AN EMPIRICAL STUDY OF THE ASSOCIATION BETWEEN ALTERNATIVE MEASURES OF EARNINGS PER SHARE AND THE BEHAVIOR OF SECURITY PRICES 1969 - 1972

By

RUSSELL FRANK BRINER II

Bachelor of Business Administration
Texas Tech University
Lubbock, Texas
1961

Master of Business Administration
Texas A & M University
College Station, Texas
1963

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of the Oklahoma State University
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Thesis Approved:

Thesis Adviser

Dean of the Graduate College

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CHAPTER I

NATURE OF THE PROBLEM

Introduction and Statement of the Problem

Earnings per share numbers of business firms are continuously published on a quarterly and annual basis. The existence of alternative measures of earnings per share for each firm and the continuous publishing of these numbers make the relevance of these numbers to investor decisions confusing. This study provides empirical evidence to help determine the informational content of earnings per share measures and the investor preference for the alternative measures.

The importance of accounting information in investment decisions has long been espoused. Empirical research by Ball and Brown (12) and by Beaver (18) indicates that accounting data have informational content and that the market reacts quickly to new accounting information, and this research supported the hypothesis that the stock market impounds information in an unbiased manner. Such an hypothesis is known as the efficient-market hypothesis and is explained further in Chapter II. An alternative viewpoint is known as the functional fixation hypothesis, which states that investors react only to observed signals and that signals generated by an underlying information system are ignored (21,p. 321). The functional fixation hypothesis would thus provide for inefficiency in the impounding of information by the stock market.

Research by Dyckman (41) and by Bruns (29) has supported the functional fixation hypothesis at the individual investor level. Although the market consists of a group of individual investors, what is true for the individual in the group may not be necessarily true for the group as a whole. Evidence supporting functional fixation at the aggregate level would tend to provide greater support for that hypothesis. On the other hand, evidence indicating an unbiased impounding of accounting information by the market would tend to refute functional fixation. Although considerable research has been accomplished supporting market efficiency in other information contexts, relatively little has been accomplished with respect to the efficiency of accounting data (22, p. 552).

One method of judging the efficiency of the market in impounding accounting information is to relate such accounting information to the behavior of security prices. Such a relationship is very logical because, as Beaver (16, p. 409) indicates:

> Given the importance of security prices upon the wealth and overall well being of investors, it is inconceivable that optimal information systems for investors can be selected without a knowledge of security price behavior.

The effects of alternative information systems on security price behavior have important implications for accounting research. Alternative accounting methods available for external reporting procedures may provide different levels of efficiency for the market in impounding accounting information. If the efficient capital market hypothesis is assumed to be true, then in order to provide the greatest efficiency the accounting method chosesn for external reporting should be the method that is most closely associated with the information set used

by the market in setting security prices assuming costs of each alternative method are equal.*

Of the many alternative methods available in reporting accounting information for external purposes, the alternative measures of earnings per share are particularly intriguing. The historical development of the earnings per share measure illustrates the apparent importance which many investors now attach to earnings per share data. In 1953, the American Institute of Certified Public Accounts (AICPA) published Accounting Research Bulletin No. 43--A Restatement and Revision of Accounting Research Bulletins. Chapter Eight, paragraph fourteen, of this restatement discussed the undesirability in many cases of the dissemination of information in which major prominence is given to a single figure of net income per share (4, p. 65). By December, 1966, the Accounting Principles Board (APB) of the AICPA, through the issuance of Opinion No. 9, strongly recommended the disclosure of earnings per share in the income statement. With the issuance of Opinion No. 15 in May, 1969, the APB made mandatory the disclosure of earnings per share data on the face of audited earnings reports.

The earnings per share computation required by Opinion No. 9 specified a division of net income by the number of shares of common stock and other residual securities outstanding. Opinion No. 15, however, changed the earnings per share measures to what the APB called "Primary Earnings Per Share" and "Fully-Diluted Earnings Per Share."

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*In relating the accounting method chosen to society as a whole, the problem of selecting accounting methods becomes a social choice problem. The question of whether the efficient capital market provides a basis for selecting accounting methods which optimize the welfare of society is developed in Chapter II.

Both measures reflected dilutive effects of securities (called common stock equivalents) which might be eventually converted into common stock. The common share base of primary earnings per share included common stock outstanding plus common stock equivalents which met certain specified criteria. Fully-diluted earnings per share included as part of the common share base all securities ". . . of which conversion, exercise or other contingent issuance would potentially dilute the earnings per share figure" (3, P. 234).

The change in the earnings per share measure as promulgated by Opinion No. 15 was determined necessary by the APB (3, p. 217) because, "in view of the widespread use of earnings per share data, it is important that such data be computed on a consistent basis and presented in the most meaningful manner." Little empirical evidence has evolved which supports the APB's development of primary and fully-diluted earnings per share as the most meaningful earnings per share figures.

The research undertaken in this study should provide evidence concerning the information content of reported and unreported earnings per share figures. The possibility exists that the market may look beyond reported earnings per share measures and use an unreported measure in impounding information which determines security prices. The argument usually arises that the more visible measures tend to be more highly impounded in security prices (16, p. 428). Research providing evidence relating to this so-called "visibility" issue should add to the knowledge of what accounting information is actually impounded by the market in setting security prices and also provide evidence that could aid accounting policy makers (e.g., one policy

maker is the Financial Accounting Standards Board) in formulating accounting policies.

Objectives of the Study

The objectives of this study are as follows: (1) to investigate the efficiency of the market in impounding earnings per share data in security prices, and (2) to investigate the association between three alternative earnings per share measures and security prices. The three earnings per share measures to be considered will be called, simple earnings per share, primary earnings per share and fully-diluted earnings per share. Primary and fully-diluted earnings per share will be defined as in APB Opinion No. 15. Simple earnings per share will be defined as the net income after deduction for preferred stockholder rights divided by the number of common shares outstanding at the end of the fiscal year.

Research Hypotheses

The basic research hypotheses are: (1) earnings per share data are included in the information set impounded by the market in setting security prices assuming the market is efficient, and (2) the association of each of the three earnings per share measures to the information set impounded by the market in setting security prices is not the same. The second hypothesis indicates that the market prefers one of the three earnings per share measures over the other two measures for inclusion in the information set used by the market in setting security prices assuming the market is efficient. The association methodology

and research design used to evaluate the first and second hypotheses is explained in Chapter III.

The data to test these hypotheses consists of reported earnings per share numbers and stock prices of a sample of firms listed on the New York Stock Exchange. The period used to test the hypotheses is the years 1969 through 1972.

Definition of Terms

Because of the importance and frequency of appearance of several of the terms used in this study, these terms will be defined in relation to their utility in the study as follows:

1. Information is defined as a change in expectations about the outcome of an event (18, p. 68). As applied to earnings per share figures, such figures would have information content if those figures lead to a change in investor expectations so that there is a change in the equilibrium value of the current market price (18, p. 68);*

2. Efficiency is used in the context formulated by Beaver (18, p. 70) and is defined as being the closeness to zero of the expectation of the difference between the forecasted value of earnings per share and the actual value of earnings per share. The closer the expectation of the difference is to zero, the more efficient the forecast(18, p. 70);

3. Earnings per share is defined initially as net income available to common shareholders divided by the number of common shares

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*Note that this study concentrates solely on analyzing security price changes which deal with changes in expectations at the aggregate investor level. Security volume analysis, which deals with changes of expectations at the individual level, is also possible. The concern in this study, however, is aggregate investor reactions.

outstanding. Three different earnings per share measures can be derived from this definition, and these measures have been identified previously in the section specifying the objectives of the study and they are simple, primary and fully-diluted earnings per share;

4. Efficient capital market is defined as a market "in which security prices fully reflect all publicly available information concerning the securities traded," (62, p. 212). The use of "efficient" in efficient capital market is consistent with the definition of efficiency as defined above. That is, the market reflects publicly available information so that the expectation of the difference between forecast and actual prices will be close to zero.

Organization of the Study

The remainder of this study is organized in the following manner. Chapter II develops a theoretical framework for the research undertaken in this study. A review of the development and importance of earnings per share is also included in this chapter.

Chapter III discusses the research methodology. Included in this discussion is an explanation of the models used, a description of the population and selection of the samples and a description of the data analyses used. Statistical analysis and interpretation of the results are presented in the fourth chapter.

The fifth chapter summarizes the findings of the study and presents recommendations and conclusions resulting from the study.

Limitations of the Study

The results and findings of this study will be dependent upon the market model and the investor expectations models used. As previously indicated, recent research has supported the market model. Beaver, Kennelly and Voss (23) have indicated that inferences in research using investor prediction models are conditional upon those prediction models used. Research employing expectations models used by other researchers should provide additional evidence to be considered in further evaluating these models. A fuller discussion of investor expectations models is contained in Chapters II and III.

A finding that one of the three earnings per share measures is more closely associated to the information set impounded by the market in setting security prices does not prove that the higher associated measure is the preferred measure. Other unknown earnings per share measures may be currently used by the market. Alternatively, a presently nonexisting earnings per share measure might be constructed which would prove to be more highly associated to the information set impounded by the market. The research, however, does provide evidence concerning the association with security prices of three prominent earnings per share measures.

CHAPTER II

THEORETICAL BASIS FOR RESEARCH

Introduction

A review of any issue of the Wall Street Journal provides an insight concerning the nature of the research undertaken in this study. A section of each issue of the Wall Street Journal is invariably devoted to the earnings and earnings per share announcements of various companies. Consequently, any party interested in these announcements would likely conclude that these announcements are part of the information set used by investors in making buying and selling decisions. These decisions, of course, are what determines the prices of securities at any point of time.

The concern with earnings per share as accounting information, which in turn would be related to security price behavior, can be seen from just a superficial review of accounting developments in the last fifteen years. Accounting Principles Board Opinion No. 9 and Opinion No. 15 were primarily concerned with earnings per share. Recently the Financial Accounting Standards Board (hereafter referred to as FASB) (46) called for views on the need for interpretation, amendment or replacement of existing APB Opinions. One of the Opinions specifically mentioned by the FASB was APB Opinion No. 15.

The first part of this chapter attempts to develop a conceptual basis for the relationship of accounting information to security prices

and also reviews the literature from which this conceptual basis is developed. The second part of the chapter portrays the development of earnings per share and its place in the accounting information set.

Accounting Data and Security Price Behavior

Nature of the Investor Setting

An investor is faced with many investment choices and much information is available concerning these investment choices. Furthermore, unless the cost of information is the same for all alternate sources (including the cost of the investor generating information himself) then the investor has to make a decision concerning the source from which information should be obtained.

The circumstances described in the preceding paragraph can be seen more clearly if the investment decision process under uncertainty is analyzed in a multi-period context. This type of analysis should be closely related to reality or the situation an investor would actually face. Beaver (16) (17) constructed such an analysis and the remainder of this and the succeeding paragraph is based on his analysis of decision processes of investors. Beaver agreed with Hirshleifer that the investment decision is a decision to exchange current consumption for future consumption so that utility is maximized. Thus, the utility function is construed as time-dated, state-contingent consumption claims. The principal constraint the investor faces in optimizing his consumption (or wealth) is that the present certainty equivalent value of all consumption, both current and future, must equal the present certainty equivalent value of current wealth. The utility function, then, would be directly affected by security price changes because such

changes imply increases or decreases in current wealth which induce changes in consumption opportunities. An investment in securities may be viewed as a decision to exchange current consumption for future consumption.

Because of uncertainty considerations, there is no sure way to know how an investor will make an investment decision. One method suggested by Beaver (17) is to construe uncertainty by segregating the future into a set of mutually exclusive states, on which the investor assigns a probability distribution. Then portfolios of securities can be developed that consist of alternative combinations of future state dependent consumption claims. The investor will then choose an optimal portfolio from the alternative combinations. The analysis constructed here avoids an inadequacy of the classical approach to the microeconomic investment theory which assumed under perfect certainty that investors would choose the investment or security that offered the highest rate of return. The classical microeconomic theory of investment is not consistent with the prevalent observations of portfolio diversification, but the analysis explained in this and the preceding paragraph is consistent with the diversification concept and appears to be closer to observed investor behavior /see Graham, Dodd and Cottle (53) for microeconomic theory investment/.

Information plays an important role in investor decisions because information, as defined in Chapter I, is any data or facts that would change the expectation about the outcome of an event. Thus, information alters the investor's probability assessments that future states will occur (17, p. 563). In a securities market context, information

will take the following role in altering the probability assessments of investors:

> (1) in exchanges of securities reflecting the desire of individuals to hold different portfolios;
> (2) in a change in the prices of securities, which affect the opportunity set to the investor (17, p. 564).

While actions of all individual investors in the market cannot be simultaneously observed, actions of the market as an aggregate force can be observed. Such observations of the market may provide clues as to how accounting information is impounded by investors, providing that a sound conceptual basis for examining information issues associated with a security price behavior can be developed. Subsequent sections will attempt to develop a conceptual framework and discuss the problems involved in developing such a framework.

Portfolio Theory

Assuming that the investment decision process is structured as described in the previous section, portfolio theory appears to be the next logical step in developing a conceptual basis in examining information issues in general. Such an examination can also be applied to accounting information issues in particular and the relationship of these information issues to the behavior of security prices.

Portfolio theory is an appropriate context to involve in a conceptual structure because of the aforementioned phenomenon of investors constructing diverse security portfolios. So, any analysis of investors' objectives and decisions should be a multi-security analysis. The theory of portfolio selection was first developed into a coherent set of logic by Harry Markowitz (67) who proposed a two-parameter model for investor choice. The two parameters were assumed

to be the mean (μ) and the standard deviation (σ). The mean is the mean of expected returns from all securities in the portfolio and the standard deviation is the uncertainty involved in the expected return. The investor, then, is viewed as preferring the highest return at a given risk (σ) level or preferring the lowest risk at a given return level. The investor is assumed to be risk averse which is an assumption not present in the investor setting discussed in the previous section. Other assumptions of portfolio theory which modify the investor setting are: (1) the multi-period consumption-investment is reduced to a one-period decision; and (2) the utility function is stated in terms of terminal wealth, not current consumption (16, p. 430). In developing any theoretical model, e.g., Markowitz's portfolio model, certain assumptions must underly the framework. The assumptions made here do not appear to destroy the validity of the model, e.g., investors have often been observed to be risk averse and a one-period investment decision may be just one step in a multi-period decision process.

The Markowitz model can be expressed in equation form in the following manner:

1. $$Ep = \sum_{i=1}^{n} W_i E_i$$

where: Ep = expected return of a portfolio comprised of n securities,

E_i = expected return of a security i, and

W_i = proportion of funds invested in security i;

2. $$\sigma^2 p = \sum_{i=1}^{n} W_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ j \neq i}}^{n} W_i W_j r_{ij} \sigma_i \sigma_j$$

where: $\sigma^2 p$ = the variance of the portfolio's returns,

W_i = same as in equation 1,

σ_i^2 = variance of security i,

r_{ij} = correlation coefficient of one-security to another security in the portfolio (which involves correlation coefficients for all possible paired security combinations in the portfolio),

$\sigma_i\sigma_j$ = the standard deviation of all possible paired combinations of securities in the portfolio (62, pp. 183-184).

Equations 1 and 2 provide a mathematical formulation of the mean and standard deviation (the σ may be determined in the second equation by taking the square root of the variance). Equation 2 provides an interesting insight into the interrelationship among securities in the portfolio. The first term in Equation 2, $\sum_{i=1}^{n} W_i^2 \sigma_i^2$, represents a summation of the variance of returns on individual securities while the second term, $W_iW_jr_{ij}\sigma_i\sigma_j$, represents essentially the covariance ($r_{ij}\sigma_i\sigma_j$) of the securities in the portfolio multiplied by the weighted proportions of funds (W_iW_j) invested in each security.

