantly from one another within an industry (F = 11.59) as well as industries within a period (F = 1.63). The level of significance for all tests was .0001 or better. The R-square, or fraction of variation explained by the model was high .857 and .912 for the "non-industry" model and the model which

TABLE VII

ANOVA OF E3'S SALES TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 10

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	55	1.89437981	0.00344433	11.95	0.0001	0.857058	50.9163
ERROR	1096	0.31594967	0.00028828		STD DEV		E3 MEAN
CORRECTED TOTAL	1646	2.21032947			0.01697867		0.03334621

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	548	1.85777830	11.76	0.0001
IPERD	2	0.03660151	63.48	0.0001

TABLE VIII

ANOVA OF E3'S SALES TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:09 FRIDAY, MAY 25, 1979 12

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	852	2.01551608	0.00236563	9.64	0.0001	0.911862	46.9735
ERROR	794	0.19481340	0.00024536		STD DEV		E3 MEAN
CORRECTED TOTAL	1646	2.21032947			0.01566387		0.03334621

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	0.72893213	19.67	0.0001
ICNUM(IDNUM)	397	1.12884617	11.59	0.0001
IPERD	2	0.03660151	74.59	0.0001
IDNUM*IPERD	302	0.12113627	1.63	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	0.72893213	1.70	0.0001

incorporated industry data respectively. Table IX shows the Compustat company and industry numbers of the 549 specific companies and 152 specific industry examined.

After determining that significant differences existed between periods tested, the next item of interest was the specific differences in mean values for the predictability surrogates E1, E2, E3 and E4, broken down by periods. This information is presented below.

For E1 through E3, the lowest value was for the "post" period, indicating for these three predictability terms an increased ability of past data to predict future sales in the last period examined. For E1, E2 and E4, the highest numbers were in the "during" period, showing the least association between the expected and actual sales amounts.

Analysis of Variance Test: Earnings Available for Common Stock

A total of 548 companies in 152 industries (listed in Table X)[1] were examined. This was one less company than for the sales tests, due to the screeming procedure excluding companies whose expected value of earnings available for common stock was zero. The screening procedure provided infinite values for error term E1, computed as follows:

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[1]The excluded company was Compustat number 85928, in industry 3550. For a list of the names of all companies examined and excluded due to the above screen, see Appendix A.

TABLE IX

SALES TEST: MEAN VALUES FOR E1, E2, E3 AND E4 BY PERIOD

	"Pre" period	"During" period	"Post" period
E1	.091865	.098463	.078929
E2	.021989	.024952	.014737
E3	.038955	.033656	.037425
E4	7.127399	12.655581	12.200917

TABLE X

SALES TEST: COMPUSTAT COMPANY AND INDUSTRY NUMBERS OF SAMPLED COMPANIES

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
ICNUM	549	2040 2050 2060 2073 2080 2824 4626 6284 8230 9158 10202 10284 11662 13068 13716 13788 14752 17248 19087 19645 22249 23519 23753 23771 24703 24753 24843 25393 26573 26609 26681 27429 27591 27627 29639 32087 30719 31105 32177 33047 35231 35310 40555 42465 42627 44540 47483 53501 53627 57264 59165 59815 66050 67383 68887 69203 71707 71892 77455 81689 91797 92113 93545 95293 96086 99725 104303 105425 105655 115331 117043 119061 119529 120547 120655 121691 121897 122205 122781 124845 127055 134429 134449 137051 142339 144141 149123 150843 152357 153609 157177 158525 163267 165159 165339 170520 171106 171563 171870 172070 172172 181396 186000 186108 189486 196804 200273 201723 202795 203417 204525 204900 206039 206219 206741 206813 207192 208291 208453 209237 211452 212093 216237 216687 216705 216831 217210 217687 218675 220291 224003 224399 227129 227813 228255 228381 228669 229669 231129 231561 232525 235717 235811 236235 239577 244199 248631 250595 252741 253579 253651 254111 254687 255204 256353 258435 260003 260543 260561 261597 264359 264830 266093 266867 269803 276317 276461 277461 278058 278784 285695 285744 290371 291011 291641 297425 297659 300587 302747 307045 307387 313081 313549 313693 316438 317495 318315 319594 337354 337657 337819 338027 339711 341099 343172 343856 343861 344820 354010 359064 361556 362232 364730 364802 365550 366064 369352 369604 369730 370064 370514 370838 370856 371028 371352 373298 375766 377310 379565 382388 382748 383082 383492 384602 387478 390568 391090 398856 401370 401460 402064 406306 408326 412693 413342 416162 418056 419866 420758 422884 423452 427056 428146 428236 432948 433728 436506 439316 441074 441438 442272 442672 444859 445582 448510 449290 451380 451542 452308 452722 453258 456623 456866 457326 457470 457794 458702 459200 459578 460148 460380 460578 465632 465640 471016 481196 483008 486746 487656 487836 493080 493782 495620 498552 499040 500170 503755 501026 501044 503624 524462 525354 526264 531000 532457 538021 540414 546642 547779 549866 551120 552618 554528 556139 561246 565004 565821 571154 571630 571748 573890 574055 578473 578592 580628 582562 582834 584404 585072 586005 587541 588602 589331 591690 595390 597715 604739 611662 615394 620076 623555 624284 626320 628862 630854 635405 635632 635655 636418 637657 637734 637742 637776 644001 644239 648210 649840 651186 654086 654098 656041 656559 656780 657045 666807 667528 668367 677347 680665 683574 684065 688605 690620 690207 690326 690768 693506 694308 694478 694665 694886 696429 696593 702019 705540 709317 711106 714041 716544 717081 718167 719151 725038 725106 730196 731095 732827 736245 737628 737679 743107 744448 744567 747620 751277 752159 753228 754586 754713 755111 755281 759200 759457 760779 760981 761688 761695 761753 766481 769739 770519 770706 771044 775133 775371 775422 776678 776755 776806 781099 781258 782352 782684 784197 786514 793453 793897 797440 799850 803701 804498 806605 806823 809877 810640 811517 811850 812540 816323 819139 822737 824348 826546 826622 829658 830164 831865 832377 832407 833034 837004 838518 842400 843571 844861 845743 851783 852563 853326 853887 855192 857721 859298 861572 861589 862131 863314 863863 864261 866713 867017 867323 871565 871616 872356 872489 875127 876043 876553 878487 878555 879335 879369 882593 882848 882887 882895 884102 884425 884753 885392 885539 887224 892059 892872 893341 893553 894546 895861 895895 902182 903443 905581 909313 910688 912027 912078 912129 912503 912635 913017 913025 917508 918204 919796 922204 922408 922612 924138 927804 929032 929126 929769 931422 931643 932270 933169 934391 934408 940144 940688 942486 948849 955465 958043 959090 959805 960402 961548 962166 963320 966680 975876 977878 978165 984138 985514 989070 989399
IDNUM	152	1000 1041 1211 1311 1381 1520 1600 1700 2000 2010 2020 2030 2046 2048 2050 2065 2082 2085 2086 2111 2200 2270 2300 2400 2430 2510 2600 2649 2650 2711 2721 2750 2761 2790 2800 2810 2820 2830 2844 2850 2890 2911 2950 3000 3069 3079 3140 3210 3221 3241 3269 3270 3310 3320 3330 3350 3390 3429 3449 3452 3480 3494 3499 3510 3520 3531 3533 3536 3540 3550 3560 3568 3570 3573 3580 3600 3610 3630 3640 3651 3661 3662 3670 3679 3699 3711 3713 3714 3720 3728 3730 3740 3760 3811 3820 3823 3825 3830 3841 3861 3911 3931 3940 4011 4210 4511 4700 4811 4830 4911 4912 4922 4924 5050 5063 5093 5199 5211 5311 5411 5600 5812 5912 5944 5949 5961 5962 5980 5999 6023 6024 6025 6026 6027 6120 6400 6552 7011 7200 7213 7311 7349 7370 7392 7394 7399 7500 7830 7990 8060 8911 9997
IPERD	3	1 2 3

NUMBER OF OBSERVATIONS IN DATA SET = 12078

TABLE XI

EAC TEST: COMPUSTAT COMPANY AND INDUSTRY NUMBERS OF SAMPLED COMPANIES

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
ICNUM	548	2040 2050 2060 2073 2080 2824 4626 6284 8230 9158 10202 10284 11662 13068 13716 13788 14752 17248 19087 19645 22249 23519 23753 23771 24703 24753 24843 25393 26573 26609 26681 27429 27591 27627 29609 30087 30710 31105 32177 33047 35231 35310 40555 42465 42627 44540 47483 53501 53627 57264 59165 59815 66050 67383 68887 69203 71727 71892 77455 81689 91797 92113 93545 95293 96086 99725 104303 105425 105655 115331 117043 119061 119529 120547 120835 121691 121897 122205 122781 124845 127055 134429 134449 137051 142339 144141 149123 150843 152357 153609 157177 158525 163267 165159 165339 170520 171106 171583 171870 172070 172172 181396 186000 186108 189486 196864 200273 201723 202795 203417 204525 204900 206039 206219 206741 206813 207192 208291 208453 209237 211452 212093 216237 216687 216705 216831 217210 217687 218675 220291 224003 224399 227129 227813 228255 228381 228669 229609 231129 231561 232525 235717 235811 236235 239577 244199 248631 250595 252741 253579 253651 254111 254657 255204 258353 258435 260003 260543 260561 261597 264399 264830 266093 266867 269803 276317 276461 277461 278058 278704 280695 285744 290371 291011 291641 297425 297659 300587 302747 307045 307387 313081 313549 313693 316438 317495 318315 319594 337354 337657 337819 338027 339711 341099 343172 343856 343861 344820 354010 359064 361556 362232 364730 364802 365550 366064 369352 369604 369730 370064 370514 370838 370856 371028 371352 373298 375766 377310 379508 382388 382748 383082 383492 384802 387478 390568 391090 398856 401379 401460 402264 406306 409306 412693 413542 416162 418056 419866 420758 422894 423452 427056 428146 428236 432848 433728 438506 439316 441074 441408 442272 442672 444859 445582 448510 449290 451380 451542 452308 452722 453258 456623 456866 457326 457470 457794 458702 459200 459578 460146 460380 460578 465632 465640 471016 481196 483008 486746 487656 487836 493080 493782 495620 498552 499040 500170 500755 501026 501044 503624 524462 525354 526264 530000 532457 538021 540414 546642 547779 549866 551120 552618 554528 556139 561246 565004 565821 571154 571630 571748 573890 574055 578473 578572 580628 582562 582834 584404 585072 586005 587541 588602 589331 591690 595390 597715 604739 611662 615394 620076 623555 624284 626320 628862 630854 635405 635632 635655 636418 637657 637734 637742 637776 644001 644239 648216 649843 651186 654086 654098 656041 656559 656780 657045 666807 667528 668367 677347 680665 683574 684065 688605 690020 690207 690326 690768 693506 694308 694478 694665 694886 696429 696593 702019 705540 709317 711106 714041 716544 717081 718167 719151 725038 725106 730196 731095 732827 736245 737628 737679 743107 744448 744567 747620 751277 752159 753228 754586 754713 755111 755281 759200 759457 760779 760881 761688 761695 761753 766481 769739 770519 773706 771044 775133 775371 775422 776678 776755 776806 781088 781258 782352 782684 784197 786514 793453 793897 797440 799850 803701 804498 806605 806823 809877 810640 811517 811850 812540 816323 819139 822737 824348 826546 826622 828658 830164 831865 832377 832407 833034 837004 839518 842400 843571 844861 845743 851783 852553 853326 853887 855192 857721 861572 861589 862131 863314 863863 864261 866713 867017 867323 871565 871616 872036 872489 875127 876043 876553 878487 878555 879335 879369 882593 882848 882887 882895 884102 884425 884753 885342 885559 887224 892059 892892 893341 893553 894546 895861 895895 902182 903443 905581 909313 910688 912027 912078 912129 912503 912605 913017 913025 917508 918204 919796 922204 922408 922612 924138 927804 929032 929126 929709 931422 931643 932270 933169 934391 934408 940144 940688 942486 948849 955465 958043 959090 959805 960402 961548 962166 963320 966680 975876 977878 978165 984138 985514 989070 989399
IDNUM	152	1000 1041 1211 1311 1381 1520 1600 1700 2000 2010 2020 2030 2046 2048 2050 2065 2082 2085 2086 2111 2200 2270 2300 2400 2450 2510 2600 2649 2650 2711 2721 2750 2761 2790 2800 2810 2820 2830 2844 2850 2890 2911 2950 3000 3069 3079 3140 3210 3221 3241 3269 3270 3310 3320 3330 3350 3390 3429 3449 3452 3480 3494 3499 3510 3520 3531 3533 3536 3540 3550 3560 3568 3570 3573 3580 3600 3610 3630 3640 3651 3661 3662 3670 3679 3699 3711 3713 3714 3720 3728 3730 3740 3760 3811 3820 3823 3825 3830 3841 3861 3911 3931 3940 4011 4210 4511 4700 4811 4830 4911 4912 4922 4924 5053 5063 5093 5199 5211 5311 5411 5600 5812 5912 5944 5949 5961 5962 5980 5999 6023 6024 6025 6026 6027 6120 6400 6552 7011 7200 7213 7311 7349 7370 7392 7394 7399 7500 7830 7990 8060 8911 9997
IPERD	3	1 2 3

NUMBER OF OBSERVATIONS IN DATA SET = 12056

$$E1 = \frac{\text{Predicted EAC - Actual EAC}}{\text{Predicted EAC}}$$

Moodels employed were the same as for the sales tests. The ANOVA tests comparing companies' variations in predictability were significant at the .0001 level for E1, E2, E3 and E4 (Tables XII, XIII, XIV, XV, XVI, XVII, XVIII and XIX, respectively). That result was true when variation of companies within their respective industries (ICNUM(IDNUM)) or of the companies standing alone were tested. Also, variation between industries was significant at the .0001 level for E1 through E4 whether the model error term or the variation of companies within industries was used as the error term.

The IPERD or "period" test, which measured the significance of variations among the three periods, produced a significance level of .0001 for each of the error terms E1 through E4. As with the sales test, F values in the case of each of the above four error terms were highest for the period test (when compared to the company and industry tests).

The model explained from 45 percent to 85 percent of total variation as determined by R-Square. The lower of these values occurred in each of the E1 tests (Tables XII and XIII) and the higher was for the E3 test which incorporated industries as an independent variable (Table XIX).

Table XX is a listing of the means of the respective error terms separated into within period components. In every case, the

TABLE XII

ANOVA OF E1'S EAC TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 2

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1643	608.51903186	0.37037068	5.12	0.0001	0.446990	83.0256
ERROR	10412	752.85191013	0.07230618		STD DEV		E1 MEAN
CORRECTED TOTAL	12055	1361.37094198			0.26889808		0.32387371

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	547	413.78264268	10.46	0.0001
IPERD	2	7.02448423	48.57	0.0001
ICNUM*IPERD	1094	187.71190494	2.37	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	7.02448423	20.47	0.0001

TABLE XIII

ANOVA OF E1'S EAC TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 6

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1643	608.51903186	0.37037068	5.12	0.0001	0.446990	83.0256
ERROR	10412	752.85191013	0.07230618		STD DEV		E1 MEAN
CORRECTED TOTAL	12055	1361.37094198			0.26889808		0.32387371

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	197.66797733	18.10	0.0001
ICNUM(IDNUM)	396	216.11466535	7.55	0.0001
IPERD	2	7.02448423	48.57	0.0001
IDNUM*IPERD	302	67.68451095	3.10	0.0001
ICNUM*IPERD(IDNUM)	792	120.02739399	2.10	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	197.66797733	2.40	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	7.02448423	23.18	0.0001

TABLE XIV

ANOVA OF E2'S EAC TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 3

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1643	660.14673283	0.40179351	5.30	0.0001	0.455431	126.1883
ERROR	10412	789.35228657	0.07581178		STD DEV		E2 MEAN
CORRECTED TOTAL	12055	1449.49901939			0.27533940		0.21819733

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	547	444.33347278	10.71	0.0001
IPERD	2	5.65192582	37.28	0.0001
ICNUM*IPERD	1094	210.16133422	2.53	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	5.65192582	14.71	0.0001

TABLE XV

ANOVA OF E2'S EAC TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 7

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1643	660.14673283	0.40179351	5.30	0.0001	0.455431	126.1883
ERROR	10412	789.35228657	0.07581178		STD DEV		E2 MEAN
CORRECTED TOTAL	12055	1449.49901939			0.27533940		0.21819733

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	200.57992048	17.52	0.0001
ICNUM(IDNUM)	396	243.75355230	8.12	0.0001
IPERD	2	5.65192582	37.28	0.0001
IDNUM*IPERD	302	70.14625019	3.06	0.0001
ICNUM*IPERD(IDNUM)	792	140.01508404	2.33	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	200.57992048	2.16	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	5.65192582	15.99	0.0001

TABLE XVI

ANOVA OF E4'S EAC TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 4

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1093	159249.52779885	96.92606683	6.06	0.0001	0.488861	222.4707
ERROR	10912	166506.81989132	15.99181904		STD DEV		E4 MEAN
CORRECTED TOTAL	12005	325756.34769018			3.99897725		1.79752957

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	547	107316.80293552	12.27	0.0001
IPERD	2	4028.84332520	125.97	0.0001
ICNUM*IPERD	1094	47903.88153813	2.74	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4028.84332520	46.00	0.0001

TABLE XVII

ANOVA OF E4'S EAC TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 8

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1643	159249.52779885	96.92606683	6.06	0.0001	0.488861	222.4707
ERROR	10412	166506.81989132	15.99181904		STD DEV		E4 MEAN
CORRECTED TOTAL	12055	325756.34769018			3.99897725		1.79752957

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	43466.62900958	18.00	0.0001
ICNUM(IDNUM)	396	63853.17392594	10.08	0.0001
IPERD	2	4028.84332520	125.97	0.0001
IDNUM*IPERD	302	13666.91038544	2.83	0.0001
ICNUM*IPERD(IDNUM)	792	34236.97115269	2.70	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	43466.62900958	1.79	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4028.84332520	46.60	0.0001

TABLE XVIII

ANOVA OF E3'S EAC TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 10

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	549	157.62806536	0.28711852	6.68	0.0001	0.770174	68.5688
ERROR	1094	47.03755220	0.04299593		STD DEV		E3 MEAN
CORRECTED TOTAL	1643	204.66561756			0.20735461		0.30240389

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	547	154.27357525	6.56	0.0001
IPERD	2	3.35449011	39.01	0.0001

TABLE XIX

ANOVA OF E3'S EAC TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 2:56 FRIDAY, MAY 25, 1979 12

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	851	174.00565556	0.20447198	5.28	0.0001	0.850195	65.0633
ERROR	792	30.65996199	0.03871207		STD DEV		E3 MEAN
CORRECTED TOTAL	1643	204.66561756			0.19675384		0.30240389

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	69.78620685	11.94	0.0001
ICNUM(IDNUM)	396	84.48736840	5.51	0.0001
IPERD	2	3.35449011	43.33	0.0001
IDNUM*IPERD	302	16.37759020	1.40	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	151	69.78620685	2.17	0.0001

TABLE XX

EAC TEST: MEAN VALUES FOR E1, E2, E3 AND E4 BY PERIOD

	"pre"	"during"	"post"
E1	.32070	.396977	.303946
E2	.215869	.283121	.199212
E3	.316815	.349098	.241300
E4	1.404256	2.787353	2.581422

lowest value (indicating highest predictability) was in the "post", or most recent time period. The highest value was for the "during" period and the middle was for the "pre" time segment.

Thus, the ability of past EAC to predict future EAC fell off in the middle period, when only APB #28 was in effect. The predictability increased after companies were required to comply with both directives.

Analysis of Variance Test: Primary Earnings per Share

Table XXI is based on the same model as in the sales section, E1 = ICNUM + IPERD + ICNUM * IPERD + ERROR. The model had 1,577 degrees of freedom of which 525 was from companies (526 companies sampled less one for the mean), 2 from periods and 1,050 from company by period interaction. The number of companies examined (526) was less than for the sales test (549) due to the screening procedure which eliminated companies whose expected value was zero for any of the quarters surveyed. The 23 companies listed in Table XXII constitute the excluded units. Compustat company numbers are in the right hand column and four digit industry numbers are to the left. The 526 included units are in Table XXIII.

All tests performed on sales and EAC were also computed for PEPS, and all were significant at the .0001 level. As before, the period ("IPERD") test had the highest F value, this time 28.43. Thus, the mean value for the predictive ability measure E1 differed

TABLE XXI

ANOVA OF E1'S PEPS TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 2

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	527.73957448	0.33464780	4.00	0.0001	0.386675	84.4327
ERROR	9994	837.07334618	0.08375759		STD DEV		E1 MEAN
CORRECTED TOTAL	11571	1364.81292066			0.28940903		0.34276903

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	525	344.64142509	7.84	0.0001
IPERD	2	4.76268355	28.43	0.0001
ICNUM*IPERD	1050	178.33526584	2.03	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4.76288355	14.02	0.0001

TABLE XXII

COMPUSTAT COMPANY AND INDUSTRY NUMBERS OF COMPANIES INCLUDED IN THE SALES TEST BUT EXCLUDED FROM THE PEPS TEST

THIS CO HAD ED=0	2200	851763
THIS CO HAD ED=0	2450	892059
THIS CO HAD ED=0	2830	449290
THIS CO HAD ED=0	2890	53627
THIS CO HAD ED=0	3079	775133
THIS CO HAD ED=0	3241	370514
THIS CO HAD ED=0	3449	457794
THIS CO HAD ED=0	3499	871565
THIS CO HAD ED=0	3510	690020
THIS CO HAD ED=0	3573	68887
THIS CO HAD ED=0	3630	876043
THIS CO HAD ED=0	3679	285695
THIS CO HAD ED=0	3679	878555
THIS CO HAD ED=0	3730	170520
THIS CO HAD ED=0	3820	672056
THIS CO HAD ED=0	3841	67383
THIS CO HAD ED=0	3940	418056
THIS CO HAD ED=0	4511	135425
THIS CO HAD ED=0	4700	157051
THIS CO HAD ED=0	5411	781258
THIS CO HAD ED=0	5912	231129
THIS CO HAD ED=0	7370	465040
THIS CO HAD ED=0	8060	235717