Probably the most important factor that can be explicitly derived from the above analysis is that risk of the portfolio should be related, ". . . to both the variability of the returns on the individual securities . . . and the interrelationship among the returns on the securities . . ." (62, pp. 185-186). The correlation coefficient, r_{ij}, among securities may be positive, negative or zero. The implication of the preceding statement is that a security brought into the portfolio may move with the returns of other securities (positive correlation) or against (negative correlation) the returns of securities or is neutral to the returns of other securities (zero correlation). A portfolio consisting of securities entirely positively correlated would tend to have a larger variance or risk level than portfolios with a mix of

negative and positive correlations. Thus, the interrelationship of securities in the portfolio has an obvious effect on the investor's choice of an optimal portfolio.

The principle of portfolio diversification can also be shown to effect the investor's choice. The individual risk elements (the first term of Equation 2) of each security can be reduced to almost zero by simply adding securities to the portfolio. Such an addition can be shown to reduce the first term of Equation 2 to zero (62) (64). The second term in Equation 2 becomes equated with the average covariance between the returns of individual securities in the portfolio as the number of securities in the portfolio increases (62, p. 200). In short, the individual risk elements can be diversified away and portfolio risk will then depend solely upon the interrelationship (covariance) among the returns of individual securities. The implication of this theory is that the effect of information on covariances of returns should be assessed to provide the maximum benefit to the investor and this assessment provides an important implication for accounting information which will be seen more explicitly later in the chapter.

The Markowitz model is not an operational model because of the large number of variables to be estimated. For example, in a one hundred fifty security portfolio, 11,475 variables (expected returns, standard deviations and correlation coefficients) must be estimated. Therefore, a market model was suggested by Markowitz (67) and later extended by William Sharpe (80). If the market has a strong effect on all securities, then the return on each security may be hypothesized as being linearly related to the market return in the following fashion:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \mu_{it}$$

where: R_{it} = rate of return on asset i, for period t,

R_{mt} = aggregate rate of return on all securities in the market,

μ_{it} = unexplained factors which affect R_{it},

α_i = intercept associated with the linear relationship,

β_i = slope associated with the linear relationship also defined as the systematic risk or security i (62, p. 189).

The market model simplifies the process of generating expected returns so that for a one hundred fifty security portfolio only 151 variables must be estimated for each period; i.e., the expected return on each security and the expected market return. The major assumption of the market model is that the only source of interrelationship between the future returns on any two securities is the effect of market-wide events (67, p. 189). To state the assumption in another way, the market return (R_{mt}) reflects economy-wide events and β_i reflects the sensitivity of the individual security to economy-wide events while μ_{it} reflects those events which affect only security i in period t. The μ_{it}, then, represents the individual risk of the security which is often called the unsystematic risk while β_i reflects risk related to the market factor and this risk is often called the systematic risk. As was explained in the preceding paragraph, the individual risk elements, μ_{it}'s, can be diversified away in a portfolio because the addition of each security to the portfolio tends to reduce the first term of Equation 2, the summation of the variance of returns of individual securities, towards zero. The risk factor of greatest concern becomes β_i or as it is commonly titled, the beta risk.

Evidence regarding the importance of the market relating to the variance of securities' ex post returns has been provided by King (59) who found a 52 per cent influence between 1926 through 1960 although, in the final 101 months, only a 30 per cent influence by the market was found. But as Beaver (16, p. 411 noted ". . . relative importance of the market factor varies across securities, and the degree of responsiveness to the market factor (i.e., β_i) also varies across securities." Beaver also notes that previous accounting experimental research designs for analyzing financial reporting problems ignored the market factor (R_{mt}) so that the market model is most appealing for empirical research.

Additional assumptions must be made regarding the market model since it is a time-series regression model. These assumptions are explained and tested in Chapter III.

Another extension of portfolio theory was initiated by Sharpe (80) and John Litner (65) with the development of a capital asset pricing model. When the capital markets are in equilibrium, then Sharpe's model is shown as follows:

$$E(R_i) = E(R_o) + [E(R_m) - E(R_o)]\beta_i$$

where: $E(R_i)$ = expected return on security i,

$E(R_o)$ = expected return on a security that is riskless in the market portfolio,

$E(R_m)$ = expected return on the market portfolio (a portfolio composed of securities in the market with return based on the market value of each security in relation to the total market value),

β_i = systematic risk of security i (defined previously during discussion of the market model) (62, p. 191).

The capital asset pricing model implies that the β risk is the primary factor in influencing rates of return on individual securities since

the events affecting individual firms can be diversified away. The capital asset pricing model, per se, is not used in this study but such a model lends support to the importance of the assessment of information on β (beta) and in determining the preference of certain kinds of information used by the market.

To summarize, portfolio theory thus suggests that errors in individual security returns that still remain at the portfolio level are the errors of primary concern. The preceding suggestion provides a "new" context in viewing measurement errors especially when evaluated in connection with efficient capital markets. The "new" context is that accounting data aids in measuring the beta (β_i) risk for portfolios and also aids in forecasting the beta risk for these portfolios. The accounting data preferred by the market (NYSE), which is a large portfolio, would be the data which assists in minimizing the forecast errors of beta risks of the portfolios which may be constructed from the securities of the market.

Efficient Capital Markets

The definition of an efficient capital market as stated in Chapter I was that security prices reflect all publicly available information related to the securities in the market. The capital market of concern in this study is the New York Stock Exchange, a securities market, although the discussion in this section could be generally applied to any capital market.

The definition of efficient capital markets implies that market will reflect all publicly available information instantaneously and in an unbiased manner. Without an instantaneous and unbiased reaction,

expected returns would not likely be the same as actual returns and thus the market would be inefficient. Capital markets efficiency also implies that price changes in efficient markets will behave in a random or patternless manner (62, p. 212). The investor should consider these implications in assessing his risk and return for optimizing his portfolio. The accountant should consider the implication to determine the effect of information produced by accountants on the market.

The building of an efficient capital market model is based upon the following conditions:

1. no costs are involved for transactions;
2. no costs are involved in obtaining information;
3. investor agreement exists concerning the implication of new information (62, p. 217).

The third condition is often referred to as the "homogenous expectations" condition indicating that all investors have similar expectations about new information. The first two conditions allow the market to act in an unbaised manner. The three conditions also allow that no security price changes will be dependent upon other security price changes or, alternatively, the security prices will react in a random manner. There will be no dependencies because all information is reflected immediately so that price changes do not depend on historical information. The three conditions, however, may appear to be unrealistic and restrictive. Fama (44) has defended the existence of these conditions in a logical and rational manner in indicating these conditions are not absolutely necessary for market efficiency. He argues that transaction costs do not imply that transactions will not take place and the market may be efficient if enough investors are able to

obtain the necessary information. Furthermore, unless there exists investors who can make better evaluations of information available and achieve these superior evaluations consistently, then disagreement among investors about the implications of new information does not necessarily imply market inefficiency. Fama (44, p. 388) finally notes that:

> But though transaction costs, information that is not freely available to all investors, and disagreement among investors about the implications of given information are not necessarily sources of market inefficiency, they are potential sources, and all three exist in real world markets. Measuring their effects on the process of price formation is, of course, the major goal of empirical work in this area.

Since the preceding discussion of efficient capital markets contains mostly abstract concepts, Fama (44) proposed an empirically testable model he referred to as a fair game model. Beaver (16) summarized this model as follows:

$$Z_{i,t+1} = (r_{i,t+1} \mid \lambda_{t+1}, \Phi_t) - E(r_{i,t+1} \mid \Phi)$$

$$E(Z_{i,t+1} \mid \lambda_{t+1}, \Phi) = 0$$

where:

λ_{t+1} = any trading scheme implemented in the interval t to t+1 based upon information Φ_t;

$Z_{i,t+1}$ = the excess return for security i in period t+1 (i.e., the difference between the observed return and the equilibrium expected return);

$(r_{i,t+1} \mid \lambda_{t+1}, \Phi_t)$ = the observed return for security i in period t+1 conditional upon trading scheme λ_{t+1} and information Φ_t;

$E(r_{i,t+1} \mid \Phi_t)$ = the equilibrium expected return which is the return that fully reflects the information available in period t(Φ_t).

Note that the equilibrium expected return is equal to zero implying that the capital market has efficiently "digested" all information.

The equilibrium expected return depends upon the information set but must be determined from whatever expected return theory that is selected. The capital asset pricing model developed by Sharpe and Litner is one example, but only one, of expected return theory.

From the fair game model, various forms of market efficiency evolve. Three forms have generally been specified and empirically tested. The first form is the weak form which specifies that successive price changes would not show a dependency upon one another nor could any trading system be profitable. Price change dependency or trading system profits would violate the expectation of the expected equilibrium return being zero. The second form, the semi-strong form, is the crux of the efficient capital market definition because the main concern of this form is that the market reacts instantaneously and in an unbaised manner to public information. The third form, the strong form, specifies that all information is available to investors; i.e., no investor or group monopolizes the access to relevant information.

The argument for the violation of the conditions of market efficiency has already been stated. Empirical evidence regarding efficient capital markets is reviewed here and provides support or nonsupport for the concepts of efficient capital markets.* Fama (43) discussed in detail random walk theory and empirically tested this theory. His tests showed strong support for the weak form of the efficient market hypothesis. Five years later Fama (44) summarized the theory and

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*Evidence concerning portfolio theory and accounting information is presented in the section entitled "Review of Empirical Research Concerning the Relationship of Accounting Information with Security Price Behavior."

empirical work on efficient capital markets. Generally, the sources cited by Fama supported the weak form and the semi-strong form while showing that empirical studies of the strong form were conflicting. Specialists on the stock exchanges (those who have access to lists of unexecuted buy-and-sell limit orders) were found to have probably turned inside information into profit (44). Mutual funds, in which managers usually claim or are expected to have inside information, were found to have unimpressive performances indicating either mutual fund managers could not cover costs of obtaining the information or that mutual fund managers could not obtain inside information (16). Downes and Dyckman (40) also reviewed efficient market literature. Some empirical evidence against efficient capital markets was cited; but Downes and Dyckman concluded that the evidence was not persuasive enough to refute efficiency in the capital market structure, that evidence supported the efficient market hypothesis but not the degree to which the hypothesis suggests and that further empirical testing should be conducted to test the usefulness of the hypothesis. Finally, Downes and Dyckman (40, p. 317) stated efficient markets research, ". . .to be perhaps the most significant thrust made by accounting researchers in the past decade."

Gonedes (51) contended that the accounting process, as a supplier of information, operates within a competitive context; i.e., accountants do not possess monopoly powers and thus do not produce inside information. If accounting information is viewed within the efficient market context, then observations may be made on the effect of accounting information on security prices market-wide. When a conceptual basis is constructed to associate security prices with accounting information, then such information could be evaluated to determine the

information content of accounting numbers and the preference of the market for alternative sets of accounting procedures.

The efficient capital markets hypothesis indicates that chartist methods and mechanical trading rules would be useless for security analysis because of the randomness of security prices which obviates any advantages of using past information. Fundamental analysis would be compatible with efficient markets because fundamental analysis is not restricted to historical information, but fundamental analysis concentrates on the valuation of each individual security. The major concern in this study is with the effect of accounting information on investors in a portfolio context and/or the effect of accounting information in an aggregate context.

Functional Fixation

The functional fixation hypothesis can be postulated as the inability of investors to determine whether signals generated by changes in the underlying accounting information system are generated by real economic effects or are generated by altering the accounting measurement methods. Ijiri, Jaedicke and Knight (56) related functional fixation to accounting information in the form of the effects of accounting alternatives on management decisions. Ijiri, et al. (56, p. 186) brought the general theme of their discussion into a context similar to the one applying to this study when they stated that:

> . . . unless we can show that the different figures (or more precisely different patterns of figures) lead to different decisions under a given set of conditions, there is no point in arguing the merits or demerits of alternative accounting methods.

Their analysis theorized that decision makers (of which investors are a subset) may not be able to adjust to changes in accounting methods that affect the real economic substance of the firm because the decision maker is unable to transfer meaning from a title or object (e.g., a particular accounting procedure) to another title or object. Thus, the decision maker would suffer from functional fixation.

Since under a given set of conditions, capital markets are an environment in which investors operate, functional fixation would imply the capital market is not efficient. Inefficiency would exist because investors might be misled by alternative accounting concepts, methods or procedures so that security prices would be constantly overstated or understated. The result of the inefficiency caused by functional fixation would be to delay the market in reaching equilibrium. Securities would be improperly priced for an extended period of time thus providing "overvalued" or "undervalued" securities. In functional fixation's extreme form the market inefficiency might be such that as Beaver (16, p. 421) states ". . . disequilibrium could exist indefinitely and presumably permanently."

As indicated in Chapter I, evidence supporting functional fixation was presented by Dyckman (41) and Bruns (29) from observations of the behavior of a sample of individual investors. A later study by Dyckman (42) added the effects of earnings trend and size factors but still concluded that alternative accounting practices had a material effect in evaluating a business firm. Mlynarczyk (73) and O'Donnell (76) conducted studies at a market-wide level which supported functional fixation.

The first three studies cited in the preceding paragraph may be questioned by two factors. The first factor is the wealth of empirical evidence supporting efficient capital markets which in turn would support, at the most, a temporary disequilibrium in security prices. The second factor is the Fallacy of Composition which holds that what is true for the individual decision maker (investor) is not necessarily true for decision makers acting in aggregate. Mlynarczyk and O'Donnell's studies were both concerned with the electric utility industry and the income tax allocation issue created by the governmental regulatory agencies. The tax allocation issue is not a purely accounting issue because the regulatory agencies are involved in making rate decisions (which affect revenue) based upon reported accounting information (16, p. 421).

The logic concerning market reaction to accounting information should now be apparent. Observing market reaction to accounting information should provide evidence as to what information is used by the market given the efficient market hypothesis. To delineate more specifically, an observation of market reaction is a way of determining the use of accounting information by one subset of investors, that subset being the buyers and sellers of securities over a given time period.

Theoretical Framework for the Behavior of Security Prices with Respect to Accounting Information

Information was previously defined as a change in expectations about the outcome of an event. Security price changes (or returns on securities) are events about which expectations exist. The information set that is related to security prices consists of anything that would change expectations about security prices. As mentioned previously, data generated by the accounting process (measuring and communicating

economic data) is generally believed to be part of the information set the market impounds in setting security prices. Obviously accounting information is not the entire information set nor is it known if accounting information is the major part of the information set.

Competition exists between various information sources and these information sources may also have differing costs underlying the providing of information. As Beaver (16, p. 425) suggests, any analysis of the effect of information on security prices should include:

1. specification of competing sources of information,
2. specification of the comparative advantage each source has in providing given types of information,
3. specification of the cost of each source providing types of information
4. any imperfections created in the market by governmental and institutional requirements to disclose or not disclose certain types of data.

Provisions of information required by APB Opinion No. 15 concerning disclosure of different earnings per share measures is an example in which all of the above named factors should be considered.

Another important factor concerning information is that the value of information should be considered at both the individual and social level. In an efficient market the value of information to the individual investor is to aid in the assessment of risk which would be associated with a given portfolio (62, p.425). At this point information can be directly connected to the assessment of risk (beta) related to the individual securities in the portfolio. The connection is made because under the "fair game" model the expected return is conditional upon the information set. The expected return of securities in equilibrium and in a portfolio under Sharpe and Litner's capital asset pricing model equals

the expected return of a riskless security plus a risk premium. The risk premium consists of systematic and unsystematic risk. Since unsystematic risk can be diversified away, systematic risk remains and expected return is conditional upon information thus leaving systematic risk conditional upon information. The possibility further exists that even the systematic risk of individual securities in a portfolio could be diversified away thus leaving information, including accounting information, valueless to the individual investor then the only value left for such information would be a social value. Very little empirical evidence exists that systematic risks of individual securities can be diversified away and the value of accounting information should be evaluated in both the individual and social context until convincing evidence is presented concerning elimination of the individual securities' systematic risks. The research in this study evaluates information primarily from an aggregate context.

The study of individual investor reactions to accounting information cannot be generalized to determine all investor reactions because of the Fallacy of Composition; nor can aggregate investor reactions to accounting information be specified to an individual investor. The efficient market structure, however, provides a framework from which to evaluate information by relating information to the behavior of security prices. Under the efficient market hypothesis, public information is reflected instantaneously and in an unbiased manner. The connection of information with the expected return of securities was shown in the preceding paragraph. The return on a security is the change in price from the previous period to the current period divided by the price in the previous period, thus security price changes are related closely to

security returns. The theoretical basis for the research conducted in this study is the security price-information framework which postulates that the market reacts to published information and this reaction is manifested in changes in security prices. Furthermore, such reactions are immediate and unbiased. From this framework, it may be possible to establish the following assertions: (1) the relationship of accounting information with security prices can be used to assess the effects of information on security prices, and (2) the relationship of accounting information to security prices can be used to assess the preference of alternative accounting practices or regulations.

Both of the above assertions are important for several reasons. First, there may be alternate information structures that could lead to equilibrium prices. Second, different levels of market efficiency likely exist and alternative information structures may provide different levels of efficiency. Third, some accounting information structures may provide essentially the same information, thus being only differentiated by the costs of these systems. Fourth, governmental or institutional requirements for disclosure of accounting information may lead to inefficiency in the market. Fifth, the interrelationships of the above factors must be studied closely in order to provide a complete analysis of the value of accounting information.

Research methods may be, and have been, developed from this theoretical framework establishing the relationship of information to the behavior of security prices. One such method is an association method developed by Beaver and Dukes (21) to rank market preferences as to alternative accounting practices or procedures. The research undertaken

in this study is based upon Beaver and Dukes' methodology and is fully explained in Chapter III.

Complete agreement among accountants does not exist concerning the theoretical framework proposed in this section nor about the two assertions set forth. Gonedes and Dopuch (52) evaluate the security price-information theoretical framework and the assessment of the effects of information on security prices (Assertion 1) and assessment of the preference of alternative accounting practices (Assertion 2). They use the word desirability instead of preference in Assertion 2. The only difference between desirability and preference is that preference implies a ranking of alternatives while desirability implies that alternatives may not necessarily be assigned a rank but may be evaluated individually in regard to which alternative is desired above all others. If no essential difference between preference and desirability is assumed, then Gonedes and Dopuch argue that security price-information theoretical framework cannot be used to test Assertion 2 but can be used for Assertion 1. Gonedes and Dopuch (52, p.76) contend that the second assertion is logically false because information never adds a positive amount to the value of the firm. Information does not contribute a positive amount to the firm because the equilibrium prices of information equal zero and costs of information production are (by assumption) nonnegative (52, p. 76). To delineate their argument in another way, Gonedes and Dopuch (52, p. 77) state:

> Allowing for costs of information production merely requires that tradeoffs are consistent with expected utility maximization. And the decisions implied by these tradeoffs need not maximize the value of a firm's ownership shares. In short, the market value rule cannot (in this situation) be used in determining optimal information-production decisions because the needed correspondence between the value of the firm and expected utility does not, in general exist.

Harold Bierman (25, p. 557) also disagrees with the security price information framework and (among other arguments) asserts that the relationship between accounting information and security prices "cannot generally be used as the primary basis to choose among alternative methods of recording and presenting the financial affairs of a corporation." Bierman(25) contends that security prices can be used to determine whether the market is using reported accounting information and which of current alternative practices are being used, but security prices cannot be used to identify which alternative practices "best" measure financial affairs.

In evaluating Gonedes and Dopuch's and Bierman's contentions, the most important implication related to the research conducted in this study is the role of the words desirability, preference and best. When these words are used in connection with the assessment of alternate accounting techniques or practices, the implication is that the most desirable, highly preferred or best accounting practice should be determined or that the more desirable or more preferred practices should be determined and used. Since all accounting information or all alternative practices cannot be conveyed to every interested party, then the problem becomes one of social choice. The problem of social choice is a collective one because as Demski (38, p.228) indicates, ". . . the concept of social optimality cannot follow from individual tastes. . ." The concept here is that accounting information adds to the benefit of society as a whole and the accounting alternatives should be selected which will optimize the benefits to society (social optimality). May and Sundem (70, pp. 93-94) have demonstrated that information helps maximize social benefits or, alternatively, betters resource allocation. All known methods

of collective choice violate Kenneth Arrow's (8) conditions for ranking social alternatives. However as Demski (38, p.228) proposes, well-defined, acceptable concepts of optimality may exist in restricted settings. The association tests applied to the accounting information generated by the research conducted in this study are based upon the security price-information framework which is in turn built upon a restricted setting.

Gonedes and Dopuch (52, p.73) also note that the inclusion of non-purchasers of information rights as users of information that has been produced does not affect the equilibrium price of information. Yet as Gonedes and Dopuch (52, p.74) argue, efficient capital market studies ignore nonpurchasers of information rights and thus create ambiguous market criteria for determining optimal information-production decisions. In replying to the preceding argument, this study does not attempt to propose an optimal earnings per share measure based upon the observed reaction of the market. The study does attempt to show the preference of a subset of users of accounting information over a given time period based upon observation of market reaction.

The preference concept used in Assertion 2 should be modified, then, in light of the preceding discussion. The context of preference may be changed to use of the term, simplified preference ordering. Assessing the simplified preference ordering of accounting alternatives is consistent with the efficient capital market structure. The nature of efficient capital markets as being well-defined, acceptable and operating in a restricted setting has, hopefully, been previously demonstrated. Assertion 2, then, might be modified to state that: (2) the relationship of security prices and accounting information can be used

to assess the simplified preference ordering of alternative accounting procedures or regulations of a subset of users of accounting information (referred to as actors in the market) over a given time period. The assertion as used in this study may provide a current answer concerning earnings per share preference by the market but does not provide a complete answer in regard to an optimal earnings per share measure. As Beaver (16, p. 428) indicates:

> . . .the ultimate issue is the extent to which this simplified preference ordering is consistent with ordering obtained under a complete analysis. Our current state of knowledge provides little basis for answering that issue at the present time. Essentially what is needed is a general equilibrium theory under uncertainty that specifies the optimal amount of the economic good information that society should produce. Such a theory must be dynamic, in the sense of permitting the probability distributions of actors in the market to be revised in the light of new data. Presently, the general equilibrium theories under uncertainty are static, in the sense that probability distributions remain intact throughout the analysis. In such a context information has no role. Until general equilibrium theory is extended to the dynamic case, the analysis of the value of information is incomplete in a very fundamental sense.

The research design of this study formulates a simplified preference ordering by the actors in the market (NYSE) for the 1969-1972 period for three earnings per share measures. The simplified preference ordering implies assessments of accounting alternatives which are based upon the security price-information theoretical framework applied in a restricted setting but providing significant evidence that can be used by accounting policy makers or other interested parties in evaluating the potential consequences of various accounting alternatives.* To summarize, the simplified preference ordering is not proposed to be optimal but, given the current state of knowledge concerning the economic good information

*Support of other researchers for the conclusion presented in this sentence can be found in Beaver (16) (17) (20), Demski (38), Downes and Dyckman (40), Gonedes (51) and Lev (62).

that society should produce, the simplified preference ordering assists in evaluating the potential consequences of policy decisions made by accounting policy makers and aids in the measurement and forecasting of beta risk. The preceding statement is made within the bounds of the discussion in this section stating that there is no known method of ranking social alternatives optimally in regard to maximizing the welfare of society but that rankings provided in the specified well defined, acceptable setting aid in analyzing the value of information.

Review of Empirical Research Concerning the Relationship of Accounting Information with Security Price Behavior

As was indicated in the previous section, several research methods have been constructed within the efficient market framework to assess the role of accounting information. This section will review the empirical evidence produced by application of these methods with emphasis on the implications of such evidence on the role of accounting information in the economic sector.

The market model ($R_{it} = \alpha_i + \beta_i R_{mt} + \mu_{it}$) is used in the majority of research that is cited in the following paragraphs. Therefore, the assumptions underlying the market model will be considered at this point. In any regression model, three assumptions exist which are: (1) linearity, (2) homoscedasticity of variance, and (3) independence of the residuals (μ_{it}) (no serial correlation). Fama (44) cited evidence which generally supports assumptions one and three while assumption two, homoscedasticity, can be satisfied by eliminating the time period under study when ascertaining α and β_i. Tests concerning these

assumptions were conducted on the market model as used in this study and the results are given in Chapter III. Evaluation of β_i from a time series regression assumes the β_i is stationary during that period (62, p. 434). Fama (44) cited evidence generally supporting stationarity of betas over a long time period. Levy (63) provided evidence which supported that which Fama cited. Levy found that as the time period lengthened (52 weeks was Levy's maximum period) the predictability of β_i's improved. Meyers (72) provided conflicting evidence indicating nonstationarity to some extent, but Blume (26) in a recent study found evidence more in line with Levy's and over a longer time period. Blume (26) indicated more research was needed of beta tendencies. To summarize, evidence generally supports at least some degree of beta stationarity.

The earliest research done with accounting information in the efficient market framework concerned the information content of accounting data. The objective of these studies was to provide evidence that accounting data indeed had information content through the use of the market model to construct an Abnormal Performance Index (API).* A positive API indicated "good" news, a negative API "bad" news and an API of zero "no" news. By developing a large sample of firms, Ball and Brown found on the average that the API's were significantly positive or negative right up to the announcement of earnings (the information variable being studied). Brown and Kennelly (28) performed a similar study on quarterly earnings announcements, as opposed to Ball and Brown's study which concerned annual earnings

*The API is fully explained in Chapter III.

announcements, and concluded basically that quarterly earnings announcements contained information. Beaver (18) also used the market model to study the information content of annual earnings announcements. Beaver's research method consisted of price and volume analysis of the week of the earnings announcements. Using the market model, price and volume residuals (μ_{it}'s) were computed using a time period of 17 weeks. Beaver found evidence that the market reacted, and apparently very quickly, to earnings announcements thus implying earnings announcements had information content.

Another area of great concern in accounting is the effect of reporting changes in accounting techniques in financial statements. Also related to this area is the reporting of alternative accounting procedures, practices or measures that are used by accountants in the measurement of similar accounting data. Kaplan and Roll (58), using a market model residual price analysis, examined the effect of differences in accounting procedures concerning the (1) investment tax credit, and (2) depreciation. Results of Kaplan and Roll's study indicated that accounting changes did not have a statistically significant effect on stock prices. One of the purposes of this type of study was to determine if investors were "fooled" by alternative accounting methods that had no real economic impact on the business firm. The use of alternative accounting methods for measuring the same type of accounting data, e.g., differing investment tax credit methods and differing depreciation methods should have no real economic impact on firms using different methods and the security prices should not be affected by the use of different methods.

Archibald (6) conducted a study of firms switching back to straight-line depreciation from accelerated depreciation for reporting purposes. The purpose of Archibald's study was to determine if the depreciation switchback had an effect on security prices. Archibald used residual price analysis on sixty-five firms and the evidence showed "no immediate substantial effect on stock market performance," (6, p. 30). An important point brought out by Archibald is that evidence should not be generalized in regard to changes in accounting techniques, but the evidence is relevant to the study of investor reaction to changes in accounting techniques.

Ball (10) investigated the price effect of accounting changes using residual price analysis. His use of a cross-sectional model rather than a time-series model differed from the Kaplan and Roll and Archibald studies, but the conclusions were essentially the same, i.e., that accounting changes had little effect on security prices.

The studies of Summers (84) and Comiskey (31) were two studies that did not use the market model in their research. Summers used a measure of accounting efficiency he defined as the "net historic cash cost for some period of one's marginal dollar of owner and long term creditor equity for an individual firm" (84, p. 258). Thus, Summers did not use security prices in his study, and his study is used here to illustrate that other methods without security prices included in the method can be constructed to indicate the effects of alternative reporting practices. Summers' results indicated no preference for any accounting treatment studied in the airline industry. Comiskey (31) did not employ the market model in his research, but did use security prices in his price/earnings ratio model. The subject of Comiskey's

study was firms that switched depreciation methods, from accelerated to straight line, in one industry (steel) for one year (1968). Comiskey concluded from his results that the market did not respond to the accounting change. Archibald's study was concerned with the same topic and Archibald's results were consistent with those of Comiskey's, at least when reviewing both author's conclusions /see Gonedes and Dopuch (52) for a different interpretation of Comiskey's results/.

Patz and Boatsman (77) investigated the effects of a proposed change in an accounting practice as publicly announced by the APB. The change concerned exploration, development and production costs in the oil industry. The residual price analysis was used to study price changes in relation to the announcement of the proposed change and concluded from the results of the study that most likely the market perceived that the proposed change(s) were of no real economic substance thus causing no response in security price movement.

Beaver and Dukes (21) (22) investigated in two related studies the preference of the market in impounding alternative accounting methods of income tax allocation in the information set that would affect security prices. The alternative accounting methods included earnings reported using deferred income tax allocation and earnings that would have been reported without deferral or on a cash flow basis. The market model was used to construct API's and the API's were compared to forecast earnings as predicted by investor expectation models. An association between earnings and security prices was thus generated by this methodology. Beaver and Dukes were able to rank preferences of alternate accounting practices, including those practices not directly visible, by this method. From the evidence provided, Beaver and Dukes

concluded that the deferral tax method was the preferred method. In their second and later study (22), Beaver and Dukes viewed tax allocation as a depreciation method. This viewpoint changed the context of their previous study and Beaver and Dukes apparently felt that the new context might provide evidence which would result in different implications than their previous study. Beaver and Dukes applied their methodology of the prior study plus some cross-sectional analysis based upon three factors: (1) market beta, (2) price-earnings ratios, and (3) earnings growth. The results indicated that the market apparently "saw through" the differences in alternative depreciation practices. The market betas and earnings were not significantly different and the price-earnings were essentially the same once the accelerated-straight line depreciation (accelerated for tax purposes; straight line for reporting purposes) earnings were converted to be comparable with the accelerated-accelerated depreciation group.

The empirical evidence cited in this section is not meant to be all-inclusive nor was it presented to provide an inference that general conclusions could be drawn therefrom. The purpose of citing such evidence was to review evidence generated by research related to the efficient capital market structure and provide background for the research conducted in this study.

Implications of the Theoretical Framework

As Lev (62) on pages 249-250 notes:

> . . . the justification for the rather heavy private and social cost of the elaborate financial accounting system maintained by business enterprises lies in the ability of financial statement analysis to improve users' decision making.

The user should be provided with useful information to improve decision making. The previous section cited evidence which indicated accounting information was useful. Since the volume of accounting information is almost infinite, users should be provided with data that are relevant and cost-minimized. Observation of market reaction to the release of accounting information has been suggested as a method of judging the usefulness of such accounting information.

The efficient capital market structure has been formulated as the base of a theoretical framework for research concerning the usefulness of accounting information. Based on this theoretical framework, research conducted concerning accounting information and security price behavior should provide significant evidence regarding the usefulness of a selected accounting information. This type of evidence will hopefully aid accounting policy makers, but these policy makers or other parties interested in the evidence provided should be alert to the fact that evidence was generated in a restricted setting and generalizations should not necessarily be made from such evidence.

Earnings Per Share

Development of the Importance of Earnings Per Share

An overview of the development of earnings per share figures was given in Chapter I. An elaboration of this development is made here because an awareness of the importance of earnings per share figures is appropriate in understanding the relevance of the research conducted in this study. In requiring earnings per share data to be shown on the face of the income statement, the APB (3, p. 220) specifically took

note of ". . . the significance attached by investors and others to earnings per share data, together with the importance of evaluating the data in conjunction with the financial statements."

Since the issuance of APB Opinions No. 9 and No. 15, accountants, financial analysts and other interested parties have continuously challenged the existence of any earnings per share figure as having informational content /see Knutson (60) for one example/. The popularity of earnings per share figures, however, has shown no noticeable decline. The APB apparently felt that by issuing Opinion No. 15, it could eliminate the variances in computing earnings per share and at the same time let the firm's independent auditor attest that earnings per share had been computed in accordance with procedures set forth in Opinion No. 15.