TABLE XXIII

PEPS TEST: COMPUSTAT COMPANY AND INDUSTRY NUMBERS OF SAMPLED COMPANIES

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 5

ANALYSIS OF VARIANCE PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
ICNUM	526	2040 2050 2060 2073 2080 2824 4626 6284 8230 9158 10202 10284 11662 13068 13716 13788 14752 17248 19087 19645 22247 23519 23753 23771 24703 24753 24843 25393 26573 26609 26681 27429 27591 27627 29609 30087 30710 31105 32177 33047 35231 35310 40555 42465 42627 44540 47483 53501 57264 59165 59815 66050 69203 71707 71892 77455 81689 91797 92113 93545 95293 96086 99725 104303 105655 115331 117043 119061 119529 120547 120655 121691 121897 122205 122781 124845 127055 134429 134449 142339 144141 149123 150843 152357 153609 157177 158525 163267 165159 165339 171136 171583 171870 172170 172172 181396 186000 186108 189486 196864 200273 201723 202795 203417 204525 204900 206039 206219 206741 206813 207192 208291 208453 209237 211452 212093 216237 216687 216705 216831 217210 217687 218675 220291 224003 224399 227129 227813 228255 228381 228669 229669 231561 232525 235811 236235 239577 244199 248631 250595 252741 253579 253651 254111 254687 255264 258363 258435 260003 260543 260561 261597 264399 264836 266093 266867 269803 276317 276461 277461 278058 278764 285744 290371 291011 291641 297425 297659 300587 302747 307045 307387 313081 313549 313693 316438 317495 318315 319594 337354 337657 337819 338027 339711 341099 343172 343856 343861 344820 354019 359064 361556 362232 364730 364802 365550 366064 369352 369604 369730 370064 370858 370856 371028 371352 373258 375766 377316 379568 382388 382748 383082 383492 384802 387478 390568 391090 398856 401370 401460 402364 406306 408306 412693 413342 416162 419866 420758 422884 423452 427656 428146 428236 432948 433728 438506 439316 441074 441488 442272 442672 444859 445582 448510 451380 451542 452208 452722 453258 456623 456666 457326 457470 458702 459200 459578 460146 460380 460578 465632 471016 481196 483008 486746 487656 487836 493060 493782 495620 498552 499040 500170 500755 501026 501044 503624 524462 525354 526264 530300 532457 538021 540414 546642 547779 549866 551120 552618 554528 556139 561246 565004 565821 571154 571630 571748 573390 574056 576473 573592 580628 582562 582834 584404 585072 586065 587541 588602 589331 591690 595390 597715 604739 611662 615394 620076 623555 624284 626320 628862 630854 635405 635632 635655 636418 637657 637734 637742 637776 644001 644239 648210 649840 651186 654086 654098 656041 656559 656780 657045 666807 667528 668367 677347 680665 683574 684065 688605 690207 690326 690768 693506 694308 694478 694665 694886 696429 696593 702019 705540 709317 711106 714041 716544 717081 718167 719151 725038 725106 730196 731095 732827 736245 737628 737679 743107 744448 744567 747623 751277 752159 753228 754586 754713 755111 755281 759200 759457 760779 760881 761688 761695 761753 766481 766739 770519 770706 771044 775371 775422 776678 776755 776806 781068 782352 782684 784197 786514 793453 793857 797440 799850 803701 804498 806605 806823 809877 810640 811517 811850 812540 816323 819139 822737 824348 826546 826622 828658 830164 831865 832377 832407 833034 837004 838518 842400 843571 844861 845743 852563 853326 853387 855192 857721 859298 861572 861589 862131 863314 863863 864261 866713 867017 867323 871616 872489 875127 876555 876467 879335 879369 882593 882848 882887 882895 884102 884425 884753 885392 885539 887224 892892 893341 893523 894546 895861 895895 902182 903443 905581 909313 910688 912027 912078 912129 912503 912605 913017 913025 917500 918234 919796 922204 922408 922612 924138 927804 929032 929126 929769 931422 931643 932270 933169 934391 934400 940144 940688 942486 948849 955465 958043 959090 959805 960402 961548 962166 963320 966680 975876 977878 978165 984158 985514 989070 989399
IDNUM	151	1000 1041 1241 1311 1381 1520 1600 1700 2000 2010 2020 2030 2046 2048 2050 2065 2082 2085 2086 2111 2200 2270 2300 2400 2450 2510 2600 2649 2650 2711 2721 2750 2761 2790 2800 2810 2820 2830 2844 2850 2890 2911 2950 3000 3069 3079 3140 3210 3221 3241 3269 3270 3310 3320 3330 3350 3390 3429 3449 3452 3480 3494 3499 3510 3520 3531 3533 3536 3540 3550 3560 3568 3570 3573 3580 3600 3610 3630 3640 3651 3661 3662 3670 3679 3699 3711 3713 3714 3720 3726 3730 3740 3760 3811 3820 3823 3825 3830 3841 3861 3911 3931 3940 4011 4210 4511 4811 4830 4911 4912 4922 4924 5050 5063 5093 5199 5211 5311 5411 5600 5812 5912 5944 5949 5961 5962 5980 5999 6023 6024 6025 6026 6027 6120 6400 6552 7011 7200 7213 7311 7349 7370 7392 7394 7399 7500 7830 7990 8060 8911 9997
IPERD	3	1 2 3

NUMBER OF OBSERVATIONS IN DATA SET = 11572

significantly between the "pre," "during," and "post" time periods and between companies. Table XXIV shows similar significance differences between industries. The ANOVAs of E2, E3 and E4 produced similar significance levels for all tests, .0001; see Tables XXV, XXVI, XXVII, XXVIII, XXIX, and XXX. The R-Square values, representing the percentages of total variation "explained" by the model, ranged from 38 percent (Tables XXIX and XXX, the E4 tests) to 76 percent (Table XXVIII, the E3 test which incorporated industries and companies).

Table XXXI is a comparison of the individual error means by period. For E1, E2 and E3 the "pre" period was intermediate, "during" was highest and "post" was lowest. The E4 examination revealed the same pattern except the "pre" and "post" ranks were exchanged. Thus, in every case the "during" period showed the least ability of past data to predict future primary earnings per share.

Summary

In summary, values for the predictability surrogates E1 through E4 for three time periods were computed for each of over 500 companies. The values for each predictability surrogate were averaged by time period resulting in 12 values for each of the income statement numbers, sales, EAC and PEPS. The pattern of averages were examined to infer the impact of APB #28, ASR #177, or both on the predictability of sales, EAC, and PEPS. Those patterns are displayed in Table XXXII.

TABLE XXIV

ANOVA OF E1'S PEPS TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 6

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	527.73957448	0.33464780	4.00	0.0001	0.386675	84.4327
ERROR	9994	837.07334618	0.08375759		STD DEV		E1 MEAN
CORRECTED TOTAL	11571	1364.81292066			0.28940903		0.34276903

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	172.21455092	13.71	0.0001
ICNUM(IDNUM)	375	172.42687417	5.49	0.0001
IPERD	2	4.76268355	28.43	0.0001
IDNUM*IPERD	300	65.44198612	2.60	0.0001
ICNUM*IPERD(IDNUM)	750	112.89327973	1.80	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	172.21455092	2.59	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4.76268355	15.82	0.0001

TABLE XXV

ANOVA OF E2'S PEPS TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 3

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	587.04377948	0.37225351	4.19	0.0001	0.397936	125.5687
ERROR	9994	888.17872009	0.08887119		STD DEV		E2 MEAN
CORRECTED TOTAL	11571	1475.22249956			0.29811272		0.23741312

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	525	380.01624773	8.14	0.0001
IPERD	2	4.40308868	24.77	0.0001
ICNUM*IPERD	1050	202.62444307	2.17	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4.40308868	11.41	0.0001

TABLE XXVI

ANOVA OF E2'S PEPS TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 7

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	587.04377948	0.37225351	4.19	0.0001	0.397936	125.5687
ERROR	9994	888.17872009	0.08887119		STD DEV		E2 MEAN
CORRECTED TOTAL	11571	1475.22249956			0.29811272		0.23741012

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	179.32044179	13.45	0.0001
ICNUM(IDNUM)	375	200.69580594	6.02	0.0001
IPERD	2	4.40308868	24.77	0.0001
IDNUM*IPERD	300	72.32520782	2.71	0.0001
ICNUM*IPERD(IDNUM)	750	130.29923525	1.95	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	179.32044179	2.23	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	4.40308868	12.67	0.0001

TABLE XXVII

ANOVA OF E3'S PEPS TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 10

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	527	144.28796893	0.27379121	3.18	0.0001	0.614971	53.5055
ERROR	1049	90.33757942	0.08611781		STD DEV		E3 MEAN
CORRECTED TOTAL	1576	234.62554835			0.29345836		0.54846411

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	525	137.98529862	3.05	0.0001
IPERD	2	6.30267031	36.59	0.0001

TABLE XXVIII

ANOVA OF E3'S PEPS TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 12

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E3

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	827	178.69488166	0.21607604	2.89	0.0001	0.761617	49.8237
ERROR	749	55.93066668	0.07467379		STD DEV		E3 MEAN
CORRECTED TOTAL	1576	234.62554835			0.27326505		0.54846411

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	58.69840136	5.24	0.0001
ICNUM(IDNUM)	375	79.28689726	2.83	0.0001
IPERD	2	6.30267031	42.20	0.0001
IDNUM*IPERD	300	34.40691274	1.54	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	58.69840136	1.85	0.0001

TABLE XXIX

ANOVA OF E4'S PEPS TEST ON COMPANIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 4

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	1132.04495557	0.71784715	3.92	0.0001	0.382251	200.7400
ERROR	9994	1829.47918013	0.18305775		STD DEV		E4 MEAN
CORRECTED TOTAL	11571	2961.52413571			0.42785249		0.21313766

SOURCE	DF	ANOVA SS	F VALUE	PR > F
ICNUM	525	570.42697103	5.94	0.0001
IPERD	2	22.43465716	61.28	0.0001
ICNUM*IPERD	1050	539.18332739	2.81	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	22.43465716	21.84	0.0001

TABLE XXX

ANOVA OF E4'S PEPS TEST ON INDUSTRIES AND PERIODS

S T A T I S T I C A L A N A L Y S I S S Y S T E M 1:51 FRIDAY, MAY 25, 1979 8

ANALYSIS OF VARIANCE PROCEDURE

DEPENDENT VARIABLE: E4

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1577	1132.04495557	0.71784715	3.92	0.0001	0.382251	200.7400
ERROR	9994	1829.47918013	0.18305775		STD DEV		E4 MEAN
CORRECTED TOTAL	11571	2961.52413571			0.42785249		0.21313766

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	253.94488126	9.25	0.0001
ICNUM(IDNUM)	375	316.48208977	4.61	0.0001
IPERD	2	22.43465716	61.28	0.0001
IDNUM*IPERD	300	176.34431952	3.21	0.0001
ICNUM*IPERD(IDNUM)	750	362.83900787	2.64	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IDNUM	150	253.94488126	2.01	0.0001

TESTS OF HYPOTHESES USING THE ANOVA MS FOR ICNUM*IPERD(IDNUM) AS AN ERROR TERM

SOURCE	DF	ANOVA SS	F VALUE	PR > F
IPERD	2	22.43465716	23.19	0.0001

TABLE XXXI

PEPS TEST: MEAN VALUES FOR E1, E2, E3 AND E4 BY PERIOD

	"pre"	"during"	"post"
E1	.342240	.400958	.321430
E2	.235932	.293077	.216549
E3	.553470	.622162	.458715
E4	.184216	.309011	.261554

TABLE XXXII

SALES, EAC AND PEPS MEAN VALUE ERROR TERM TREND LINES

	Sales	EAC	PEPS
E1			
E2			
E3			
E4			

In every case the pattern of error metric indicated a decline from the middle to the last period, meaning an increase in predictability as a result of ASR #177. In 11 of the 12 instances the middle period exhibited the largest value, meaning lowest ability of past data to predict future data. Also, in 11 of 12 instances an increase in the mean error metric was exhibited between the first and middle periods showing a decrease in predictability as a result of APB #28. Only one error metric pattern, E3 in the sales category, suggested that APB #28 was effective in increasing predictability of income statement data.

The purpose of this chapter was to present the results of applying the methodology specified in Chapter II. The next chapter contains, in addition to the usual research summary, an explanation of these results and an extension of the research reported thus far.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND EXTENSIONS

This chapter contains a summary of the research effort reported in previous chapters and an attempt to explain the results which otherwise may appear unreasonable. This chapter also contains a brief report on an extension of the research effort. The extension was suggested by the results in Chapter III and the attempt below to explain those results. Finally, this chapter contains a discussion of the limitations of the research, including the extension, and suggestions for further research.

Summary

Research was performed in which comparisons were made between actual and predicted quarterly income statement numbers in three different time periods. The purpose of the research was to infer empirically whether significantly different deviations between predicted and actual amounts occurred in time segments differentiated by the presence or absence of authoritative accounting pronouncements. The pronouncements were APB #28 and ASR #177 and the time periods were (1) before APB #28, (2) between APB #28 and ASR #177 and (3) after ASR #177.