The importance of earnings per share has thus been demonstrated by APB pronouncements and in FASB Status Reports and also suggests that the APB and the FASB have accumulated enough evidence to apply that importance to the entire financial or economic sector. Such an importance provides the impetus for the research undertaken in this study. Since this study concentrates on total market reaction to earnings per share measures and a simplified preference ordering of such measures, earnings per share measures may then be viewed from an aggregate, but not individual, context. The aggregate context in this study is represented by a subset of users of accounting information as explained in the previous section.

Effects of Dilutive Securities on EPS Measurements

The increasing use of convertible securities, principally convertible bonds and convertible preferred stocks, brought focus on the problem of the effect on earnings per share that conversions of such securities to common stock would have. The conversions into common stock would affect earnings per share computations because the divisor in the earnings per share computation is common stock outstanding.

In Opinion No. 9, the APB recognized the potential dilutive effect of convertible securities. The APB (2, p. 120) in this opinion stated in part:

> When . . . an outstanding security clearly derives a major portion of its value from its conversion rights or its common stock characteristics, such securities should be considered 'residual securities' and not 'senior securities' for purposes of computing earnings per share. Appropriate consideration should be given to any senior dividend rights or interest relating to such securities, and to any participation provisions.

Thus, the residual security concept was set forth as an important feature relating to earnings per share.

The APB, however, failed to set up criteria which could adequately define a "residual security" (78, p. 69). For example, the APB failed to define the phrase "major portion of value." Eventually the APB concluded the residual security concept as explained in Opinion No. 9 was logically and practically inadequate and should either be modified or discarded.

In 1969, the APB replaced the residual security concept with the concept of common stock equivalent. The APB (3, p. 225) defined a common stock equivalent as a security which is not, in form, a common

stock but which contains provisions to enable the holder of the security to become a common stockholder and, under the circumstances of issuance, is equivalent to a common stock. The types of common stock equivalents were basically specified as convertible bonds and preferred stocks, stock options and stock warrants. For convertible bonds and preferred stocks, the common stock equivalent concept envisions that the convertible security has characteristics, not of a senior security, but of a residual type security, and thus should be used in computing earnings per share. When convertible securities are present in a firm's capital structure, and not yet converted, the APB is essentially requiring a pro forma earnings calculation. In the efficient market structure, the market should be able to determine that earnings per share figures are pro forma figures and such figures would not cause price changes unless the figures contained real economic significance. The APB apparently considered the probability of conversion of dilutive securities into common stock as being economically significant because guidelines and procedures were formulated by the APB to include the conversion of securities having a high probability of conversion (as determined by the APB) in the denominator of the computation of the earnings per share measure named "Primary Earnings Per Share." In computing the measure named "Fully Diluted Earnings Per Share," all dilutive securities were considered as converted. Whether the capital market considers the EPS measures formulated in Opinion No. 15 as having differing economic significance is a question evaluated in this study. If the measures have varying economic significance, then the information content of the measures should also vary. From viewing the time and funds expended by the APB, evidence is provided that the

APB felt that there was economic significance in requiring two earnings per share computations (measures) to be disclosed annually for firms whose capital structure included common stock equivalents. Such firms are hereafter referred to as complex capital structure firms while firms whose capital structure contains no common stock equivalents will be referred to as simple capital structure firms.

An interesting comment made by the APB in paragraph 39 of Opinion No. 15 is, "that information is available in the financial statements and elsewhere for readers to make judgments as to present and potential status of various securities outstanding." The APB requires that some debt securities be shown as converted into common shareholders' equity for earnings per share computations and thus the preceding quotation would seem inconsistent. In the context of aggregate investor reaction, as used in this study, the overriding questions become:

1. Do the earnings per share measures promulgated by Opinion No. 15 have information content?

2. Does the capital market react differently to each of the earnings per share measures required by Opinion No. 15?

The above questions lead to the two research hypotheses formulated in Chapter I. Also the possibility exists, as will be explained in the next section, that the market reacts more favorably to other earnings per share measures.

The Alternative Earnings Per Share Measures

The emergence of several alternative earnings per share measures was clearly evident from the issuance of APB Opinion No. 9 and Opinion No. 15. Two of the measures referred to by the APB (and for the APB's

convenience) in Opinion No. 15 are primary earnings per share and fully-diluted earnings per share (hereafter these measures are referred to as PEPS and FDEPS respectively). Both PEPS and FDEPS measures apply solely to complex capital structure firms. The PEPS computation provides for the inclusion in the denominator of common stock equivalents which meet criteria specified by the APB at issuance or during the period of the computation. FDEPS provides for the exclusion of any securities ". . . whose conversion, exercise or other contingent issuance would have the effect of increasing the earnings per share amount . . ." (3, p. 234). Otherwise, all securities that could possibly be converted into common stock should be treated as converted in computing FDEPS. The mechanics of computing PEPS and FDEPS are not relevant to this study except for cost considerations; the information content envisioned by the APB is relevant. PEPS was promulgated to recognize the dilutive effect of securities that were considered to be already equivalent to common stock. Whether the common stock equivalents would or would not be eventually converted into common stock was not the point in question, the APB reasoned. The current status of the securities which met the criteria of being common stock equivalents was the point that should be considered and so PEPS emerged. FDEPS purpose ". . . is to show the maximum potential dilution of current earnings per share on a prospective basis" (3, p. 234). The effect of the FDEPS, then, is to show the maximum decrease in earnings per share, or increase in the net loss per share, if all potential conversions took place. PEPS and FDEPS purpose, then, is to provide financial statement users with information of the effect of dilutive securities on earnings per

share. Thus, depending on the market's assessment of conversion, one might expect the market to differentiate between the information content of the two measures.

Of further interest are other alternative earnings per share measures that might provide greater or lesser information than PEPS and FDEPS. Although many such measures might be specified, a measure which could be called simple earnings per share (hereafter referred to as SEPS) is particularly appealing. The appeal is the fact that SEPS is computed very easily, i.e., by dividing the number of year-end outstanding shares by net income after preferred stock dividends.* The data needed to compute SEPS is disclosed in any annual report. Thus, SEPS could be computed by almost any investor and is a historical, not pro forma, number. The intriguing question can be raised as to whether investors may compute SEPS and differentiate the information content of SEPS from PEPS and FDEPS.

Implications of the Association of Alternative Earnings Per Share Measures and Security Prices

The earnings per share measures specified by the APB in Opinion No. 15 are disclosure regulations for complex capital structure firms.**

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*The net income used in this study for computing SEPS, PEPS and FDEPS is after the inclusion of extraordinary gains or losses. Computations of earnings per share before extraordinary gains or losses would provide even more alternative per share numbers.

**Simple capital structure firms are required by Opinion No. 15 to use a weighted average of shares outstanding as the denominator in computing earnings per share.

No empirical evidence was cited by the APB Opinion No. 15 as to whether investors might prefer the measures the APB formulated. Several empirical studies after the issuance of Opinion No. 15 dealt with the topic of common stock equivalents being actually converted into common stock, e.g., see Gibson (50) or Hofstedt and West (55). Hofstedt (54) conducted a study on investor reactions to earnings per share measures. The study was a behavioral study and the investors tested were one hundred twenty graduate students. The results of Hofstedt's research were mixed but some indication was found that the students were misled by changes in accounting methods. Obviously, based upon number of subjects tested and the evaluation of individual but not group reaction, conclusions of Hofstedt's study could not be generalized to investors as a "whole."

Evidence is needed concerning the reaction of the market to particular types of accounting information. Earnings per share numbers are supposedly types of accounting information but empirical evidence is needed to help support the validity of this supposition (see research hypothesis number one). PEPS and FDEPS were envisioned by the APB as providing significant and different information and evidence is needed to show support for such reasoning. Evidence can also be provided in the same context for measures not visible but possibly having higher information content (see research hypothesis number two).

The efficient capital market structure has already been presented as an appropriate framework from which to assess the effects of information, accounting or otherwise, on the behavior of security prices. The same framework can be extended to specify a simplified preference ordering for alternative accounting practices such as

alternative per share measures.* An empirical study developed within this framework provides evidence about accounting information but the limitations of the theoretical framework and of the methodology of the empirical study have to be considered in reaching conclusions. To summarize, the provision of evidence is significant, at least in one aspect, because as Beaver (20, p. 56) notes:

> In simplest terms, although evidence cannot indicate what choice to make, it can provide information on the potential consequence of the various choices. Without a knowledge of consequences (e.g., as reflected in security prices) it is inconceivable that a policy-making body such as the FASB will be able to select optimal financial accounting standards.

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*The cost of producing accounting information is an important factor in the assessing of the effects of information on security prices or specifying preference orders and is considered in Chapter III.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The need and significance of research associating alternative earnings per share measures with security price behavior was outlined in Chapter I and II. The objective of this chapter is to explain the design and methodology of the research conducted to provide evidence supporting or not supporting the research hypotheses formulated. The research design is structured on the theoretical framework concerning security price-information association that was discussed in Chapter II. The importance of the development of a research design based upon a sound theoretical framework cannot be overemphasized especially when applied to any empirical study.

An empirical study should also explicitly specify the universe with which the study is concerned, the sample selection criteria and the procedures followed in selecting the sample. These items are fully explained in a later section of this chapter.

As with almost any empirical study, this study contains some limitations. These limitations were briefly explained in Chapter I and are more fully covered in a later section of this chapter.

Research Design

Research Hypotheses

The research hypotheses were stated in Chapter I and the reasoning underlying their formulation should become apparent from the discussion developed in Chapter II. An important segment of financial statement readers is investors; and the *a priori* expectation, based upon the previously demonstrated importance of earnings per share numbers, is that investors would include such numbers in the information set that forms the base of their decisions. A study of *ex post* price changes of business firms and the association of such changes to earnings per share numbers provides evidence as to whether such numbers are included in the information set. The point should be further emphasized that this study views the information set from the aggregate or market viewpoint and no conclusions are made as to what any particular individual investor's information set contains. No attempt is made, either, to compare the value of earnings per share numbers as information to the value of other data as information. The first research hypothesis as explicitly stated is:

> 1) earnings per share data are included in the information set impounded by the market in setting security prices assuming the market is efficient.

Three earnings per share numbers, SEPS, PEPS and FDEPS, have been previously identified and were selected to be tested in this study for several reasons. PEPS and FDEPS were required by APB *Opinion No. 15* and little empirical research has been done concerning the information content of these numbers. Furthermore since the APB went to great

length in formulating these two earnings per share measures, the expectation is that these measures should have differing information content.* As for SEPS, this measure is not reported or "visible" in annual reports but can be easily computed from the data published in those reports. Also, SEPS is a historical number whereas PEPS and FDEPS are pro-forma numbers. Therefore, the expectation would arise that SEPS would have a different information content than PEPS and FDEPS. If the market evaluated these earnings per share measures and for some reason found little variance in the information content of these measures, then no preference for any measure would be expected to be shown. The formulation of the second research hypotheses, then, is as follows:

> 2) the association of each of the three earnings per share measures (SEPS, PEPS and FDEPS) to the information set impounded by the market in setting security prices <u>is not</u> the same.

The following points should be noted concerning the research hypotheses. First, the assumption of efficient capital markets underlies the framework of the research design and sufficient evidence has been cited to make this assumption valid. Secondly, there is not any <u>one</u> particular statistical test that is proposed to test each of the hypotheses. The purpose of the research is to evaluate the evidence related to each of the hypotheses in considering the acceptance

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*For simple capital structure firms PEPS and FDEPS are the same and are the net income divided by the weighted average of common shares outstanding. Since PEPS and FDEPS are the same for all simple capital structure firms, these two measures may be combined into one measure titled AEPS signifying a weighted average earnings per share. AEPS is used only in the sections dealing with simple capital structure firms.

or rejection of such hypotheses. As Lev (62, p. 294) notes, classical statistical tests of significance are often applied in a crude and inflexible manner in empirical research. Any prior evidence on the subject of the research should be considered and ". . . the estimation of confidence intervals should replace the conventional inflexible null hypothesis tests" (62, p. 254).

Unexpected Price Changes

The security price-information theoretical framework postulated in Chapter II suggested that the market would react to data that contained real economic significance. The market reaction is in the form of price changes. Therefore, if earnings per share expectations were altered or unexpectedly changed, then security prices should change unexpectedly if earnings per share numbers have information content. This section explains the methodology of determining unexpected price changes while the following section explains the methodology of determining unexpected earnings changes. The association methodology to connect unexpected price changes and unexpected earnings changes and the meaningfulness thereof is then detailed in a later section.

To determine unexpected price changes, one method is to determine expected prices and then compare the expected price with the actual price and the resulting difference between expected and actual prices is the unexpected price. Unexpected prices can be converted to unexpected price changes by using security returns, i.e., returns are defined as the rate of change from one period to another. Expected returns are then used to represent expected price changes. The market model is used to formulate the expected return and is formulated as

follows: $R_{it} = \alpha_i + \beta_i R_{mt} + \mu_{it}$. The terms in the equation have already been identified. On an ex post basis R_{it} and R_{mt} can be determined by observation. Operationally these two terms are defined as follows:

$$(1) \quad R_{it} = \ln \left[\frac{\text{Price}_t + \text{Div}_t}{\text{Price}_{t-1}} \right]$$

$$(2) \quad R_{mt} = \ln \left[\text{Market Index} \right]$$

The terms that have not been previously identified are: ln, the natural logarithm; Price_t, the price of security i in period t; Price_{t-1}, the price of security in period t-1; and Div_t, the dividend declared in period t. The return of security i in period t(R_{it}) is thus defined as the natural logarithm of the price relative while the market factor (R_{mt}) is the natural logarithm of the market index. The market index used in this study is Standard and Poor's 425 Composite Stock Index. A similar index was used by Beaver (18) and it has been found in several studies [see Fama, et al. (45)] that results were insensitive to whatever valid market index was used.

When ex post security and market returns are taken for a specified time period, α_i and β_i can be estimated. The residual (μ_{it}) can then be estimated in the following manner:

$$\mu_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$$

The market model postulates that expected return is related linearly to the expected value of the market factor. By using ex post returns, an estimate of the residual can be determined. The residual represents the unexpected factors unique to security i which are factors represented by public information. The residual, then, represents the unexpected reaction to public information (semi-strong form of market

efficiency) and computation of μ_{it} represents an operational method of defining unexpected returns.

The time period selected to regress security returns on the market return (Standard and Poor's Index) is seven years of monthly data. The security price data consists of eighty-four month-end security prices from the firms in the sample which are then converted into the logarithmic price relatives. The Standard and Poor's Index for those eighty-four periods is also converted into the logarithmic market relative. The seven year period is the period from January 1, 1967 to December 31, 1973. The length of time period was chosen as the seven years from 1967 to 1973 because these years included the period 1969 to 1972 which was selected as the period to study earnings per share. The additional three years provide greater length to the time series regression (market) model, thus providing stability to the model, and also coincides with the length used by King (59).

Since the objective of the research is to investigate the association of alternative earnings per share measures with security prices from 1969 to 1972, four different report periods may be identified. A report period is defined as the twelve month period ending with the month a firm announces earnings per share and the eleven months prior to the announcement month. The announcement month was assumed in all cases to be the third month after the fiscal year end. Beaver and Dukes (21) made this assumption based on the reasoning that previous research had indicated that approximately 90 per cent of the firms release their annual earnings by the third month. Although this assumption appears to be realistic, tests were made using alternative months

as announcement months and the results of these tests are reported in Chapter IV.

The relevant report periods, then, are four periods based upon three months after the fiscal year end in the years 1969 through 1972. The residuals (μ_{it}) are computed on a monthly basis or twelve residuals for each report period. These residuals could be computed from a single regression for the eighty-four month period from 1967 to 1973. However, the expected value of μ_{it} may not be zero and if the "true" residual is positive or negative an upward or downward bias exists from such a single regression (21, p. 327). Therefore, each twelve month report period was deleted from the regression leaving four seventy-two month regressions for each sample firm. Figure 1 illustrates the division of the firm's eighty-four months into four report periods. The residual computations represent unexpected security returns and must be linked with unexpected earnings per share changes.

Two items should be considered before explaining unexpected earnings per share changes. First, the market factor in the market model has been previously referred to but should again be emphasized because the market factor is the prime factor in the market model. The market factor used in this study is Standard and Poor's 425 Composite Stock Index and is made up of 425 industrial stocks which include transportation stocks other than rails (e.g., airlines and bus companies). Francis (47) indicates that percentage changes in Standard and Poor's Index provide good estimates of the average rate of price change for marketable common shares as listed on the New York Stock Exchange. The market factor used in this study, then, is thought

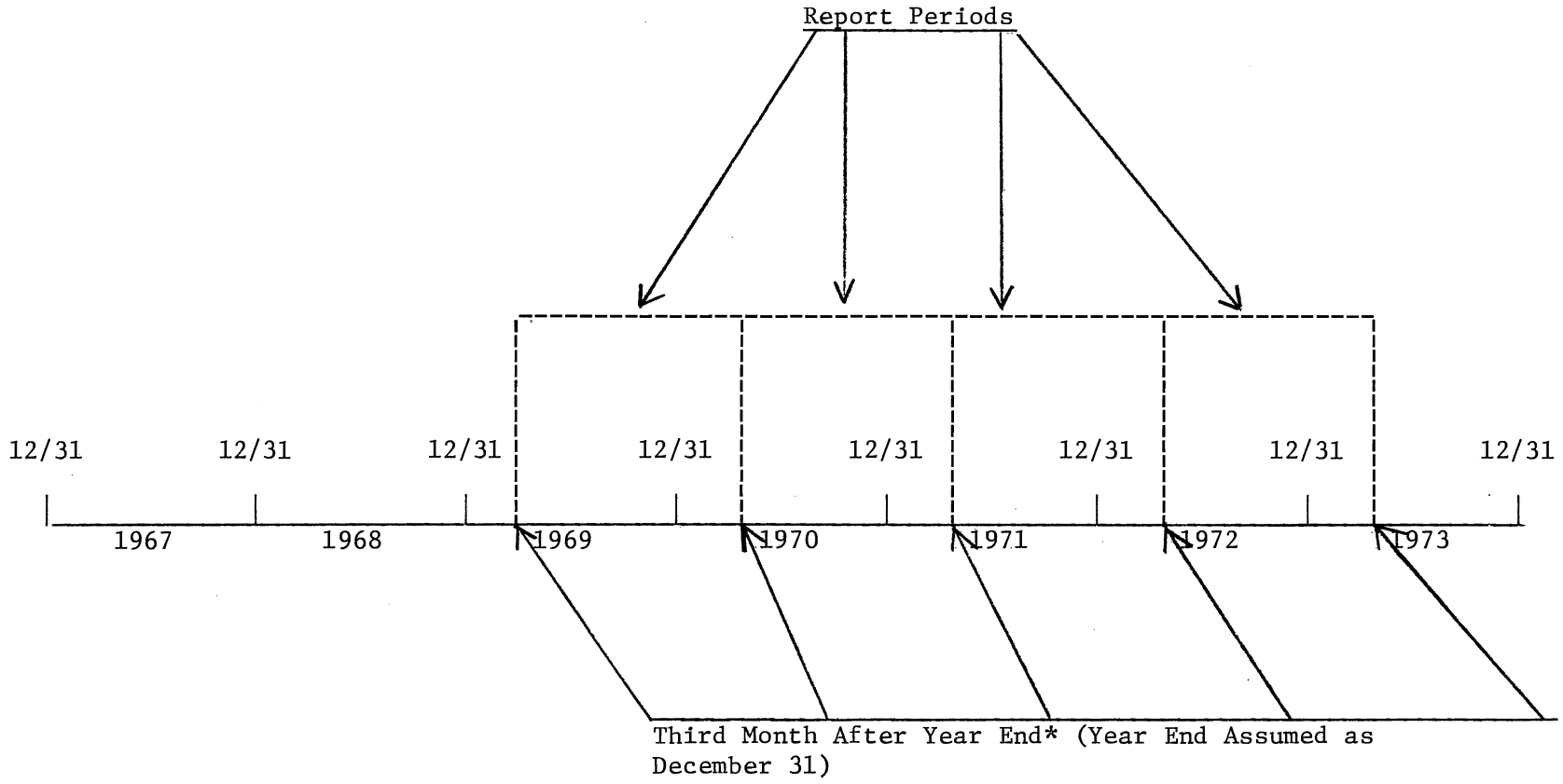

Figure 1. Illustration of Report Periods Used for Computation of Residuals

*Fiscal years are assumed to be on a calendar basis for purposes of this illustration but end of fiscal year in any month is possible. The report period shifts backward or forward when fiscal year end is not at the end of a calendar year.

to be representative and appropriate for use in the market regression model. Secondly, industry effects on the market regression model are omitted and the omission is not considered to be a misspecification of the model because of the previously cited evidence concerning the smallness in magnitude of industry effects. Other factors possibly affecting the time series market regression are discussed in the section concerning adherence to the assumptions of the market model.

Unexpected Earnings Per Share Changes

If investors are using earnings per share numbers, an intuitive expectation is that investors make predictions or forecasts of such numbers. When the forecast or prediction is compared with the actual earnings per share numbers, the probability of the forecast exactly matching the actual is very low especially when assuming the forecast is made a year in advance. The difference between actual earnings per share and forecast earnings per share is called the forecast error. The effect of forecast errors on security prices can be postulated as causing an unexpected increase or decrease in prices if earnings per share numbers have information content. The increase or decrease will occur because an unexpected earnings per share change in form of a forecast error will cause the investor to change his probability distribution about an expected event, a future security price, and thus buy or sell the security causing an unexpected change in security price.* The forecast of earnings per share takes an important role,

*Note that if earnings per share numbers do not have information content, then this process will not cause a change in the investor's probability distribution and thus security prices will not change.

then, in determining the information content of earnings per share numbers.

Forecasts of earnings per share are generated through the application of models in this study. These models are referred to as expectations models because they are formulated to represent investor expectations about earnings per share. The expectations models used should be the ones that investors actually use in making investment decisions. Not much is specifically known about the decision process of investors so the next logical step would be to specify the earnings-generating process, of which the earnings per share-generating process is closely related. The difference in earnings and earnings per share is simply the division of earnings by shares of outstanding stock. This division unitizes the earnings per share measurement but in order to develop such a measurement earnings must first be generated. Therefore earnings and earnings per share are closely interrelated and review of evidence provided by prior studies of the earnings generating processes is appropriate. The previous research in the earnings-generating process is limited but some evidence has been collected concerning four earnings generating processes. The processes are (1) the constant expectation or mean-reverting process; (2) function of time expectation process; (3) the martingale process; and (4) the submartingale process. Lev (62, pp. 118-119) explains these processes and his explanation is basically summarized in the remainder of the paragraph. Process 1 implies that periodic earnings is a random variable whose expectation (i.e., mean value) remains constant over time. Process 2 implies earnings are a function of time and may take various mathematical forms. Process 3 implies a random generating process. Process 4

implies a martingale (process 3) process combined with a systematic trend or drift. The identification of the earnings generating process with one of these four processes would aid the prediction of earnings in any expectations model providing that model was consistent with the earnings generating process.

Evidence has been provided by Brealey (27), Ball and Watts (14) and Beaver (19) concerning the processes. The first two studies, Brealey and Ball and Watts, concluded earnings changes followed either a martingale or submartingale process. Brealey also cited previous studies that favored the martingale process. Beaver examined three rates of return measures, two of which incorporated stock market prices and found that the rates of return behaved as if generated by a mean-reverting process (process 1 or 2).

Because the evidence summarized in the preceding paragraph suggested support of the four generating processes, expectations models were selected that appeared consistent with all of these processes. Earnings-generating processes are used synonymously with earnings per share generating processes for purposes of this study. As Beaver and Dukes (21, p. 324) note, care must be taken not to ascribe any one generating process to any one of the expectations models. There is not necessarily a one-to-one correspondence between generating processes and expectations models (21, p. 324). The expectations models selected for this study are:

(1) $E(X_t) = X_{t-1}$

(2) $E(X_t) = 1/5 \sum_{j=1}^{5} X_{t-j}$

(3) $E(X_t) = X_{t-1} - 1/4 \sum_{j=1}^{4} (X_{t-j} - X_{t-j-1})$

$$(4)\quad E(X_t) = X_{t-1} + 1/4 \sum_{j=1}^{4} (X_{t-j} - X_{t-j-1})$$

$$(5)\quad E(X_t) = .4(X_{t-1}) + .25(X_{t-2}) + .15\ (X_{t-3}) + .1\ (X_{t-4}) + .08(X_{t-5})$$

$$(6)\quad E(X_t) = 1/3 \sum_{j=1}^{3} X_{t-j}$$

where:

$E(X_t)$ = expected value of the earnings per share variable in period t

(X_t) = actual value of the earnings per share variable in period t

5 = number of periods for model 2

4 = number of periods for model 3

3 = number of periods for model 6

j = period specified in models 2 through 6

The forecast error (FE) is then computed as follows:

$$FE = X_t - E(X_t)$$ [for any model].

The periods (t) tested consist of the years 1969 through 1972 and the earnings per share variables as previously indicated are SEPS, PEPS and FDEPS. The first four models were used by Beaver and Dukes (21) (22) and the last two models are modifications thereof. Models 5 and 6 were formulated because it was felt that investors use recent data in their investment decisions [see Copeland and Marioni (34) for discussion of use of dated information]. Model 5 weighs most recent earnings per share data more heavily and Model 6 uses a three year average instead of the five year average used in Model 2.

The six models selected all appeared to be consistent with the earnings generating processes discussed in this section. Although a one-to-one relationship of models to processes should not be stipulated,

some examples of the relation of processes to models can be given. Model 1 is called a naive model and can be related to a martingale process which means that next year's earnings per share is predicted based on the current year's earnings per share. Such a prediction implies statistical independence of every year's prediction, a characteristic of the martingale process. Model 3, as indicated by Beaver and Dukes (21), can be related to a mean reverting process. Models 2 and 6 can also be described as mean-reverting processes over time. Model 4 could be ascribed to a pure mean-reverting process or mean-reverting over time.

Although many other expectations models could be selected, the models selected have been used by other researchers and, until replaced by other models proven more effective, provide a reasonable basis for earnings per share forecasts.

In order to provide additional evidence of the forecast's relation to earnings per share generating processes, the models were tested by computing the coefficient of variation of the forecast errors. The forecast errors of models that more closely adhere to the earnings generating processes would logically be more closely dispersed. The coefficient of variation is a measure of relative dispersion as indicated by Mason (69, pp. 120-121) and is computed as follows:

$$CV = \frac{s}{\bar{X}}$$

where:

CV = Coefficient of Variation,

s = Standard deviation of the sample group forecast errors,

$\bar{X}$ = mean of the sample group forecast errors.

Results of this test are reported in Chapter IV but generally the evidence presented indicated that no one particular model more closely adhered to the earnings per share generating process than any of the other models.

To summarize, models 1 through 6 were used to develop earnings per share forecasts for each year from 1969 to 1972. Since three earnings per share measures (SEPS, PEPS, FDEPS) were tested, this process developed a total of seventy-two predictions (6 models x 4 report periods x 3 EPS measures) for each firm in the sample group. By comparing forecasts with actual, seventy-two forecast errors $[X_t - E(X_t)]$ were computed. The preceding process was also conducted on first differences of all reported earnings per share measures. First differences are the current period's reported earnings per share less the prior period's reported earnings per share $(X_t - X_{t-1})$. First differences deflate the earnings per share numbers but isolate the changes in earnings per share from one period to another and have been shown in studies by Ball and Brown (12) and Beaver (19) to be superior form of variables in investigating the association between unexpected changes in accounting earnings and unexpected changes in security prices. All reported annual earnings per share numbers in this study were taken from Moody's Industrial and Transportation manuals, from 1963-1973 (74) (75).

The Methodology of Associating Unexpected Price Changes with Unexpected Earnings Per Share Changes

A method is needed to establish an explicit connection between

unexpected price changes and unexpected earnings changes. The base for this association method is the API (Abnormal Performance Index) which provides an index of unexpected price changes over a period of time (twelve months for this study). The market model residual term, μ_{it}, is used to construct the API. Since the residual represents the unexpected return for one point in time, there would be difficulties in linking the residuals with forecast errors which are determined from a forecast a year in advance. By compounding the residuals over a twelve month period, on a monthly basis, an index of unexpected returns (price changes) can be constructed and is known as the API. The mathematical formulation of the API as used by Beaver and Dukes (21) is as follows:

$$API_i = \prod_{t=1}^{12} e^{R_t} - \prod_{t=1}^{12} e^{R_t - \mu_t}$$

where: API_i = Abnormal Performance Index of security i for one year;

e^{R_t} = Natural logarithm of return on security i in month t;

$e^{R_t - \mu_t}$ = Natural logarithm of the return of security i less the residual of security i in month t.

The holding period for the API is defined as the announcement month and the eleven months prior to the announcement month, i.e., the report period. The abnormal return as indicated by the API, then, is the actual return (R_t) less the market-conditioned return ($\alpha + \beta R_{Mt}$) assuming continuous compounding.

Financial data, including earnings per share numbers, are published on a quarterly or more frequent basis. Thus, investors gain knowledge about any particular firm throughout the year and are able to adjust their expectations about earnings per share throughout the year. The

API, on an ex post basis, reflects the adjustment in expectations as shown through unexpected returns to any data that has information content. If earnings per share numbers have information content, then an explicit connection between unexpected earnings per share changes and unexpected returns can be made using the expectations models and the API. This connection can be accomplished by comparing the signs of the forecast error and the API. If the forecast error is negative for whichever expectations model is used, then the a priori expectation is that the API would reflect negative returns or the sign of the API would be negative. Such a matching of signs in the same direction would indicate information content for earnings per share numbers. By taking a sample of firms over a four-year period (1969-1972), the number of times the signs are the same, both API and FE negative or both positive, can be computed and a percentage then computed by dividing the total comparisons into the number of times the comparison had the same sign. The preceding process of percentage association can be accomplished for each expectation model for each of the four years. A percentage above fifty per cent implies information content for earnings per share numbers, i.e., the percentage above fifty per cent implies more than a chance occurrence for earnings per share being part of the cause of the change in stock prices.

Three earnings per share measures (SEPS, PEPS and FDEPS) have previously been selected for testing. By computing the percentage association between FE and API signs, a simplified preference ordering can be established for the three earnings per share numbers. In short, the measure with the highest percentage is the most preferred, the next highest percentage is second, and the next highest is third per

model. This process can be repeated for all six models using both the original data and the first difference data.

Beaver and Dukes (21, p. 326) suggested that the API may be ". . . an ex post analogue to the concept of the value of perfect information . . ."and ". . . at the very least the API can be interpreted as an operational index of association between accounting data and security prices." Marshall (68) constructed examples where it was shown that information value and association preference determined through the use of the API could be severely questioned. However, the API as used in this study differs in one important respect to the API as used by Beaver and Dukes and Marshall. The important difference is that in this study no attempt is made to construct a composite or average API across all sample firms. The API, as used in this study, is computed for each individual firm and the across firm computation is the simple percentage association computation. Beaver and Dukes employed a composite API which involved partitioning the firm API's into positive and negative API's and using a weighting function (W_o) to weight the number of positive and negative firms in determining the composite API. The composite API was formulated to show the private value of information and the higher the API the more the value of the information. Marshall pointed out through his examples that completely different results could be generated and the composite API could not always be relied upon to measure correctly either private information value or association. Marshall concluded that the reason for his findings concerning the API was the weighting function (W_o) used in computing the composite API. Avoiding the use of the composite API thus avoids the problem caused by the weighting

function because no weighting function is employed in a single firm API's. Marshall further criticizes the use of the API in evaluating choices among accounting alternatives. Such choices are social choices and the problems of social choices were discussed in Chapter II. The API in this study is employed only as an operational index of association between accounting data and security prices.