Predictions for each of three economic statement items were computed using the model $E(Q_t) = (Q_{t-1} - Q_{t-5}) + Q_{t-4}$. Prediction errors were defined and measured in four different ways. The analysis

of variance technique of the Statistical Analysis System package was used to analyze the values of each of the error terms for each of the income statement items. In the context of those analyses, time periods were considered to be "treatments," companies (industries when applicable) were "blocks," and individual companies (industries when applicable) constituted sub-samples.

The results of the various data analyses were uniformly significant at the .01 level. In general, those results suggested that APB #28 alone was unsuccessful with regard to improving the predictability of future quarterly financial statement data. Predictability even appeared to decline during the time between the issuance of APB #28 and ASR #177. In contrast, after the issuance of ASR #177 predictability apparently increased to its highest level, i.e. APB #28 and ASR #177 operating in tandem seemed to have been successful.

Explanation

Taken together the above results (i.e., the pattern of predictability) seemed unreasonable. For example, if APB #28 (a substantive document) changed the predictability of income statement numbers, then ASR #177 (an APB #28 enforcement document) should have had little or no impact on predictability; and whatever slight impact ASR #177 did have, the impact should have reinforced rather than diminished the APB #28 impact. In contrast, if APB #28 did not change the predictability of income statement numbers because those numbers reflected the substance of APB #28 before its issuance, all three time periods should have shown the same degree of predictability; or if APB #28 had no impact in the sense that managements refused to comply until

forced to do so via ASR #177, the periods before and immediately after APB #28 should have shown the same degree of predictability and the period after ASR #177 possibly a different degree of predictability. Since the observed pattern of predictability and those patterns which seemed reasonable were incongruous an investigation was conducted to explain the observed pattern. That investigation unearthed one important macro phenomenon that could account for the incongruity.

The phenomenon was the 1974-75 economic recession. Interestingly, the duration of that recession corresponded very closely to the period of time from which data were used to generate predictions for the "during" period (the period between APB #28 and ASR #177) while the actual amounts for the "during" period were from more normal times (last two quarters of 1975). Thus the recession could have distorted (indeed, likely did distort) the predictability inferences for the "during" period and this likely distortion suggested that the statistical tests should be repeated with the "during" period dropped or omitted. The results of repeating the tests are referred to as the "during period dropped" test and are reported below under the heading EXTENSION.

However, before reporting the results of the "during period dropped" test, one point about the explanation and extension deserves emphasis. The point is that both the explanation and the extension tests were necessary because of the pattern of predictability inferences, not because of either of the inferences considered independently. Put another way, a change in GAAP (APB #28) or a closer adherence to GAAP via a change or broadening of generally accepted auditing

standards (ASR #177) could have either increased or decreased the predictability of income statement numbers, but not both. If managements had been successfully smoothing income statement numbers in the "pre" period, injection of smoothing limitations via APB #28/ASR #177 could have reduced predictability. On the other hand, if attempts to smooth income statement numbers in the "pre" period had been counterproductive (a possibility suggested by Ball and Watts [6]), limitations on smoothing actions could have increased predictability. But it seemed highly unlikely that voluntary application of a change in GAAP (APB #28) and forced application of a change in GAAP (ASR #177) could have produced opposite predictability inferences on average across a very large cross-section of American enterprises.

Extension

Table XXXIII contains a summary of the "during period dropped" test for each of the three income statement components--sales, earnings available for common (EAC) and primary earnings per share (PEPS). The mean value of a given error term (E1, E2, E3, or E4 for an income statement component is the bottom number in each matrix cell.

As an example, E1 for the sales component had a mean of .091865 for the "pre" period and .078929 for the "post" period. That reduction in mean values indicated a reduction in the difference between the predicted and actual sales numbers of an increase in predictability as a result of APB #28/ASR #177 and is portrayed by the downward sloping line above .078929. The two asterisks (*, *) above .098165 signify that the ANOVA indicated a significant difference in the two means at the .0001 level using either a fixed or random effects model.

TABLE XXXIII

MEAN PERIOD VALUES, TREND LINES, AND SIGNIFICANCE LEVELS

	During Period Dropped					
	Sales		EAC		PEPS	
	Pre	Post	Pre	Post	Pre	Post
E1	*, *	\	.0046,.0908	\	.0015,.0407	\
	.091865	.078929	.320769	.303946	.342124	.321430
E2	*, *	\	.0060,.1143	\	.0024,.0590	\
	.021089	.014737	.215869	.199212	.236932	.216579
E3	*	\	*	\	*	\
	.038955	.027425	.316815	.2413	.55347	.468715
E4	*, *	/	*, *	/	*, *	/
	7.127399	12.200917	1.404256	2.581422	.184216	.261554

Both models were used for the sake of rubustness, although the fixed effects model was likely more applicable. Whenever significance was higher than .0001, actual amounts are shown for the fixed and random models, respectively. For E3, the fixed and random models were congruous; hence a single significance number is reported for E3.

A pattern of trend lines connecting the mean values "pre" and "post" emerged. E1, E2, and E3 showed a downward trend over all three income statement components and all were significant at the .01 level under fixed model assumptions. The E4 term, also significant, showed an upward trend. Moreover, E1, E2, and E3 showed an upward trend from sales to EAC to PEPS while E4 showed a downward trend. Accordingly, at first glance, E4 appeared to be inexplicably inconsistent with E1, E2, and E3. On closer examination, however,

the inconsistency seemed explicable. Recall that the error metrics E1, E2, E3, and E4 were defined as follows:

$$E1 = \left|\frac{P - A}{P}\right|$$

$$E2 = \left(\frac{P - A}{A}\right)^2$$

$$E3 = \frac{\sqrt{\frac{1}{n}\sum_{1}^{n}(P - A)^2}}{\sqrt{\frac{1}{n}\sum_{1}^{n}P^2 + \frac{1}{n}\sum_{n}^{1}A^2}}$$

$$E4 = |P - A|$$

Now notice that E4 is an absolute error metric whereas E1, E2, and E3 are akin to percentage error metrics in the sense that each is tempered by a divisor. Then, recall the arithmetic property that increasing absolute errors can be accompanied by decreasing percentage errors if the base (divisor) increases at a more rapid rate than the numerator. Therefore, the conclusions of this analysis and of the research were as follows:

(1) The issuance of APB #28 and ASR #177 were accompanied by a significant decrease in predictability of sales, earnings available to common and primary earnings per share if prediction error is defined in absolute terms, although,

(2) the issuance of APB #28 and ASR #177 were accompanied by a significant increase in predictability of sales, earnings available to common and primary earnings per share if prediction error is defined in terms similar to percentage error.

Limitations

Some limitations of the research reported in this dissertation were summarized in Chapter I. Due to custom, those limitations are reiterated here.

Strictly speaking the results of this research are not generalizable. First, a population of firms rather than a sample of firms was examined. The population examined may not be representative of any larger population. Further, for the sake of analysis the data were treated as if they conformed to a randomized complete block design with subsampling, yet to be truthful no randomization procedures were possible.

Second, a single static prediction model was used. Investors may use other models, models for which the one used in this research was not representative.

Finally, this research was a benefit analysis only. Costs were ignored. And while technically the omission of cost considerations was a scope limitation rather than a limitation of the research that was conducted, that omission must be acknowledged as a limitation of this research as this research relates to the overall scheme of post evaluations for authoritative pronouncements.

Recommendation for Further Research

This study found inconsistencies, although explicable inconsistencies, in the temporal direction of change among the four error metrics. Unfortunately, the metric most compatible with investors' loss functions is not known. Therefore, isolating the actual loss

function of investors, though difficult, would increase both the realism and definitiveness of this and similar studies.

This study used a single static prediction model. Additional research based on other prediction models might provide more insight regarding the impact of APB #28 and ASR #177. Related to this suggestion are the notions that repeating the methodology on individual industries might point out differences among industries regarding the impact of the two authoritative documents and differential impacts might be revealed by comparing companies segregated by financial, rather than line of business characteristics.

Finally, this study was based on data that were unadjusted for the effects of general price level changes, i.e. the effects of inflation or deflation. Yet the "pre" and "post" period data may have been tainted in different ways by the intervening recession. Accordingly, additional insight might be provided by repeating the research on data stated in real rather than nominal terms.

Concluding Remarks

The purpose for conducting the research reported in this dissertation was to infer empirically whether two recent authoritative accounting pronouncements had a statistically significant impact on the predictability of future quarterly financial statement data. Subject to the limitations discussed earlier that purpose has been accomplished. Yet this study and similar ones leave an important void in accounting literature. In particular, this study was a benefit analysis only. Costs were ignored. Until a mechanism is devised to permit, efficiently and effectively, the examination of costs associated with authoritative

pronouncements, such studies will remain undefinitive with respect to policy implications for authoritative accounting bodies. Therefore, the most important challenge of the accounting profession may be development of this mechanism. Without it "post" evaluations will continue to be one-sided.

SELECTED BIBLIOGRAPHY

1. Accounting Principles Board, "Interim Financial Reporting," APB Opinion #28 (May, 1973).

2. AICPA, "Limited Review of Interim Financial Information," Statement on Auditing Standards #10 (December, 1975).

3. AICPA, "Reports on a Limited Review of Interim Financial Information," Statement on Auditing Standards #13 (May, 1976).

4. Albrecht, W. Steve, Lookabill, Larry L., and McKeown, James C., "The Times-Series Properties of Annual Earnings," Journal of Accounting Research (Autumn, 1977), pp. 226-244.

5. Ball, Ray, and Brown, Philip, "An Empirical Evaluation of Accounting Income Numbers," Journal of Accounting Research (Autumn, 1968), pp. 159-178.

6. Ball, Ray, and Watts, Ross, "Some Times Series Properties of Accounting Income," Journal of Finance (June, 1972), pp. 663-682.

7. Baskin, Elba F., Boatsman, James E., and Crooch, G. Michael, "Measurement Errors in Interim Reports: A Study of the Pervasiveness of the Information Set Impounded in Security Prices," unpublished manuscript (1976), Oklahoma State University.

8. Beaver, William, "The Time Series Behavior of Earnings," Empirical Research in Accounting: 1970, supplement to Journal of Accounting Research (Vol. VIII), pp. 62-99.

9. Benston, George J., "The Value of the SEC's Accounting Disclosure Requirements," The Accounting Review (July, 1969), pp. 515-538.

10. _____. "Required Disclosure and the Stock Market: An Evaluation of the Securities Exchange Act of 1934," American Economic Review (March, 1973), pp. 132-155.

11. Brealey, Richard A., An Introduction to Risk and Return from Common Stocks (Cambridge: M. I. T. Press), 1969.

12. Briner, Russell, "An Empirical Study of the Association between Alternative Measures of Earnings per Share and the Behavior

of Security Prices 1969-1972," doctoral dissertation, Oklahoma State University (May, 1976).

13. Brown, Philip, and Niederhoffer, Victor, "The Predictive Content of Quarterly Earnings," The Journal of Business (October, 1968), pp. 488-497.

14. Carter, William K., "An Alternative to Conventional Industry Definitions in Modeling Earnings Generation Processes," doctoral dissertation, Oklahoma State University (December, 1977).

15. Conover, W. J., Practical Nonparametric Statistics (New York: John Wiley), 1971.

16. Deakin, Edward B., "Accounting Reporting Policy Interventions and the Behavior of Security Prices," The Accounting Review (July, 1976), pp. 590-603.

17. Demski, Joel, "Rational Choice of Accounting Method for a Class of Partnerships," Journal of Accounting Research (Autumn, 1973), pp. 176-190.

18. "Equity Funding Suits Against Accounting Firms Settled for $39 Million," Wall Street Journal, 5 January 1977, p. 4.