To summarize, the percentage association tests provide evidence from which an acceptance or rejection of the research hypotheses can be considered.

Formulation of Test Statistics

Additional evidence to evaluate the research hypotheses can be provided from carefully selected statistical tests. The tests selected are nonparametric because parametric tests of significance cannot be used on data which are not characterized by finite variance. Evidence was presented by Fama, et al. (45), which indicated time series regressions using security prices, e.g., the market model, violated the assumption of a finite variance to some extent.* Therefore, the tests selected for this study are nonparametric tests.

The binomial test is a test which according to Siegel (81) can be applied to a population conceived of consisting of only two classes. In relation to percentage association, the population can be conceived as consisting of those percentages of fifty per cent and those percentages other than fifty per cent. The following hypothesis can then be

*The evidence indicated a violation of the normality of the μ's which implies the variance is not finite.

formulated:

Null Hypothesis, H_o: The percentage association between earnings per share measures and security prices is fifty per cent.

Alternative Hypothesis, H_a: The percentage association between earnings per share measures and security prices is greater than fifty per cent

The reasoning underlying this hypothesis is that fifty per cent association could be achieved by chance, i.e., by flipping a coin. Evidence which indicates a non-chance happening is thus significant. Furthermore, evidence indicating a percentage greater than fifty per cent (one-tailed test) implies information content to earnings per share measures.

The Mann-Whitney U test may be used, according to Siegel (81), to test whether two independent groups have been drawn from the same population. Two independent groups which can be considered in this study are forecast errors with differing signs among earnings per share measures. For each model and each year, three comparisons of forecast error signs can be made. The three comparisons are: (1) SEPS vs. PEPS, (2) PEPS vs. FDEPS, and (3) SEPS vs. FDEPS. When the signs of forecast errors differ in these comparisons, two groups are established and the Mann-Whitney U test can be applied to test the following hypothesis:

Null Hypothesis, H_o: Population A (the first named measure of any of the three comparisons) has the same distribution as Population B (the second named measure).

Alternative Hypothesis, H_a: Population A has a greater distribution than Population B.

Rejection of the null hypothesis indicates a greater dependence on one

earnings per share measure when compared with another measure and implies a greater preference for that measure.

Analysis of beta (risk) can also provide evidence concerning the research hypotheses. Risk analysis provides evidence because insight into which EPS measure best aids in measuring beta risk indicates which measure the market might prefer in terms of minimizing forecast errors of beta risk at a given return level. Since dilutive securities are reflected to a different extent in PEPS and FDEPS, but not in SEPS, the market should assess the three EPS measures' effect on the beta risk in a different manner if the measures have varying economic significance. The comparison in this study was limited to the beta risk of CCS Group firms compared to the beta risk of SCS Group firms. Essentially the risk comparison among the three EPS measures was limited to comparing PEPS and FDEPS (from CCS Group) with AEPS (from SCS Group). The average beta for all firms in the sample group can easily be determined because the market model provides a beta for each year and each firm. The average beta per firm is then defined as: $\bar{\beta}_i = (1/4) \sum_{t=1}^{4} \beta_t$ where β_t equals β for each year. Then the average beta for all firms is defined as: $\bar{\beta}_T = (1/N) \sum_{i=1}^{N} \bar{\beta}_i$ where N equals the number of firms in the sample group. Two sample groups are identified for this study and consist of (1) a group of firms with three earnings per share measures (Complex Capital Structure Group) and (2) a group of firms with two earnings per share measures (Simple Capital Structure Group). A comparison of $\bar{\beta}_T$ for each group indicates, at the very least, whether the risk factors of the two groups are the same or not.

Cost Factors of Alternative Earnings Per Share Measures

The costs of the information production process for an accounting alternative should be evaluated in considering that alternative. Three alternative earnings per share measures were selected for this study and the costs of each measure are evaluated in this section.

The costs involved in generating SEPS numbers are very minimal. The data to compute SEPS is provided in any annual report so the investor has a minimal time factor in computing SEPS for himself. The firm disclosing the data does it as a part of required data disclosure for other purposes so no additional costs are incurred by the firm. Costs of generating PEPS and FDEPS are greater than SEPS especially at the firm level. The firm must follow the procedures set forth in APB Opinion No. 15 for computing PEPS and FDEPS. These measures use earnings, common stock and common stock equivalents to produce the specified numbers and such data should be generated by a firm's accounting system. If the APB procedures for computing PEPS and FDEPS are followed, the complication of these procedures alone makes it obvious that firm costs in computing PEPS and FDEPS is more than the cost of just dividing net income by outstanding shares (SEPS). Evidence is sparse or nonexistent concerning the additional costs of supplying PEPS and FDEPS to financial statement readers. The additional costs of supplying PEPS and FDEPS must be considered feasible, however, if only because no evidence apparently exists of business firms complaining publicly about these costs. The assumption for this study, unless otherwise indicated when referring to PEPS and FDEPS, is that cost differences among per

share measures are trivial. This assumption will be reexamined in light of the results of this study in Chapter V.

Identification of the Universe and Samples

Universe Criteria

The universe of business firms considered in this study included those firms which met the following criteria:

1. Firms with their common stock listed on the New York Stock Exchange (NYSE) from 1963 through 1973.
2. Firms not included in the following Standard and Poor's industry classifications;
   a. Banking,
   b. Finance,
   c. Insurance,
   d. Railroads,
   e. Real estate investment trusts,
   f. Telecommunications,
   g. Utilities - electric,
      - gas,
      - water,
      - diversified.
3. Firms which have not lost their corporate identity during 1969 - 1972 period due to merger or consolidation or both.

The first criterion aided in data collection and provided a capital market which empirical research has supported as being efficient. The years 1963 to 1973 are specified because data from these years were necessary to compute forecast errors and the API.

The second criterion was established because most of these industries are highly government regulated industries thus lacking comparability with the less regulated industries. The firms remaining after consideration of this criterion represent a fairly homogenous group in regard to accounting data measured and communicated.

The criterion that a firm has not lost its identity through merger or consolidation simply provides assurance that the universe contains firms that can be identified for each of the tested years, 1969-1972. This criterion provides a degree of uniformness to the sample selected from this universe but does provide a bias towards survivorship.

Sample Selection Criteria and Procedure

The following sample selection criteria were met by the firms which were included in this study:

1. Firms for which a seven-year financial analysis was included in the 1973 Moody's Industrial and Transportation manuals;
2. Firms for which Moody's reported either
   a. SEPS, PEPS and FDEPS measures
   b. SEPS and AEPS (weighted average earnings per share) measures.

Table I presents a summary of the effect the sample selection criteria on the firms in the universe. The total of 250 firms meeting the first criterion were subdivided into two sample groups by the second criterion. The purpose of subdivision into two sample groups is to study the effects of the research methodology on firms with and without dilutive securities. Such effects are clearly outlined in Chapter IV although primary concern is with the Complex Capital Structure Group

since this is the group which contains dilutive securities in its capital structure.

TABLE I

UNIVERSE SIZE AND THE FACTORS REDUCING THE UNIVERSE TO THE SAMPLE

	Number of Firms
Universe of Firms Meeting Universe Criteria	695
Firms Excluded Because Seven-Year Analysis of Earnings Per Share Data Unavailable	445
Firms included in Sample Groups	250
Complex Capital Structure Group- Firms Reporting PEPS and FDEPS (See Appendix A)	103
Simple Capital Structure Group- Firms Reporting AEPS only (See Appendix B)	147
Total of Both Sample Groups	250

The first sample selection criterion was established because of data collection. Moody's Industrial and Transportation manuals contained seven-year and two-year financial analyses of firms. Use of the firms with only two-year financial analysis would have multiplied

the data source problem almost by four. Limiting the sample to those firms with only a seven-year analysis leaves the sample groups with basically the larger business firms in the United States. These firms, however, are the ones primarily traded on the New York Stock Exchange. Selection of larger firms would tend to bias against earnings per share reported because larger firms generally have a greater outflow of information than smaller firms (18, p. 71). Bias in the opposite direction is caused by the omission of smaller firms because an assessment of the alternative earnings per share measures of smaller firms is lacking. The direction and magnitude of the bias caused by this selection criterion is unascertainable.

The seven-year period (1967-1973) selected for security price data collection means that eighty-four month end quotations were collected for the common stock of each firm in the sample groups. Common stock quotations totaled 8,652 (103 x 84) for the Complex Capital Structure Group and 12,348 (147 x 84) for the Simple Capital Structure Group.

Adherence to the Assumptions of the Regression Model

The market model is a time-series regression model and should conform to the assumptions of regression models. These assumptions were indicated in Chapter II and are (1) linearity, (2) homoscedasticity of variance, and (3) serial independence of the residual (μ) terms. Fama (44), Fama, et al. (45), King (59) and Meyers (71) provided empirical evidence supporting the linearity of the market model when employed to predict returns of common stocks listed on the NYSE. The violation of the regression model's assumption of homoscedasticity of variance

is avoided by omitting the report period in estimating α and β [see Patz and Boatsman (76)].

The third assumption, serial independence of the residual terms, has been supported by empirical evidence also. However, because of the importance of this assumption in not only estimating the return of a security but also in estimating the regression coefficients, α and β, tests of serial correlation were performed on both sample groups. To further emphasize the importance of no serial correlation, Yamane (85) indicates that mathematical statisticians have shown that when the μ's are not independent and show a serial correlation, the linear regression model may not give the best estimate. The sampling variances of the regression coefficients, α and β, may also underestimate the true variance if serial correlation is found.

To test the data used in this study for serial correlation of the residuals, the Durbin-Watson statistic, d, was computed for each firm in both sample groups according to the following formulas:

$$(1) \quad d_1 = \frac{\sum_{i=1}^{84} (\Delta\hat{\mu}_i)^2}{\sum_{i=1}^{84} \hat{\mu}_i^2}$$

$$(2) \quad d_2 = \frac{\sum_{i=1}^{84} (\Delta\hat{\mu}_i)^2}{\sum_{i=1}^{84} \hat{\mu}_i^2}$$

where:

d_1 = statistic of Complex Capital Structure Group

d_2 = statistic of the Simple Capital Structure Group

$\Delta\mu_i = \hat{\mu}_i - \hat{\mu}_{i-1}$ or the change in the residual from period $i-1$ to period i.

Tables II and III present a frequency distribution of the test statistic for each of the sample groups. The results indicate presence of serial correlation in nine firms (8.74%) in the Complex Capital Structure Group and thirteen firms (8.84%) in Simple Capital Structure Group at the 90 per cent level of confidence. To state another way, the results of the Durbin-Watson test show that only approximately nine per cent of either sample group contain serial correlation such that the null hypothesis of serial correlation could not be rejected at the 90 per cent level of confidence. The conclusion is that the data in this study adhere to the assumptions of a linear regression model.

TABLE II

FREQUENCY DISTRIBUTION OF DURBIN-WATSON STATISTIC FOR COMPLEX CAPITAL STRUCTURE (CCS) GROUP**

Test Statistic Values	Number of Firms
1.37-1.65*	6
1.66-2.34	94
*2.35-2.84	3

*Critical values of the Durbin-Watson test statistic at the 90% level of confidence.

**CCS is the abbreviation for the Complex Capital Structure Group.

Source: Yamane (85, p. 1096).

TABLE III

FREQUENCY DISTRIBUTION OF DURBIN-WATSON STATISTIC FOR SIMPLE CAPITAL STRUCTURE (SCS) GROUP**

Test Statistic Values	Number of Firms
1.37-1.65*	1
1.66-2.34	134
*2.35-3.07	12

*Critical values of the Durbin-Watson test statistic at the 90% level of confidence.

** SCS is the abbreviation for the Simple Capital Structure Group.

Source: Yamane (85, p. 1096).

Data Sources

The purpose of this section is to identify the data sources of this study. One source which has been previously mentioned is Moody's Industrial and Transportation manuals, 1963-1973 (74) (75). Moody's was used to collect the reported earnings per share numbers for the years under study and those years necessary for the computation of forecast earnings per share. Stock price quotations for the seven-year period (1967-1973) were gathered from Standard and Poor's ISL Daily Stock Price Record-New York Stock Exchange, 1967-1973 (82). The Standard and Poor's 425 Composite Index for the corresponding seven

year period was also obtained from the source cited in the preceding sentence.

Limitations of the Methodology

In establishing a theoretical basis of the research, constraints of theoretical structure were noted. These constraints consist of a restricted setting and the inherent problem factor of social choice. The well-defined, acceptable but restricted setting was specified by basing the theoretical framework on the efficient capital market structure. The problem factor of social choice is the impossibility of selecting a "desirable" accounting alternative utilizing market preference or any other collective choice method.

As noted in Chapter I, the use of investor prediction or expectations modes injects a limitation of methodology. The limitation is that any inferences from evidence provided by the research are "bound" by the expectations models used. Use of expectations models by investors other than those models used in this study is entirely possible. Until further research is completed in the investor expectations model area, any conclusions reached in research using expectations models must be conditional upon those models used.

Another limitation is the omission of other earnings per share measures. There are almost an infinite number of earnings per share measures that can be derived from the data provided in annual reports. The possibility exists one or more of those measures are included in the information set impounded by the market and are not one of the three measures selected for research in this study.

The study is also restricted by the lack of cross-sectional analysis of firms earnings per share in the study. Davis, et al. (37), have demonstrated, however, that earnings per share numbers do not provide statistically valid cross-sectional analysis because of the characteristics of the denominator. The research was carefully designed to provide the most valid evidence possible without cross-sectional analysis. The lack of such an analysis is not considered to seriously affect the significance of evidence provided in this study.

Summary

The research hypotheses and the research design to provide evidence regarding these hypotheses were presented in this chapter. The research design was constructed in a logical fashion and in consideration of the limitations imposed upon the study. Evidence concerning the adherence to the assumptions of a regression model used in the methodology was reported. The universe from which the sample is drawn and the sample selection criteria were identified. A summary of the sources of the data used in the research was included. Limitations of the research methodology were cited. Finally, one result of the discussion in this chapter is that inferences made from evidence provided by this study are not generalized and are made only after considering the constraints of the study.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

Introduction

Research concerning earnings per share data and security price data was carried out in accordance with the design specified in Chapter III. This chapter summarizes, analyzes and interprets the research conducted. The first part of the chapter deals with analyses related to expectations models and the API, two of the foundations on which the research design is based. The tests performed based on these foundations provide background for later analyses and help establish validity for the body of evidence provided by this study.

The remainder of the chapter concentrates on percentage association tests and statistical analysis of the results of the percentage association tests. The sections of the chapter devoted to percentage association tests and statistical analysis of these tests compose the primary evidence generated concerning the association between earnings per share measures and security prices. Interpretation of the results presented is made throughout the chapter. The interpretations are made in consideration of limitations stated in Chapter III and such limitations are again specified when the limitations can be related directly to a particular interpretation.

Analysis of Expectations Models

The Coefficient of Variation, a measure of relative dispersion, was used to test the forecast errors generated by the use of six expectations models on four sets of data. These sets of data are the original data of the Complex Capital Structure Sample Group (hereafter referred to as the CCS Group), the original data of the Simple Capital Structure Sample Group (hereafter referred to as the SCS Group) and the first difference data of the CCS and SCS Groups. The results of the Coefficient of Variation test are presented in Table IV.

The results are both positive and negative because the denominator of the Coefficient of Variation computation is the mean of the forecast errors and this may be positive or negative. Further explanation can be made of the differences in size in some of the results, e.g., Model #3 results in the first difference series of CCS Group. The size differences are caused by the denominator. Since the numerator of the Coefficient of Variation is the standard deviation of the forecast error, no large variation in relative size through standard deviation results were expected among models and none resulted. In fact the standard deviations over all four sets of data ranged from .9029 to 1.9082. The denominator, however, was smaller than the numerator in all cases and small differences in the denominator caused large relative differences among results. These differences can be demonstrated by analyzing the results of Coefficients of Variation for Models Four and Five of the original data of the SCS Group, PEPS or AEPS column. The results are shown as 31.20 and 11.42 for Models Four and Five respectively and were computed by dividing the standard deviation, 1.035 for Model Four, .9294 for Model Five, by the mean of the

TABLE IV

RESULTS OF COEFFICIENT OF VARIATION TEST*

Model #	SEPS	PEPS or AEPS	FDEPS
Original Data Series - CCS Group			
1	-68.25 (5)	-75.61 (5)	-51.56 (5)
2	- 9.09 (1)	- 9.81 (1)	- 7.38 (1)
3	-29.16 (4)	-32.28 (4)	-19.02 (4)
4	266.73 (6)	286.47 (6)	86.11 (6)
5	-11.59 (3)	-12.56 (3)	- 9.76 (3)
6	-10.08 (2)	-10.83 (2)	- 8.97 (2)
First Difference Series - CCS Group			
1	24.94 (3)	27.96 (3)	25.39 (3)
2	-35.52 (4)	-37.82 (4)	-51.98 (5)
3	-2088.23 (6)	-456.66 (6)	466.48 (6)
4	13.92 (1)	15.27 (1)	14.48 (1)
5	48.35 (5)	50.61 (5)	38.27 (4)
6	22.21 (2)	23.16 (2)	20.22 (2)
Original Data Series - SCS Group			
1	14.45 (4)	13.56 (4)	
2	11.99 (2)	10.18 (2)	
3	9.53 (1)	8.75 (1)	
4	31.52 (6)	31.20 (6)	
5	13.94 (3)	11.42 (3)	
6	19.48 (5)	15.88 (5)	
First Difference Series - SCS Group			
1	25.78 (4)	26.72 (4)	
2	159.13 (6)	124.57 (6)	
3	78.92 (5)	76.82 (5)	
4	16.98 (1)	17.83 (1)	
5	25.71 (3)	25.93 (3)	
6	19.33 (2)	19.68 (2)	

*The numbers in parentheses () are the rank of the models in each section and for each earnings per share measure according to the closeness of the results to zero.

forecast errors, .03317 for Model #4, .08138 for Model #5. Thus the relative difference of almost twenty is caused by a difference of only approximately .05 in the means.

The closer to zero of any result of the Coefficient of Variation test, the closer the expectation model producing that result should be to the earnings per share generation process, if the forecast error is a measure, in itself, of deviation from that process. Therefore the results were ranked by model, one indicating the top ranking and closest to zero and six indicating the worst ranking and furtherest away from zero for each set of data; the rankings are shown in Table IV. The average ranking of the models across all four sets of data is shown in Table V.

TABLE V

AVERAGE RANKING OF EXPECTATIONS MODELS IN COEFFICIENT OF VARIATION TEST†

Model #	Average Ranking††
6	2.75
2	3.25
4	3.50
5	3.50
1	4.00
3	4.00

†The average ranking was determined by averaging the ranks of each model from each of the sections in Table IV, e.g., average rank of Model 1 = 5 + 3 + 4 + 4/4 = 4.0. The ranking of one indicates the best ranking while six indicated the worst ranking.

††The average ranking is the same across all three earnings per share measures except FDEPS ranking in the First Difference Series, CCS Group. This exception causes a change in only two average rankings for FDEPS, Model #2 becomes 3.5 and Model #5 becomes 3.25.

From Tables IV and V, the following points may be noted.* First, different models show superiority among the various sets of data. A good example of the differing results is the comparison of Model #3 ranking among the sets of data. Model #3 ranks fourth, sixth, first and fifth among the sets of data respectively in the order specified in Table IV. This difference in ranks is fairly typical for all of the models and no model shows a clear superiority in Coefficient of Variation. Second, the average ranking of the expectations models are fairly close together. The lowest average ranking, Model #6, is 2.75 while the highest average ranking, Models #1 and #3, is 4.00.

Expectation Model #6 clearly shows the best ranking across all four sets of data. Model #6 is essentially an average of the last three years earnings per share numbers to forecast current earnings per share and is probably more closely related to a mean-reverting process, either constant or as a function of time. Thus Model #6 results are more closely related to the findings of Beaver (19), in his study of earnings behavior, than to the findings of Brealey's (27) study. Because of the two points emphasized in the preceding paragraph, however, the indication of Model #6 as clearly superior in closeness to the earnings per share generatings process is overly optimistic. None of the expectations models ranked in the worst three positions (#4, #5 or #6) for <u>all</u> four sets of data. The possibility that any of the six expectations models might be consistent with the earnings per share generating process led to the inclusion of all six models in the research conducted. In other words, evidence presented in this section

*The rankings for the three measures, SEPS, PEPS and FDEPS, in each set of data are virtually the same except as noted in Table V.

implied that each of the six models could be consistent with the earnings per share generating process assuming that forecast errors indicate the deviation from the actual earnings per share generating process.

Analysis of the Effect of the Announcement Month on the API

The API is an index constructed over a twelve-month period, called the report period. The last month of that period is the announcement month for earnings per share and the remainder of the report period includes the eleven months prior to the month of announcement. For purposes of this study, the announcement month is assumed to be the third month subsequent to the firm's fiscal year end. The objective of this section is to analyze the effect on the API of the announcement month, alternatively, as the second or fourth month after the fiscal year end. If the effect of different announcement months on the API is significant, then the third month assumption is not valid.

In analyzing the effect of announcement months on the API, the reasoning behind the selection of third month as the announcement month may be useful as background information. The reasons for this selection were both practical and empirical. The practical reason was that there is no published listing of annual report publication dates for NYSE firms and therefore the limitation of time and money in acquiring the annual report publication dates of each firm had to be considered. The cost of overcoming the preceding limitation was considered great enough to prevent accumulation of each firm's annual report publication date. The next logical step was to select an announcement month with an

empirical basis consistent within the developed theoretical framework. The third month was chosen as the announcement month for the firms in both sample groups because the third month was the month Beaver and Dukes (21) (22) selected and because of the fact that Beaver and Dukes state that previous research indicated 90 per cent of the business firms issued their annual reports by the third month. Ball and Brown (12, p. 171) suggested from their research concerning the API that the market anticipates forecast errors early in the report period and the sign of the API stays fairly constant throughout the report period. The third month after the fiscal year ends, then, would be expected to provide a report period which included approximately 90 per cent of the announcements of earnings per share in the annual report and result in API's which most likely were more representative than would be obtained by selecting any other month as announcement month.

In order to analyze the selection of the third month as the announcement month, the second and fourth months were also selected as the announcement month and single firm API's for both sample groups were computed using these months as the announcement months. The number of single firm API's computed was 1,000 (250 firms and four years) for each announcement month. The signs of the API from choosing the second and fourth months as the announcement month were then compared with the signs of the API when the third month was the announcement month. The results were that 13.3 per cent of the signs changed when comparing second month API signs to the third month API signs and 12.5 per cent of API signs changed when the fourth month signs were compared to the signs generated by use of the third month. The effect of the announcement changes can be further analyzed by using

an expectation analysis which is described by Schlaifer (79) for analyses similar to the announcement month change analysis. Schlaifer (79, p. 166) defines mathematical expectation as ". . . weighted average of the possible terminal values . . ." and the terminal values here refer to the percentage association of each earnings per share measure, as shown in Table VI of the next section. If the per cent of signs that change were multiplied by the per cent of API and FE signs that originally differed and added to the multiplication of the per cent of signs that did not change with the per cent of API and FE signs that were originally the same, then the expectation of percentage association using second or fourth month as announcement month is found.* Referring to Table VI in the next section of this chapter, an example of the expectation analysis follows using the fourth month as the announcement month and SEPS of Model #1 as the percentage association (58.01%). The expectation of the percentage association after a 12.5 per cent change in signs is then found by the following computation: (.125 x .4199) + (.875 x .5801) = .5591 or 55.91 per cent. The expected change is only a 2.10 per cent (58.01% - 55.91%) decrease. Similar analysis was done on all percentages in Table VI for both second and fourth months and similar results were found. The maximum expected percentage change was 3.75 per cent and these results indicate no significant effect on the API or percentage associations using the second or fourth month as announcement month. The expectation

*The per cent of signs that originally were the same is the percentage association shown for each model and each measure while the per cent of signs that originally differed is 100 per cent less the percentage association.

percentages found by this type of analysis are weighted averages of possible values and do not necessarily represent the exact percentages that would be obtained if announcement months were changed. The expectation analysis provides a reasonable approximation of the effect of changing announcement months, however. Because of the theoretical factors previously indicated in this section and the results of the expectation analysis, the third month was retained as the announcement month.

Results of the Percentage Association Test

The percentage association test employed in this study consists of the percentage reflecting the number of times the sign of the API and the sign of the forecast error was the same for the total number of comparisons possible for each sample group over four years (1969-1972). Percentages were calculated for each model, each earnings per share measure and each series of data (original and first difference series).

The purpose of the percentage association tests is to provide evidence of the information content of earnings per share measures (research hypothesis number one) and to provide evidence as to the preference by the market of the three alternative earnings per share measures (research hypothesis number two).

The results and analysis of the percentage association tests are presented in the following sections.

Complex Capital Structure Sample Group

The results of the percentage association tests of the CCS Group as a whole are shown in Table VI and the results of the CCS Group

after truncation are shown in Table VII. The CCS Group totals 103 NYSE firms that reported three earnings per share numbers in at least one of the four years selected for study. The total number of sign comparisons per model for the group as a whole was 412 (103 firms x 4 years) and the percentage association was computed by the number of times the firm API and forecast error had the same sign out of a possible 412 times. An analysis of the results of the CCS Group as a whole is undertaken first.

TABLE VI

RESULTS OF THE PERCENTAGE ASSOCIATION TESTS - CCS GROUP

CCS Group as a Whole--Original Data			
Model #	SEPS	PEPS	FDEPS
1	58.01%	57.52%	57.77%
2	47.82	48.54	48.06
3	53.40	53.16	53.40
4	57.77	57.28	57.77
5	51.70	51.70	51.94
6	52.43	52.91	53.16
CCS Group as a Whole--First Difference Data			
1	62.38%	61.89%	62.38%
2	57.28	58.25	58.01
3	60.92	61.41	61.65
4	62.62	62.62	61.89
5	58.01	57.52	58.50
6	58.01	58.74	58.25

The results in Table VI, when related to the research hypotheses, highlight two factors. First, the percentages across earnings per share measures and across models are, with one exception, above 50 per cent. The one exception is the percentages of Model #2 (original data) which are below 50 per cent for all three earnings per share measures. Model #2 is a model which predicts current earnings per share based on a five-year average of the previous five years earnings per share. The evidence of the CCS Group as a whole provides support for information content of earnings per share numbers because of the preponderance of percentages above 50 per cent. In short, percentages above 50 per cent indicate a majority of the API and forecast error signs were of the same type and unexpected price changes can be linked with unexpected earnings per share changes. Secondly, in reviewing Table VI it can be seen that the preference between the various earnings per share measures are very slight. The largest difference between any measures per model is only .97% in Model #2 of the first difference data. Furthermore, no one measure shows a clear superiority of preference among the models. If ties are counted as one-half, FDEPS ranks first 5½ times, PEPS ranks first 3½ times and SEPS ranks first 3 times when rankings include the six models of both original and first difference data. So FDEPS is slightly ahead but does not hold a clear majority. Therefore, the conclusion is that the market does not show a clear preference for any of three earnings per share measures in the years 1969 to 1972 for the 103 firms in the CCS Group

Because of the only slight preferences shown in percentage association for the CCS Group as a whole, the decision was made to truncate the CCS sample group according to dollar amount differences between

PEPS and FDEPS. The a priori feeling was that the larger the dollar amount differences between PEPS and FDEPS, the more the market would recognize the dilutive effects of securities on earnings per share. In short, the market would show a preference for FDEPS. Reducing the sample size by truncation causes at least one problem, and that problem is that the number of comparisons may not be enough to provide valid percentages. Reduction of much more than half the sample size was thought to be too great in regard to the validity problem. Therefore the cutoff points in the truncated samples were $.08 difference for the CCS Group original data and $.04 for the CCS Group first difference data, which, as shown as follows, divided both the original data and first difference data approximately in half. The largest dollar differences between PEPS and FDEPS were $1.26 for the original data and $1.11 for the first difference data. The truncation, based on the preceding criterion, resulted in 204 comparisons for the original data and 202 comparisons for the first difference data. Since the number of comparisons per model was 412 for the CCS Group as a whole, the truncated samples were approximately one-half of the original samples. The results of the truncated sample comparisons are shown in Table VII.

The analysis of the results of the truncated samples show a larger percentage difference in percentage associations when comparing measures per model than the sample group as a whole. The difference in the highest and lowest percentages per each model ranges from 1.96 per cent to .50 per cent. The rankings of each measure per model show that FDEPS ranked first six times, PEPS four and one-half times and SEPS one and one-half times. The rankings show a clear preference for PEPS and FDEPS over SEPS; but the differences in percentage associations per model per

each measure are still slight, e.g., 1.96 per cent is the highest difference in any per model comparison and is determined in both Models #3 and #4 of original data and percentagewise represents only a 4.39 and 3.84 per cent change respectively based on the change from the lower percentage association to the higher percentage association. The inference from the preceding analysis is that a slight preference for earnings per share measures including dilutive securities is indicated, but the evidence is far from conclusive.

TABLE VII

RESULTS OF THE PERCENTAGE ASSOCIATION TESTS - CCS GROUP TRUNCATED†

Original Data			
Model #	SEPS	PEPS	FDEPS
1	50.98%	50.00%	50.98%
2	42.16	43.63	43.14
3	44.61	45.10	46.57
4	51.96	50.98	52.94
5	46.57	47.06	47.55
6	48.53	48.04	49.51
First Difference Data			
1	59.41%	59.41%	60.89%
2	57.43	58.91	57.92
3	58.91	59.41	58.91
4	61.39	59.90	60.40
5	56.93	57.43	57.43
6	57.43	58.42	57.92

†The CCS Sample Group as a whole was truncated by the following criterion: a difference in PEPS and FDEPS of $.08 or more in original data and $.04 or more in first difference data.

A most noticeable factor of Table VII is that four of the models show percentage associations of less than 50 per cent across the three earnings per share measures for the original data. All percentage associations for the first difference data are significantly above 50 per cent. The noticeable difference in percentage associations between the original and first difference data has no apparent explanation. The percentages below 50 per cent imply a lack of information content for earnings per share. However, all other results in Tables VI and VII and in Table VIII in the next section show percentages above 50 per cent, thus providing a preponderance of evidence for implying information content for all three earnings per share measures within the context of the research design.

The evidence for the simplified preference ordering of the earnings per share measures shows only a slight preference for PEPS and FDEPS in the truncated sample group and a slight preference for FDEPS for the sample group as a whole. This preference ordering is further analyzed in the section which discusses the results of the statistical tests.

A model by model analysis in relation to the research hypotheses provides additional insight into the data results. As indicated in the preceding paragraph, a dominant preference for any earnings per share measure is not shown in general and the same statement may be applied if each model is analyzed in Tables VI and VII. In regard to information content, however, Models #1 and #4 show the highest percentage associations of all the percentages in Tables VI and VII across all three earnings per share measures. Model #1 has a slightly higher percentage association for the sample as a whole while Model #4

shows a slightly higher percentage in the truncated sample. Model #4 is the naive investor model which forecasts earnings per share based on the prior year's number plus the first differences of earnings per share from the four preceding years. A general conclusion concerning the "best" expectation model cannot be made from the evidence cited in this paragraph, but useful information may be supplied for further research in the expectation model area. In the Beaver and Dukes' (21) study, Model #2 showed the highest percentage associations which emphasizes the need for further research in the expectations model area since Model #2 showed the lowest percentage associations in this study.