19. Ferguson, C. E. and Gould, J. P., Microeconomic Theory, 4th Edition (Homewood, Illinois: Richard D. Irwin), 1975.

20. Financial Accounting Standards Board, Discussion Memorandum, Interim Financial Accounting and Reporting (May, 1978).

21. Foster, George, "Quarterly Accounting Data: Time Series Properties and Predictive Ability Results," The Accounting Review (January, 1977), pp. 1-21.

22. Friend, Irwin, "The Economic Consequences of the Stock Market," American Economic Review (May, 1972), pp. 212-219.

23. Friend, Irwin and Westerfield, Randolph, "Required Disclosure and the Stock Market: Comment," American Economic Review (June, 1975), pp. 467-477.

24. Gonedes, Nicholas J., and Roberts, H. V., "Statistical Analysis of Random Walks and Near Random Walks," Center for Mathematical Studies in Business and Economics Report 7606 (University of Chicago, 1976).

25. Green, David, Jr., and Segall, Joel, "The Predictive Power of First-Quarter Earnings Reports: A Replication," Empirical Research in Accounting: Selected Studies, 1966, Supplement to Vol. 4, Journal of Accounting Research, pp. 21-36.

26. _____, "The Predictive Power of First-Quarter Earnings Reports," The Journal of Business (January, 1967), pp. 44-45.

27. _____, "Brickbats and Straw Men: A Reply to Brown and Niederhoffer," The Journal of Business (October, 1968), pp. 498-502.

28. _____, "Return of Strawmen," The Journal of Business (January, 1970), pp. 63-65.

29. Griffin, Paul A., "The Time-Series Behavior of Quarterly Earnings: Preliminary Evidence," Journal of Accounting Research (Spring, 1977), pp. 71-83.

30. Hoel, Paul, and Jessen, Raymond, Business Statistics for Businesses and Economics (New York: John Wiley), 1971.

31. Joy, O. Maurice, Litzenberger, Robert H., and McEnally, Richard W., The Adjustment of Stock Prices to Announcements of Unanticipated Changes in Quarterly Earnings," Journal of Accounting Research (Autumn, 1977), pp. 207-235.

32. Kaplan, Robert S., "The Information Content of Financial Accounting Numbers: A Survey of Empirical Evidence," Duke University Symposium, 1975.

33. Lintner, John, and Glauber, Robert, "Higgledy Piggledy Growth in America," presented to the Seminar for the Analysis of Security Prices (May, 1967), University of Chicago, printed in Lorie, James and Richard Brealey, eds., Modern Developments in Investment Management (Praeger: New York), 1972.

34. Lorek, Kenneth S., "An Empirical Examination of the Time Series Behavior of Quarterly Earnings," unpublished doctoral dissertation, University of Illinois at Urbana-Champaign (1975).

35. Lorek, Kenneth S., McDonald, Charles L., and Patz, Dennis H., "A Comparative Examination of Management Forecasts and Box-Jenkins Forecasts of Earnings," The Accounting Review (April, 1976), pp. 321-330.

36. Mabert, V. A., and Radcliffe, R. C., "A Forecasting Methodology As Applied to Financial Time Series," The Accounting Review (January, 1974), pp. 61-75.

37. May, Robert G., "Lease Disclosure: The Effect of an Accounting Policy Change on Security Prices," paper presented at Oklahoma State University (March 20, 1978).

38. Newell, Gale E., "Adequacy of Quarterly Financial Data," Financial Analysts Journal (November-December, 1969), pp. 37-43.

39. Ng, David S., "An Information Economics Analysis of Financial Reporting and External Auditing," Accounting Review (October, 1978), pp. 910-920.

40. Niederhoffer, Victor, "The Predictive Content of First-Quarter Earning Reports," The Journal of Business (January, 1970), pp. 60-62.

41. Reilly, Frank K., Morgenson, David L., and West, Marilyn. "The Predictive Ability of Alternative Parts of Interim Financial Statements," Empirical Research in Accounting: Selected Studies, 1972, Supplement to Vol. 10, Journal of Accounting Research, pp. 105-131.

42. Securities and Exchange Commission, "Notice of Adoption of Amendments to Form 10-Q and Regulation S-X Regarding Interim Financial Reporting," Accounting Series Release #177 (September 10, 1975).

43. Steele, Robert, and Torrie, James, Principles and Procedures of Statistics, New York: McGraw-Hill (1960).

44. "Supreme Court Rebuffs Peat Marwick Partner in National Student Marketing Case," Wall Street Journal, 4 October 1977, p. 7.

45. "Heinz Profit-Juggling Probe is Finished by Auditors, but Other Proceedings Loom," Wall Street Journal, 23 November 1979, p. 6.

46. "Sputtering '70's: Economy Failed to Sag or Sour in the Decade, Most Analysts Believe," Wall Street Journal, 18 December 1979, p. 1.

APPENDIX

COMPANIES TESTED

APPENDIX

Companies Tested

	Name	Ticker Symbol	Compustat Company Number	Compustat Industry Code	Fiscal Year End	Deleted[1] from Sales Test	Earnings Available for Common Stock	Primary Earnings Per Share Test
1.	ARA SERVICES	ARA	002040	5999	09			
2.	ASA LTD	ASA	002050	1041	11			
3.	ASPRO INC	ASP	002060	3714	07			
4.	ATI INC	ATQ	002073	2844	09			
5.	A-T-O INC	ATO	002080	3560	12			
6.	ABBOTT LABORATORIES	ABT	002824	2830	12			
7.	ACME-CLEVELAND CORP	AMT	004626	2540	09			
8.	ADAMS-MILLIS CORP	ALL	006284	2300	12			
9.	AFFILIATED HOSPITAL PRDS	AFH	008230	3841	12			
10.	AIR PRODUCTS & CHEMICALS INC	APD	009158	2810	09			
11.	AKZONA	AXO	010202	2820	12			
12.	ALABAMA GAS CORP	AGA	010284	4924	09			
13.	ALASKA AIRLINES INC	ALK	011662	4511	12			
14.	ALBERTO-CULVER CO	ACV	013068	2844	09			
15.	ALCAN ALUMINUM LTD	AL	013716	3330	12			

[1]Deletion is due to the expected sales, earnings available for common stock or primary earnings per share being zero, tending to make testing of deviations between expected and actual quantities meaningless.

	Name	Ticker Symbol	Compustat Company Number	Compustat Industry Code	Fiscal Year End	Deleted[1] from: Sales Test	Earnings Available for Common Stock	Primary Earnings Per Share Test
16.	ALCO STANDARD CORP	ASN	013788	5199	09			
17.	ALEXANDER'S INC	ALX	014752	5311	09			
18.	ALLEGHENY AIRLINES INC	ALA	017248	4511	12			
19.	ALLIED CHEMICAL CORP	ACD	019087	2800	12			
20.	ALLIS-CHALMERS CORP	AH	019645	3520	12			
21.	ALUMINUM CO OF AMERICA	AA	022249	3330	12			
22.	AMERACE CORP	AAE	023519	3000	12			
23.	AMERICAN AIR FILTER CO	AAF	023753	3568	10			
24.	AMERICAN AIRLINES INC	AMR	023771	4511	12			
25.	AMERICAN BRANDS INC	AMB	024703	2111	12			
26.	AMERICAN BLDG MAINTENANCE	ABM	024753	7349	10			
27.	AMERICAN CAN CO	AC	024843	3221	12			
28.	AMERICAN DISTILLING CO	ADC	025393	2085	09			
29.	AMERICAN HOIST & DERRICK CO	AHO	026573	3531	11			
30.	AMERICAN HOME PRODUCTS CORP	AHP	026609	2830	12			
31.	AMERICAN HOSPITAL SUPPLY	AHS	026681	3841	12			
32.	AMERICAN MEDICAL INTL	AMI	027429	8060	08			
33.	AMERICAN MOTOR INNS	INN	027591	7011	07			
34.	AMERICAN MOTORS CORP	AMO	027627	3711	09			
35.	AMERICAN SHIP BUILDING CO	ABG	029609	3730	09			
36.	AMERICAN STERILIZER CO	ASZ	030087	3841	12			
37.	AMERON INC	AMN	030710	3270	11			
38.	AMETEK INC	AME	031105	3811	12			
39.	AMSTED INDUSTRIES	AD	032177	3740	09			

[1]Deletion is due to the expected sales, earnings available for common stock or primary earnings per share being zero, tending to make testing of deviations between expected and actual quantities meaningless.

	Name	Ticker Symbol	Compustat Company Number	Compustat Industry Code	Fiscal Year End	Deleted[1] from Sales Test	Earnings Available for Common Stock	Primary Earnings Per Share Test
40.	ANCHOR HOCKING CORP	ARH	033047	3221	12			
41.	ANHEUSER-BUSCH INC	ABUD	035231	2082	12			
42.	ANKEN INDUSTRIES	ANK	035310	3861	12			
43.	ARIZONA PUBLIC SERVICE CO	AZP	040555	4911	12			
44.	ARMSTRONG RUBBER	ARM	042465	3000	09			
45.	ARO CORP	ARO	042627	3560	11			
46.	ASHLAND OIL INC	ASH	044540	2911	09			
47.	ATHLONE INDS	ATH	047483	3310	12			
48.	AVCO CORP	AV	053501	9997	11			
49.	AVERY INTERNATIONAL	AVY	053627	2890	11			*
50.	BAKER INTERNATIONAL CORP	BKO	057264	3533	09			
51.	BALTIMORE GAS & ELECTRIC	BGE	059165	4912	12			
52.	BANDAG INC	BDG	059815	3000	12			
53.	BANKAMERICA CORP	BAM	066050	6027	12			
54.	BARD (C.R.) INC	BCR	067383	3841	12			*
55.	BARRY WRIGHT CORP	BAR	068887	3573	12			*
56.	BARTH SPENCER CORP	BTH	069203	5961	10			
57.	BAUSCH & LOMB INC	BOL	071707	3830	12			
58.	BAXTER TRAVENOL LABORATORIES	BAX	071892	3841	12			
59.	BELDEN CORP	BEL	077455	3350	12			
60.	BENDIX CORP	BX	081689	3714	09			
61.	BLACK & DECKER MFG CO	BDK	091797	3550	09			
62.	BLACK HILLS POWER & LIGHT CO	BHPL	092113	4912	10			
63.	BLISS & LAUGHLIN INDS	BLI	093545	3310	12			

[1]Deletion is due to the expected sales, earnings available for common stock or primary earnings per share being zero, tending to make testing of deviations between expected and actual quantities meaningless.

	Name	Ticker Symbol	Compustat Company Number	Compustat Industry Code	Fiscal Year End	Deleted[1] from Sales Test	Earnings Available for Common Stock	Primary Earnings Per Share Test
64.	BLUE BELL INC	BBL	095293	2300	09			
65.	BLUEBIRD INC	BBX	096086	2010	07			
66.	BORG-WARNER CORP	BOR	099725	3714	12			
67.	BRADFORD NATIONAL CORP	BDR	104303	7370	12			
68.	BRANIFF INTL CORP	BNF	105425	4511	12			*
69.	BRAUN ENGINEERING	BEX	105655	3499	12			
70.	BROWN CO	BWN	115331	2600	07			
71.	BRUNSWICK CORP	BC	117043	3940	12			
72.	BUELL INDUSTRIES INC	BUE	119061	3714	10			
73.	BUFFALO FORGE CO	BFC	119529	3568	11			
74.	BUNDY CORP	BNY	120547	3310	07			
75.	BUNKER RAMO CORP	BR	120655	3610	12			
76.	BURLINGTON INDUSTRIES INC	BUR	121691	2200	09			
77.	BURLINGTON NORTHERN INC	BNI	121897	4011	12			
78.	BURNDY CORP	BDC	122205	3679	12			
79.	BURROUGHS CORP	BGH	122781	3570	12			
80.	CBS INC	CBS	124845	4830	12			
81.	CABOT CORP	CBT	127055	2890	09			
82.	CAMPBELL SOUP CO	CPB	134429	2030	07			
83.	CAMPBELL TAGGART INC	CTI	134449	2050	12			
84.	CANAL-RANDOLPH CORP	CRH	137051	4700	10			*
85.	CARLISLE CORP	CSL	142339	3000	12			
86.	CAROLINA POWER & LIGHT	CPL	144141	4912	12			
87.	CATERPILLER TRACTOR CO	CAT	149123	3531	12			
88.	CELANESE CORP	DZ	150843	2800	12			

[1]Deletion is due to the expected sales, earnings available for common stock or primary earnings per share being zero, tending to make testing of deviations between expected and actual quantities meaningless.

	Name	Ticker Symbol	Compustat Company Number	Compustat Industry Code	Fiscal Year End	Deleted[1] from Sales Test	Earnings Available for Common Stock	Primary Earnings Per Share Test
89.	CENTRAL & SOUTH WEST CORP	CSR	152357	4912	12			
90.	CENTRAL HUDSON GAS & ELEC	CNH	153609	4911	12			
91.	CESSNA AIRCRAFT CO	CEA	157177	3720	09			
92.	CHAMPION INTL CORP	CHA	158515	2400	12			
93.	CHELSEA INDUSTRIES INC	CHD	163267	2200	09			
94.	CHESAPEAKE CORP OF VA	CSK	165159	2649	12			
95.	CHESEBOUGH-POND'S INC	CBM	165339	2844	12			
96.	CHRIS-CRAFT INDS	CCN	170520	3730	08			*
97.	CHROMALLOY AMERICAN CORP	CRO	171106	3390	12			
98.	CHURCHS FRIED CHICKEN	CHU	171583	5812	12			
99.	CINCINNATI BELL INC	CSN	171870	4811	12			
100.	CINCINNATI GAS & ELECTRIC	CIN	172070	4911	12			
101.	CINCINNATI MILACRON INC	CMZ	172172	3540	12			
102.	CLARK EQUIPMENT CO	CKL	181396	3531	12			
103.	CLEVELAND-CLIFFS IRON CO	CLF	186000	1000	12			
104.	CLEVELAND ELECTRIC ILLUM	CVX	186108	4912	12			
105.	CLUETT, PEABODY & CO	CLU	189486	2300	12			
106.	COLT INDUSTRIES INC	COT	196864	9997	12			
107.	COMBUSTION ENGINEERING INC	CSP	200273	3510	12			
108.	COMMERICAL METALS CO	CMC	201723	5093	08			
109.	COMMONWEALTH EDISON	CWE	202795	4912	12			
110.	COMMUNICATIONS SATELLITE	CQ	203417	4811	12			
111.	COMPO INDS	CEM	204525	3550	09			
112.	COMPUGRAPHIC CORP	CPU	204900	2790	09			

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113.	CONCHEMCO INC	CKC	206039	2450	10			
114.	CONCORD FABRICS INC	CIS	206219	2200	08			
115.	CONDEC CORP	CDT	206741	3713	07			
116.	CONE MILLS CORP	COE	206813	2200	12			
117.	CONGOLEUM CORP	COG	207192	2270	12			
118.	CONRAC CORP	CAX	208291	3662	12			
119.	CONROY INC	CRY	208453	3730	08			
120.	CONSOLIDATED FREIGHTWAYS INC	CNE	209237	4210	12			
121.	CONTINENTAL GROUP	CCC	211452	3221	12			
122.	CONTINENTAL TEL CORP	CTC	212093	4811	12			
123.	COOK PAINT & VARNISH	COK	216237	2850	11			
124.	COOPER-JARRETT INC	CJT	216687	4210	12			
125.	COOPER LABORATORIES	COO	216705	2830	10			
126.	COOPER TIRE & RUBBER	CTB	216831	3000	12			
127.	COPELAND CORP	CRF	217210	3580	09			
128.	COOPERWELD CORP	COS	217687	3310	12			
129.	CORE INDUSTRIES INC	CRI	218675	3714	08			
130.	CORROON & BLACK CORP	CBL	220291	6400	12			
131.	COX BROADCASTING CORP	COX	224003	4830	12			
132.	CRANE CO	CR	224399	3494	12			
133.	CROMPTON CO INC	CRC	227129	2200	09			
134.	CROUSE-HINDS CO	CHI	227813	3610	12			
135.	CROWN CORK & SEAL CO INC	CCK	228255	3221	12			
136.	CROWN INDUSTRIES	KRO	228381	3499	09			

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137.	CROWN ZELLEBACH	ZB	228669	2600	12			
138.	CUBIC CORP	CUB	229669	3811	09			
139.	CUNNINGHAM DRUG STORES INC	CDD	231129	5912	09			*
140.	CURTISS-WRIGHT CORP	CW	231561	3560	12			
141.	CYCLOPS CORP	CYL	232525	3310	12			
142.	DAMON CORP	DMN	235717	8060	08			*
143.	DANA CREATIONS-CL A	DCN	235811	3714	08			
144.	DANIEL INDUSTRIES	DAN	236235	3823	09			
145.	DAYCO CORP	DAY	239577	3000	10			
146.	DEERE & CO	DE	244199	3520	10			
147.	DENNISON MFG CO	DSN	248631	2649	12			
148.	DE SOTO INC	DSO	250595	2850	12			
149.	DIAMOND SHAMROCK CORP	DIA	252741	2800	12			
150.	DICTAPHONE CORP	DC	253579	3570	12			
151.	DIEBOLD INC	DBD	253651	3499	12			
152.	DILLINGHAM CORP	DHM	254111	1600	12			
153.	DISNEY (WALT) PRODUCTIONS	DIS	254687	7990	09			
154.	DIVERSIFIED INDUSTRIES INC	DMC	255264	5093	10			
155.	DORR-OLIVER INC	DOR	258363	3560	12			
156.	DORSEY CORP	DSY	258435	3221	12			
157.	DOVER CORP	DOV	260003	3550	12			
158.	DOW CHEMICAL	DOW	260543	2800	12			
159.	DOW JONES & CO INC	DJ	260561	2711	12			
160.	DRESSER INDUSTRIES INC	DI	261597	3533	10			

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161.	DUKE POWER CO	DUK	264399	4912	12			
162.	DUN & BRADSTREET COS	DNB	264830	7392	12			
163.	DUPLEX PRODUCTS	DPX	266093	2761	10			
164.	DURO-TEST CORP	DUR	266867	3640	07			
165.	EAGLE-PICHER INDS	EPI	269803	2714	11			
166.	EASTERN CO	EML	276317	3449	12			
167.	EASTERN GAS & FUEL ASSOC	EFU	276461	1211	12			
168.	EASTMAN KODAK CO	EK	277461	3861	12			
169.	EATON CORP	ETN	278058	3714	11			
170.	ECKERD (JACK) CORP	ECK	278764	5912	07			
171.	ELECTRONIC ENGINEERING CO-CA	EEC	285695	3679	12			*
172.	ELECTRONIC MEMORIES & MAGNET	EMM	285744	3573	12			
173.	ELTRA CORP	ET	290371	3610	09			
174.	EMERSON ELECTRIC CO	EMR	291011	3600	09			
175.	EMPIRE DISTRICK ELECTRIC CO	EDE	291641	4912	12			
176.	ESTERLINE CORP	ESL	297425	3823	10			
177.	ETHYL CORP	EY	297659	2800	12			
178.	EX-CELL-O CORP	XLO	300587	3550	11			
179.	FAB INDUSTRIES INC	FIT	302747	2200	11			
180.	FAMILY RECORD PLAN INC	FRP	307045	7200	08			
181.	FARAH MFG CO	FRA	307387	2300	10			
182.	FED-MART CORP	FMI	313081	5311	08			
183.	FEDERAL-MOGUL CORP	FMO	313549	3714	12			

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184.	FEDERAL PAPER BOARD CO	FBO	313693	2650	12			
185.	FIDELITY UNION BANCORP	FDU	316438	6023	12			
186.	FINANCIAL FEDERATION	FFI	317495	6120	12			
187.	FIRESTONE TIRE & RUBBER CO	FIR	318315	3000	10			
188.	FIRST CITY BANCORP (TEXAS)	FBT	319594	6026	12			
189.	FIRST UNION BANCORPORATION	FUBC	337354	6025	12			
190.	FISCHBACH & MOORE INC	FIS	337657	1700	09			
191.	FISHER FOODS INC	FHR	337819	5411	12			
192.	FISHER SCIENTIFIC CO	FS	338027	3811	12			
193.	FLINTKOTE CO	FO	339711	2950	12			
194.	FLORIDA POWER CORP	FDP	341099	4912	12			
195.	FLORIDA STEEL CORP	FLS	343172	3310	09			
196.	FLUKE (JOHN) MFG CO	FMK	343856	3825	09			
197.	FLUOR CORP	FLR	343861	1600	10			
198.	FOODARAMA SUPERMARKETS	FSM	344820	5411	10			
199.	FRANKLIN MINT CORP	FM	354010	3911	12			
200.	FRONTIER AIRLINES INC	FA	359064	4511	12			
201.	GCA CORP	GCA	361556	3580	09			
202.	G R I CORP	GRR	262232	5961	11			
203.	GANNETT CO	GCI	364730	2711	12			
204.	GARAN INC	GAN	364802	2300	09			
205.	GARDNER-DENVER CO	GDC	365550	3560	12			
206.	GARLAND CORP	GRK.A	366064	2300	10			
207.	GENERAL CINEMA CORP	GCN	369352	7830	10			

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208.	GENERAL ELECTRIC CO	GE	369604	3600	12			
209.	GENERAL EMPLOY ENTERPRISES	JOB	369730	7399	09			
210.	GENERAL HOST CORP	GH	370064	2010	12			
211.	GENERAL PORTLAND INC	GPT	370514	3241	12			*
212.	GENERAL SIGNAL CORP	GSX	370838	3823	12			
213.	GENERAL STEEL INDS	GSI	370856	3740	12			
214.	GENERAL TELEPHONE & ELECTRONICS	GTE	371028	4811	12			
215.	GENERAL TIRE & RUBBER CO	GY	371352	3000	11			
216.	GEORGIA-PACIFIC CORP	GP	373298	2400	12			
217.	GILLETTE CO	GS	375766	2844	12			
218.	GLATFELTER (P.H.) CO	GLT	377316	2600	12			
219.	GLOBE-UNION INC	GLB	379568	3699	09			
220.	GOODRICH (B.F.) CO	GR	382388	3000	12			
221.	GORDON JEWELRY CORP	GOR	382748	5944	08			
222.	GORMAN-RUPP CO	GRC	383082	3560	12			
223.	GOULD INC	GLD	383492	3610	12			
224.	GRAINGER (W.W.) INC	GWW	384802	5063	12			
225.	GRANITEVILLE CO	GVL	287478	2200	12			
226.	GREAT LAKES CHEMICAL CORP	GLK	390568	2800	12			
227.	GREAT NORTHERN NEKOOSA CORP	GNN	391090	2600	12			
228.	GROSS TELECASTING	GGG	398856	4830	12			
229.	GUARDIAN INDUSTRIES	GRD	401370	3210	12			
230.	GUARDSMAN CHEMICALS INC	GRV	401460	2850	12			
231.	GULF & WESTERN INDS INC	GW	402064	9997	07			

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232. HALL'S MOTOR TRANSIT	HMT	406306	4210	12			
233. HAMMERMILL PAPER CO	HML	408306	2600	12			
234. HARLAND (JOHN H.) CO	JHH	412693	2750	12			
235. HARNISCHFEGER CORP	HPH	413342	3536	10			
236. HART SCHAFFNER & MARX CO	HSM	416162	2300	11			
237. HASBRO INDUSTRIES INC	HAS	418056	3940	12			*
238. HAWAIIAN ELECTRIC CO	HE	419866	4912	12			
239. HAYES-ALBION CORP	HAY	420758	3714	07			
240. HEILEMAN (G.) BREWING INC	GHB	422884	2082	12			
241. HELMERICH & PAYNE	HP	423452	1381	09			
242. HERCULES INC	HPC	427056	2800	12			
243. HESSTON CORP	HES	428146	3520	09			
244. HEWLETT-PACKARD CO	HWP	428236	3823	10			
245. HILTON HOTELS CORP	HLT	432848	7011	12			
246. HOBART CORP	HOB	433728	3560	12			
247. HONEYWELL INC	HON	438506	3573	12			
248. HOOVER UNIVERSAL INC	HVU	439316	3449	07			
249. HOST INTERNATIONAL INC	HII	441074	5812	12			
250. HOUDAILLE INDUSTRIES INC	HH	441488	3714	12			
251. HOUSTON NATURAL GAS CORP	HNG	442272	4924	07			
252. HOWARD JOHNSON CO	HJ	442672	5812	12			
253. HUMANA INC	HUM	444859	8060	08			
254. HUNT (PHILIP A) CHEM	HCC	445582	3861	12			
255. HUYCK CORP	HYK	448510	2200	12			

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256.	ICN PHARMACEUTICALS INC	INC	449290	2830	11			*
257.	IDAHO POWER CO	IDA	451380	4912	12			
258.	IDEAL BASIC INDUSTRIES INC	IDL	451542	3241	12			
259.	ILLINOIS TOOL WORKS	ITW	452308	3452	12			
260.	IMPERIAL CORP OF AMERICA	ICA	452722	6120	12			
261.	INCO LTD	N	453258	1000	12			
262.	INEXCO OIL	INX	456623	1311	12			
263.	INGERSOLL-RAND CO	IR	456866	3560	12			
264.	INLAND CONTAINER CORP	IN	456866	3560	12			
265.	INLAND STEEL CO	IAD	457470	3310	12			
266.	INSTRUMENT SYSTEMS CORP	ISY	457794	3449	09			*
267.	INTERLAKE INC	IK	458702	3310	12			
268.	INTL BUSINESS MACHINES CORP	IBM	459200	3570	12			
269.	INTL HARVESTER CO	HR	459578	3713	10			
270.	INTL PAPER CO	IP	460146	2600	12			
271.	INTL STRETCH PRODS	IST	460389	2200	08			
272.	INTERPACE CORP	INP	460578	3270	12			
273.	ITEK CORP	ITK	465632	3830	12			
274.	ITEL CORP	I	465640	7370	12			*
275.	JANTZEN INC	JAN	471016	2300	08			
276.	JOY MFG CO	JOY	481196	3550	09			
277.	KAISER ALUMINUM & CHEM CORP	KLU	483008	3330	12			
278.	KEARNEY & TRECKER CORP	KEAR	486746	3540	09			
279.	KELLER INDUSTRIES INC	KEL	487656	3499	97			

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280.	KELLOGG CO	K	487836	2000	12			
281.	KEY CO	KC	493080	6552	10			
282.	KIDDE (WALTER) & CO	KDE	493782	9997	12			
283.	KING RADIO CORP	KRC	495620	3662	12			
284.	KLEINERTS INC	KLR	498552	3140	09			
285.	KNIGHT-RIDDER NEWSPAPERS INC	KRN	499040	2711	12			
286.	KOEHRING CO	KOE	500170	3531	11			
287.	KRAFT INC	KRA	500755	2020	12			
288.	KROEHLER MFG CO	KFM	501026	2510	12			
289.	KROGER CO	KR	501044	5411	12			
290.	LA MAUR INC	LMR	503624	2844	12			
291.	LEESONA CORP	LSO	524462	3550	12			
292.	LEIGH PRODUCTS INC	LPR	525354	3499	11			
293.	LENOX INC	LNX	526264	3269	12			
294.	LIBBEY-OWNES-FORD CO	LOF	530000	3210	12			
295.	LILLY (ELI) & CO	LLY	532457	2830	12			
296.	LITTON INDUSTRIES INC	LIT	538021	9997	07			
297.	LOEHMANN"S INC	LOH	540414	5600	07			
298.	LOUISVILLE CEMENT	LCO	546642	3241	12			
299.	LOWENSTEIN (M.) & SONS INC	LST	547779	2200	12			
300.	LUKENS STEEL CO	LUC	549866	3310	12			
301.	LYNCH COMMUNICATION SYSTEM	LYC	551120	3661	12			
302.	MA COM INC	MAI	552618	3679	00			

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303. MACKE CO	MAK	554528	5962	09			
304. MACY (R.H.) & CO	MZ	556139	5311	07			
305. MALLORY (P.R.) & CO	MRY	561246	3679	12			
306. MANUFACTURERS NATL CORP	MNTL	565004	6025	12			
307. MARATHON MFG CO	MTM	565821	3533	12			
308. MARLEY CO	MY	571154	3499	10			
309. MARRIOTT CORP	MHS	571630	5812	07			
310. MARSH & MCLENNAN COS	MMC	571748	6400	12			
311. MARY KAY COSMETICS	MKY	573890	2844	12			
312. MARYLAND CUP CORP	MDC	574055	2650	09			
313. MAYS (J.W.) INC	MJW	578473	5600	07			
314. MAYTAG CO	MYG	578592	3630	12			
315. MCGRAW-EDISON CO	MGR	580628	3610	12			
316. MCNEIL CORP	MME	582562	3550	12			
317. MEAD CORP	MEA	582834	2600	12			
318. MEDIA GENERAL-CL A	MEG	584404	2711	12			
319. MEDUSA CORP	MPD	585072	3241	12			
320. MEMOREX CORP	MRX	586005	3573	12			
321. MERCANTILE TEXAS CORP	MTD	587541	6026	12			
322. MERCHANTS INC	MRCH	588602	4210	12			
323. MERCK & CO	MRK	589331	2830	12			
324. METROMEDIA INC	MET	591690	4830	12			
325. MID-CONTINENT TELEPHONE	MID	595390	4811	12			
326. MIDLAND-ROSS CORP	MLR	597715	3550	12			

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327.	MIRRO ALUMINUM CO	MIR	604739	3499	12			
328.	MONSANTO CO	MTC	611662	2800	12			
329.	MOOG INC	MOG	615394	3610	09			
330.	MOTOROLA INC	MOT	620076	3662	12			
331.	MOUNT VERNON MILLS INC	MVW	623555	2200	12			
332.	MOUNTAIN STATES TEL & TEL	MOU	624284	4811	11			
333.	MUNSINGWEAR INC	MUN	626320	2300	12			
334.	NCR CORP	NCR	628862	3570	12			
335.	NARCO SCIENTIFIC INDS	NAO	630854	3841	11			
336.	NATIONAL CITY CORP	NCTY	635405	6025	12			
337.	NATIONAL DETROIT CORP	NBD	635632	6025	12			
338.	NATIONAL DISTILLERS & CHEMICL	DR	635655	2085	12			
339.	NATIONAL HOMES CORP	NHX	636418	2450	12			
340.	NATIONAL SERVICE INDS INC	NAS	637657	7213	08			
341.	NATIONAL SPINNING CO	NSN	637734	2200	12			
342.	NATIONAL STANDARD CO	NSD	637742	3499	09			
343.	NATIONAL STARCH & CHEMICAL	NSC	637776	2046	12			
344.	NEW ENGLAND ELECTRIC SYSTEM	NES	644001	4912	12			
345.	NEW ENG TEL & TEL	NTT	644239	4811	11			
346.	NEW PROCESS CO	NOZ	648210	5961	12			
347.	NEW YORK STATE ELEC & GAS	NGE	649840	4911	12			
348.	NEWCOR INC	NFW	651186	3550	10			
349.	NICOR INC	GAS	654086	4924	12			
350.	NIELSEN (A.C.) CO	NIELA	654098	7399	08			

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351.	NORLIN CORP	NRL	656041	3931	12			
352.	NORTEK INC	NTK	656559	3310	12			
353.	NORTH AMERICAN COAL	NC	656780	1211	12			
354.	NORTH AMERICAN PHILIPS CORP	NPH	657045	3600	12			
355.	NORTHROP CORP	NOC	666807	3720	12			
356.	NORTHWEST INDUSTRIES	NWT	667528	9997	12			
357.	NORTHWESTERN STEEL & WIRE CO	NSW	668367	3310	07			
358.	OHIO EDISON CO	OEC	677347	4911	12			
359.	OLIN CORP	OLN	680665	2800	12			
360.	OPELIKA MFG CORP	OPD	683574	2200	09			
361.	ORANGE & ROCKLAND UTILITIES	ORU	684065	4911	12			
362.	O'SULLIVAN CORP	OSL	688605	3069	12			
363.	OUTBOARD MARINE CORP	OM	690020	3510	09			*
364.	OVERHEAD DOOR CORP	OHD	690207	3449	12			
365.	OVERNITE TRANSPORTATION	OVT	690326	4210	12			
366.	OWENS-ILLINOIS INC	OI	690768	3221	12			
367.	PPG INDUSTRIES INC	PPG	693506	2810	12			
368.	PACIFIC GAS & ELECTRIC	PCG	694308	4911	12			
369.	PACIFIC LIGHTING CORP	PLT	694478	4924	12			
370.	PACIFIC NOWEST BELL TELEPHON	PNB	694665	4811	11			
371.	PACIFIC TEL & TEL CO	PN	694886	4811	11			
372.	PALL CORP	PLL	696429	3560	07			
373.	PALM BEACH INC	PMB	696593	2300	10			
374.	PARSONS (RALPH M) CO	RMP	702019	8911	12			

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375.	PEERLESS TUBE CO	PLS	705540	3221	12			
376.	PENNWALT CORP	PSM	709317	2800	12			
377.	PEOPLES GAS CO	PGL	711106	4924	09			
378.	PERKIN-ELMER CORP	PKN	714041	3811	07			
379.	PETROLANE INC	PTO	716544	5980	09			
380.	PFIZER INC	PFE	717081	2830	12			
381.	PHILIP MORRIS INC	MO	718167	2111	12			
382.	PHOENIX STEEL CORP	PX	719151	3350	12			
383.	PITTSBURG-DES MOINES STEEL	PDM	725038	3449	12			
384.	PITTSBURG FORGINGS CO	PFG	725106	3740	12			
385.	PNEUMO CORP	PNC	730196	5411	11			
386.	POLAROID CORP	PRD	731095	3861	12			
387.	POPE & TALBOT INC	POP	732827	2400	12			
388.	PORTER (H.K) CO	PORT	736245	3310	12			
389.	POTLATCH CORP	PCH	737628	2600	12			
390.	POTOMAC ELECTRIC POWER	POM	737679	4912	12			
391.	PRODUCTS RESEARCH & CHEMICAL	PRC	743106	2890	09			
392.	PUBLIC SERVICE CO OF COLO	PSR	744448	4912	12			
393.	PUBLIC SERVICE ELEC & GAS	PEG	744567	4912	12			
394.	QUANEX CORP	NX	747620	3310	10			
395.	RALSTON PURINA CO	RAL	751277	2048	09			
396.	RANCO INC	RNI	752159	3820	09			
397.	RANSBURG CORP	RBG	753228	3560	11			
398.	RAYBESTOS-MANHATTAN INC	RAY	754586	3714	12			

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399.	REYMOND INDUSTRIES INC	RAE	754713	3480	12			
400.	RAYTHEON CO	RTN	755111	3662	12			
401.	READING & BATES OFFSHORE DRL	RB	755281	1381	09			
402.	REICHHOLD CHEMICALS INC	RCI	759200	2820	12			
403.	RELIANCE ELECTRIC CO	REE	759457	3610	10			
404.	REPUBLIC STEEL CORP	RS	760779	3310	12			
405.	RESEARCH-COTTRELL	RC	760881	3568	10			
406.	REXNORD INC	REX	761688	3531	10			
407.	REYNOLDS & REYNOLDS	REYNA	761695	2761	09			
408.	REYNOLDS (R.J.) INDS	RJR	761753	2111	12			
409.	RIEGEL TEXTILE CORP	RTX	766481	2200	09			
410.	ROADWAY EXPRESS INC	ROAD	769739	4210	12			
411.	ROBERTSHAW CONTROLS	ROF	770519	3820	12			
412.	ROBINS (A.H.) CO	RAH	770706	2830	12			
413.	ROBLIN INDUSTRIES	RBL	771044	3449	12			
414.	ROGERS CORP	ROG	775133	3079	12			*
415.	ROHM & HAAS CO	ROH	775371	2800	12			
416.	ROHR INDUSTRIES	RHR	775422	3728	07			
417.	ROPER CORP	ROP	776678	3510	07			
418.	RORER GROUP	ROR	776755	2830	12			
419.	ROSARIO RESOURCES CORP	ROS	776806	1000	12			
420.	RUBBERMAID INC	RBD	781088	3000	12			
421.	RUDDICK CORP	RDK	781258	5411	09			*
422.	RUSSELL CORP	RML	782352	2200	12			

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423.	RUSSELL STOVER CANDIES INC	RUSS	782684	2065	08			
424.	SGL INDUSTRIES INC	SL	784197	3699	97			
425.	SAFEWAY STORES INC	SA	786514	5411	12			
426.	ST REGIS PAPER CO	SRT	793453	2600	12			
427.	SALANT CORP	SLT	793897	2300	11			
428.	SAN DIEGO GAS & ELECTRIC	SDO	797440	4911	12			
429.	SANDERS ASSOCIATES INC	SAA	799850	3670	08			
430.	SARGENT-WELCH SCIENTIFIC	SWS	803701	3811	12			
431.	SAUNDERS LEASING SYSTEM INC	SAU	804498	7500	12			
432.	SCHERING-PLOUGH	SGP	806605	2830	12			
433.	SCHILTZ (JOSPEH) BREWING	SLZ	806823	2082	12			
434.	SCOTT PAPER CO	SPP	809877	2600	12			
435.	SCOVILL MANUFACTURING CO	SCO	810640	3630	12			
436.	SEABOARD COAST LINE INDS	SCI	811517	4011	12			
437.	SEAGRAM CO LTD	VO	811850	2085	07			
438.	SEASON-ALL INDUSTRIES INC	SAI	812540	3449	12			
439.	SELIGMAN & LATZ INC	SAL	816323	7200	10			
440.	SHAKESPEARE CO	SKP	819139	3940	07			
441.	SHELLER-GLOBE	SHG	822737	3714	09			
442.	SHERWIN-WILLIAMS CO	SHW	824348	2850	12			
443.	SIFCO INDUSTRIES	SIF	826546	5050	09			
444.	SIGNAL COS	SGN	826622	9997	12			
445.	SIMKINS INDUSTRIES	SMK	828658	2650	09			
446.	SKAGGS COS INC	SKG	830164	5912	12			

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447.	SMITH (A.O.) CORP	SKL	830164	5912	12			
448.	SMITHKLINE CORP	SKL	832377	2830	12			
449.	SMITH'S TRANSFER	SST	832407	4210	12			
450.	SNAP-ON TOOLS CORP	SNA	833034	3429	12			
451.	SOUTH CAROLINA ELEC & GAS	SCG	837004	4912	12			
452.	SOUTH JERSEY INDUSTRIES	SJI	838518	4924	12			
453.	SOUTHERN CALIF EDISON CO	SCE	842400	4911	12			
454.	SOUTHERN PACIFIC CO	SX	843571	4011	12			
455.	SOUTHWEST FOREST INDUSTRIES	SWF	844861	2600	12			
456.	SOUTHWESTERN PUBLIC SERV CO	SPS	845743	4912	08			
457.	SPRINGS MILLS INC	SMI	851783	2200	12			*
458.	STALEY (A.E.) MFG CO	STA	852563	2046	09			
459.	STANDARD COOSA-THATCHER	SNC	853326	2200	09			
460.	STANDARD REGISTER CO	SREG	853887	2761	12			
461.	STAR SUPERMARKETS	STR	855192	5411	12			
462.	STAUFFER CHEMICAL CO	STF	857721	2810	12			
463.	STERLING EXTRUDER CORP	SLX	859298	3550	10		*	
464.	STONE & WEBSTER INC	SW	861572	8911	12			
465.	STONE CONTAINER CORP	STO	861589	2650	12			
466.	STORER BROADCASTING CO	SBK	862131	4830	12			
467.	STRIDE RITE CORP	SRR	863314	3140	11			
468.	STUDEBAKER-WORTHINGTON INC	SKW	863863	9997	12			
469.	SUAVE SHOE CORP	SWV	864261	3140	09			
470.	SUN ELECTRIC CORP	SE	866713	3714	10			

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471.	SUNAIR ELECTRONICS INC	SNR	867017	3662	09			
472.	SUNDSTRAND CORP	SNS	867323	3540	12			
473.	SYNALLOY CORP	SYO	871565	3499	09			*
474.	SYNTEX CORP	SYN	871616	2830	07			
475.	SYSTRON-DONNER CORP	SYS	872056	3820	07			*
476.	T.I.M.E. DC INC	TMDC	872489	4210	12			
477.	TAMPA ELECTRIC	TE	875127	4912	12			
478.	TAPPAN CO	TAP	876043	3630	12			*
479.	TASTY BAKING CO	TBC.A	876553	2050	12			
480.	TECHNICAL OPERATIONS INC	TO	878487	1520	09			*
481.	TECHNITROL INC	TNL	878555	3679	12			
482.	TELEDYNE INC	TDY	879335	9997	12			
483.	TELEFLEX INC	TFX	879369	3560	12			
484.	TEXAS OIL & GAS CORP	TXO	882593	4922	08			
485.	TEXAS UTILITIES CO	TXU	882848	4912	12			
486.	TEXASGULF INC	TG	882887	1000	12			
487.	TEXFI INDUSTRIES	TXF	882895	2200	10			
488.	THIOKOL CORP	THI	884102	3760	12			
489.	THOMAS INDUSTRIES INC	TII	884425	3640	12			
490.	THOMPSON (J. WALTER) CO	JWT	884753	7311	12			
491.	THOROFARE MARKETS	TMI	885392	5411	07			
492.	THREE D DEPARTMENTS INC	TDD	885539	5949	07			
493.	TIME INC	TL	887224	2721	12			

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494.	TOWN & COUNTRY MOBILE HOMES	TNC	892059	2450	10			*
495.	TRANE CO	TRA	892892	3580	12			
496.	TRANS UNION CORP	TU	893341	9997	12			
497.	TRANSCON LINES	TCL	893553	4210	12			
498.	TREADWAY COS INC	TCO	894546	7990	08			
499.	TRIANGLE INDUSTRIES	TRI	895861	3350	12			
500.	TRIANGLE PACIFIC CORP	TPC	895895	5211	12			
501.	TYLER CORP	TYL	902182	3494	12			
502.	UARCO INC	URC	903443	2761	09			
503.	UNION CARBIDE CORP	UK	905581	2800	12			
504.	UNITED AIRCRAFT PRODUCTS INC	UAP	909313	3728	11			
505.	UNITED INNS INC	UI	910688	7011	09			
506.	U S GYPSUM CO	USG	912027	3270	12			
507.	U S INDUSTRIES	USI	912078	2300	12			
508.	U S LEASING INTL INC	USL	912129	7394	12			
509.	U S RUBBER RECLAIMING CO	USU	912503	3000	12			
510.	U S SHOE CORP	USR	912605	3140	07			
511.	UNITED TECHNOLOGIES CORP	UTX	913017	3728	12			
512.	UNITED TELECOMMUNICATIONS	UT	913025	4811	12			
513.	UTAH POWER & LIGHT	UTP	917503	4912	12			
514.	V.F. CORP	VFC	918204	2300	12			
515.	VALLEY NATIONAL BANK-ARIZONA	VNBK	919796	6026	12			
516.	VARIAN ASSOCIATES INC	VAR	922204	3670	09			
517.	VEECO INSTRUMENTS	VEE	922408	3801	09			

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518.	VENDO CO	VEN	922612	3580	12			
519.	VERMONT AMERICAN-CL A	VAR.C	924138	3429	12			
520.	VIRGINIA ELECTRIC & POWER	VEL	927804	4912	12			
521.	VOPLEX CORP	VOT	929032	3079	12			
522.	VULCAN INC	VX	929126	3320	12			
523.	WACHOVIA CORP	WB	929769	6024	12			
524.	WALGREEN CO	WAG	931422	5912	08			
525.	WALKER(HIRAM) GOODRHM & WORT	HIR	931643	2085	08			
526.	WALLACE BUSINESS FORMS	WF	932270	2761	07			
527.	WALTER (JIM) CORP	JWC	933169	2950	08			
528.	WARNACO INC	WRC	934391	2300	12			
529.	WARNER & SWASEY	WS	934408	3540	12			
530.	WASHINGTON STEEL CORP	WSS	940144	3310	09			
531.	WASHINGTON WATER POWER	WWP	940688	4911	12			
532.	WATKINS-JOHNSON	WJ	942486	3662	12			
533.	WEIS MARKETS INC	WMK	948849	5411	12			
534.	WEST POINT-PEPPERELL	WPM	955465	2200	08			
535.	WESTERN CO OF NORTH AMERICA	WSN	958043	1381	12			
536.	WESTERN PACIFIC INDUSTRIES	WPI	959090	4011	12			
537.	WESTERN UNION CORP	WU	959805	4811	12			
538.	WESTINGHOUSE ELECTRIC CORP	WX	960402	3600	12			
539.	WESTVACO CORP	W	961548	2600	10			
540.	WEYERHAEUSER CO	WY	972166	2400	12			
541.	WHIRLPOOL CORP	WHR	963320	3630	12			

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542. WHITTAKER CORP	WKR	966680	9997	10			
543. WINTER (JACK) INC	JWI	975876	2300	11			
544. WOLVERINE ALUMINUM	WOLA	977878	3449	12			
545. WOMETCO ENTERPRISES INC	WOM	978165	2086	12			
546. XTRA CORP	XTR	984138	7394	09			
547. YELLOW FRIEGHT SYSTEM	YELL	985514	4210	12			
548. ZAPATA CORP	ZOS	989070	1520	09			
549. ZENITH RADIO CORP	ZE	989399	3651	12			

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VITA

Karl Bonawit Putnam

Candidate for the Degree of

Doctor of Philosophy

Thesis: AN EMPIRICAL EVALUATION OF THE ASSOCIATION OF RECENT CHANGES IN THE SECURITIES' REGULATORY ENVIRONMENT WITH THE PREDICTIVE ABILITY OF QUARTERLY EARNINGS

Major Field: Business Administration

Biographical:

Personal Data: Born in Durham, North Carolina, December 19, 1947, the son of Mr. and Mrs. Glenn C. Putnam.

Education: Graduated from Stark High School, Orange, Texas, in June 1966; received Bachelor of Business Administration degree from University of Texas at Austin in 1971 with a major in accounting; received Master in Professional Accounting degree from University of Texas at Austin in 1973; received the Doctor of Philosophy degree at Oklahoma State University in May, 1980.

Professional Experience: Audit staff, Peat, Marwick, Mitchell & Co., CPAs, 1972; Lecturer in Accounting, California Polytechnic State University, San Luis Obispo, California, 1973-75; Part-time instructor, Department of Accounting, Oklahoma State University, 1975-78; Assistant Professor, Department of Accounting, Texas A&M University, College Station, Texas, 1979.

Professional Activities: Certified Public Accountant, Texas, 1975; member American Institute of Certified Public Accountants; member of the American Accounting Association.