A final comment in regard to information content of earnings per share is that the percentage associations of the first difference data were higher than those of the original data in all cases. These results are consistent with Beaver and Dukes (21) findings in regard to first difference and original data.

Simple Capital Structure Group

The percentage associations of the SCS Group as a whole are shown in Table VIII. SEPS refers to the simple earnings per share measure as previously defined. AEPS in this section refers to a computation of net income after allowing for preferred dividends divided by the weighted average of the number of common shares outstanding during the fiscal year. Firms in the SCS Group do not have dilutive securities but the SCS Group was used in this study for additional evidence concerning SEPS and PEPS.* The number of API and forecast error

*PEPS for CCS firms would be identical to AEPS for SCS firms if common stock equivalents were ignored.

comparisons per model in Table VIII is 588 (147 firms x 4 years). Therefore the percentages in Table VIII represent the percentage of times the API and forecast error signs were the same out of a possible 588 times on a per model basis.

TABLE VIII

RESULTS OF THE PERCENTAGE ASSOCIATION TEST - SCS GROUP AS A WHOLE

Original Data		
Model #	SEPS	AEPS
1	58.50%	58.33%
2	55.10	54.59
3	58.33	57.82
4	56.97	56.12
5	57.31	56.12
6	57.65	56.12
First Difference Data		
1	58.84%	58.33%
2	56.63	56.12
3	57.31	56.46
4	59.35	59.01
5	57.31	56.97
6	56.46	56.97

The results in Table VIII show that all percentages were above 50 per cent, the lowest percentage being 54.59 per cent for Model #2 under AEPS while the highest percentage is 59.35 per cent for Model #4 under SEPS. These results are consistent with the results of the

previous section and imply information content for SEPS and AEPS under the specifications and limitations of the research design

The evidence concerning the simplified preference ordering provided by Table VIII indicates some preference for SEPS over AEPS. If the rankings of each model for SEPS and AEPS are considered for both original and first difference data, SEPS ranks ahead of AEPS in eleven of twelve instances. The only exception in the ranking is that AEPS percentage is higher than SEPS percentage in Model #6 of first difference data. The percentage differences in each model between the two measures are not large, however. The largest percentage difference between the two measures is 1.53 per cent (Model #6 of original data) and the smallest is .17 per cent (Model #1 of original data). The largest difference (1.56 per cent) represents only 2.77 per cent change from the lower percentage association in Model #6 (1.56% ÷ 56.12% = 2.77%). The preference of SEPS over AEPS appears to be offset by the smallness of the percentage difference in those preferences. The evidence does provide support for a measure not "visible" in annual reports both for information content and market preference. The strength of the evidence for SEPS is difficult to assess fully because of smallness in differences with AEPS and also when considering the limitations of the study.

The expectations models showing the highest percentage association were Model #3 of the original data and Model #4 of the first difference data. First difference data shows only a slight superiority in percentage associations (seven of twelve percentage comparisons between original and first difference data are in favor of first difference data).

To summarize, the analysis of the results of the SCS Group provide findings in favor of information content for SEPS and AEPS and a slight market preference for SEPS. The models showing the highest percentage associations across both earnings per share measures were Models #3 and #4. First difference data was slightly superior in percentage but not as superior as was shown for the CCS Group. The similarity and differences in the results of the CCS and SCS groups is analyzed in the next section.

Interpretation of the Results of the Percentage Association Tests

The percentage association tests on both sample groups, CCS and SCS, provide evidence for rejecting or accepting the research hypotheses. Although other evidence is presented in the following section, the percentage association tests form the primary base of evidence from which acceptance or rejection of the research hypotheses is considered.

The first research hypothesis postulated that earnings per share numbers were impounded in the information set the market used in setting security prices. The percentage association tests show strong support for accepting the first hypothesis. With one exception, all the percentage association tests on each data series, original and first difference, from both sample groups were above 50 per cent implying an impounding of earnings per share numbers of all three earnings per share measures into the information set used by the market. In other words, the results imply information content for earnings per share numbers. The one exception to the implication of these results is

shown in Table VII for tests performed on the truncated CCS Group of the original data. Twelve of the eighteen percentages shown in the original data section of Table VII are below 50 per cent. Probably the most significant point in relation to the preceding cited percentages is that the truncated group percentages represent the CCS Group which has been reduced approximately in half and generally the larger the sample, the higher the percentages that are shown, e.g., see Table VIII for the largest sample group and the percentages shown for that group.

The second research hypothesis postulated that the association of each of the three earnings per share measures to the aforescribed information set is not the same. Evidence was cited in the preceding paragraph indicating strong support for each of the three earnings per share measures being part of the information set the market uses. This paragraph evaluates the evidence regarding the strength of association of each measure to the information set or, in other words, the market preference for the three measures. The results of the CCS Group as a whole differ slightly from the results when that group was truncated according to differences in PEPS and FDEPS. The results of the truncation show a slight preference, according to ranking by percentages but offset by size of percentage differences for PEPS and FDEPS, while the results for the group as a whole indicate a slight preference for FDEPS. The interpretation of these results is that there is not conclusive evidence at this point to accept the second research hypothesis. The SCS Group percentage association tests were conducted on two earnings per share measures, SEPS and AEPS (as defined for the SCS Group). The results from the SCS Group indicate SEPS, a measure not visible in annual reports, is the preferred measure but the

extent of that preference could be questioned. The evidence provided by the percentage association tests indicates, at this juncture, some doubt as to preference of the market for any one of the three earnings per share measures.

An evaluation of which expectation model or models presented the best percentage association may indicate which past earnings per share numbers investors might use in predicting earnings per share. This type of evaluation may be useful in further research on building investor models. As mentioned in the preceding sections, Models #1, #3 and #4 showed the best percentages at various time. Also Models #5 and #6 showed percentage associations consistently above Model #2, the counterpart of Models #5 and #6. Since Models #1, #5, and #6 use the more recent earnings per share numbers when compared with Model #2, the inference is that models using more recent data are better predictors than those models including older data. Furthermore, Models #3 and #4 also use as a base for their prediction the most recent or prior year's earnings per share numbers. Model #2, a simple average over five years, performed the worst as to percentage associations across all models and both types of data.

The results of the statistical tests are analyzed and interpreted in the next section and an analysis of the evidence as a whole is made in the summary of this chapter and in Chapter V. Recommendations resulting from the evidence are also made in Chapter V.

Results of the Statistical Tests

Statistical tests were specified in Chapter III to provide additional evidence in regard to the research hypotheses. The results of

these tests are described in this part of the chapter and analyzed to the extent that the tests affect the research hypotheses. A summary of all evidence is made in the last section of the chapter. The emphasis of the statistical analysis in this section concerns evaluation from a confidence interval standpoint and emphasis is not necessarily confined to the rejection of the hypotheses because of failure to fall within certain specified intervals.

Results of the Binomial Test

The binomial test was used to test the following hypothesis:

Null Hypothesis, H_o: The percentage association between earnings per share measures and security prices *is* fifty per cent.

Alternative Hypothesis, H_a: The percentage association between earnings per share measures *is greater* than fifty per cent.

The approach in the binomial test is to compute a *z* value and determine the probability associated with the *z* values from an appropriate statistical table in Siegel (81). The *z* values for each percentage association are shown in Table IX and the *z* values were computed as follows:

$$z = \frac{(X \pm .5) - NP}{NPQ}$$

where:

X = number of times the API and forecast error signs were the same for each model,

P = Q = ½(P and Q represent the binomial distribution)

N = the number of comparisons per model (81, p. 41).

The probabilities determined from the *z* value table can be evaluated from the aspect of being evidence provided to accept or reject the null

hypothesis but, as noted previously, the confidence level of the evidence should also be emphasized.

As a guide to acceptance or rejection of the null hypothesis, one per cent and five per cent levels of significance are often used in empirical research. If five per cent is used as a level of significance, then z values of 1.64 or greater would indicate a rejection of the null hypothesis while a z value of 2.32 or greater would indicate a rejection for a one per cent level of significance. Since the primary concern of this test relates to all earnings per share measures, the three measures can be evaluated together for evidence as to information content which is the type of evidence the binomial test is providing. From Table IX, the results show that 81 z values of the 96 values (84.4%) are above 1.64 (critical point for five per cent significance) while 68 of the 96 z values (70.8%) are above 2.32 (critical point for one per cent level of significance). The results cited in the preceding sentence include the z values of the truncated sample groups which are only approximately half the size of the groups as a whole. Seigel (81, p. 10) notes that the power of a statistical test is increased in a greater proportion to the increase in sample size when such sample sizes are increased.* Omitting the truncated sample groups would provide results of the larger sample groups and thus provide greater power to the binomial test. The results when the sample groups as a whole are evaluated show 51 of a possible 60 z values (85.0%) above 1.64 and 45 of a possible 60 z values (75.0%) are

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*The power of a statistical test is the probability of rejecting the null hypothesis when it is false and, thus, should be rejected (81, p. 10).

TABLE IX

Z VALUES PRODUCED BY THE BINOMIAL TEST

Model #	Sample Group and Data Series†	z Values††		
		SEPS	PEPS†††	FDEPS
1	CCS-WG-OD	-3.202	-3.104	-3.202
	CCS-TS-OD	-0.210	-0.070	-0.350
	CCS-WG-FD	-4.976	-3.301	-3.202
	CCS-TS-FD	-2.603	-2.603	-3.025
	SCS-WG-OD	-4.083	-4.000	
	SCS-WG-FD	-4.248	-4.000	
2	CCS-WG-OD	0.838	0.542	0.739
	CCS-TS-OD	2.170	1.750	1.890
	CCS-WG-FD	-2.907	-3.301	-3.202
	CCS-TS-FD	-2.040	-2.463	-2.181
	SCS-WG-OD	-2.433	-2.186	
	SCS-WG-FD	-3.175	-2.928	
3	CCS-WG-OD	-1.429	-1.330	-1.429
	CCS-TS-OD	1.477	1.330	.910
	CCS-WG-FD	-4.385	-4.582	-4.680
	CCS-TS-FD	-2.463	-2.603	-2.463
	SCS-WG-OD	-4.000	-3.753	
	SCS-WG-FD	-3.505	-3.093	
4	CCS-WG-OD	-3.202	-3.005	-3.202
	CCS-TS-OD	-0.630	-0.350	-0.910
	CCS-WG-FD	-5.074	-5.074	-4.779
	CCS-TS-FD	-3.166	-2.744	-2.885
	SCS-WG-OD	-3.340	-2.928	
	SCS-TS-FD	-4.495	-4.330	
5	CCS-WG-OD	-0.739	-0.739	-0.838
	CCS-TS-OD	.910	.770	.630
	CCS-WG-FD	-3.202	-3.005	-3.399
	CCS-TS-FD	-1.890	-2.040	-2.040
	SCS-WG-OD	-3.505	-2.928	
	SCS-WG-FD	-3.505	-3.340	
6	CCS-WG-OD	-1.035	-1.232	-1.330
	CCS-TS-OD	.350	.490	.070
	CCS-WG-FD	-3.202	-3.498	-3.301
	CCS-TS-FD	-2.040	-2.322	-2.181
	SCS-WG-OD	-3.670	-2.928	
	SCS-WG-FD	-3.093	-3.340	

†The abbreviations refer first to the sample groups (CCS or SCS), then to the sample group as a whole (WG) or truncated (TS) and finally to the original data (OD) or first difference data (FD).

††z values of ± 1.64 or greater indicates rejection of null hypothesis at 5% level of significance while a z value of ± 2.32 or greater indicates rejection at the 1% level.

†††For the SCS Groups the measure is AEPS as previously defined.

above 2.32 with 1.64 and 2.32 being the 5% and 1% confidence levels respectively. Evidence is thus provided for rejection of the null hypothesis even at a 1% level and implying a percentage association to earnings per share measures above fifty per cent.

An evaluation of the truncated sample groups as shown in Table IX produces results of 24 of 36 z values (66.6%) above 1.64 while only 11 of 36 z values (30.6%) are above 2.32. In addition, however, 7 of the z values are above 2.00 and such a z value (2.00) is close to 2.32. The evaluation of the truncated sample groups indicates a rejection of the null hypothesis at the 5% confidence level. While rejection of the null hypothesis is not indicated at a 1% confidence level, a rejection would likely be indicated at a two or three per cent confidence level because of the closeness of 50% of the z values to 2.32. Evidence of nonrejection of a 1% confidence level would not be considered strong evidence in this instance considering the power of the tests of the trucated group when compared with the much stronger power of the tests of the sample groups as a whole. The truncated sample groups also produce only 36 of the possible 96 z values (37.5%) used in the binomial test. Even at its weakest point the binomial test of the truncated groups would indicate approximately a 3% probability that the test would yield values under which the null hypothesis would be rejected when in fact it is true. In evaluating the results of both whole and truncated groups the preceding probability would be lower and the power of the test strengthened.

In considering the results evaluated in this section, the evidence is strong enough to reject the null hypothesis thus indicating that earnings per share numbers do have information content. To state the

conclusion in another way, acceptance of the alternate hypothesis indicates a percentage association above fifty per cent and implies information content for earnings per share numbers.

The results described and analyzed in this section show additional support for the acceptance of the first research hypothesis. Supplemental evidence concerning the second research hypothesis is considered in the next section.

Results of the Mann-Whitney U Test

The Mann-Whitney U Test was used to test the following hypothesis:

Null Hypothesis, H_o: Population A (the first named measure in any of the three comparisons) has the same distribution as Population B (the second named measure).

Alternative Hypothesis, H_a: Population A has a greater distribution than Population B.

The comparisons referred to above are comparisons among SEPS, PEPS and FDEPS when the signs of forecast errors of the measures being compared differ.* The Mann-Whitney U test is an appropriate test when the primary concern is whether two groups come from the same population. The two groups concerned with in this study are the sample group comparisons resulting from comparisons of the three measures. The specified comparisons and results of the test are shown in Table X. To determine the z values, a U value first must be determined in the following manner:

$$U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

*For the SCS Group only one comparison is possible and that is comparing SEPS with AEPS.

where:

n_1 = number of cases in the smaller of two independent groups,
n_2 = number of cases in the larger,
R_1 = sum of ranks (based upon the API) assigned to group whose sample size is n_1 (81, p. 123).

Then the z value is determined from the following formula:

$$z = \frac{U - n_1 n_2}{\sqrt{\frac{(n_1)(n_2)\ (n_1+n_2+1)}{12}}}$$ (81, p. 123).

TABLE X

Z VALUES AND ASSOCIATED PROBABILITIES PRODUCED BY THE MANN-WHITNEY U TEST

Sample Group and Data Series	Comparison	Per Cent of Total Comparisons†	z Value	Associated Probability††
CCS - Original	SEPS vs. PEPS	2.43%	1.51	.0655
	PEPS vs. FDEPS	2.99	1.45	.0735
	SEPS vs. FDEPS	4.21	-0.39	.3520
CCS - First Difference	SEPS vs. PEPS	4.53	.83	.2033
	PEPS vs. FDEPS	4.77	1.13	.1292
	SEPS vs FDEPS	7.28	1.19	.1190
SCS - Original	SEPS vs. AEPS	2.92	-2.76	.0029
SCS - First Difference	SEPS vs. AEPS	4.76	-0.74	.2296

†Percent of total comparisons represents the number of comparisons where the forecast error signs differed in proportion to the total comparisons that were possible for a particular sample group and data series.

††Associated Probability is determined from the z table in Siegel (81, p. 247).

The associated probability is then determined from a z table and if the observed value of U has an associated probability equal to or less than the level of significance selected, then the null hypothesis should be rejected.

The U and z values were computed for the comparisons listed in Table X across all models per each sample group. The across model comparisons were performed for two reasons. First, Gonedes and Dopuch (51) had criticized Beaver and Dukes (21) for lack of across model comparisons in the Beaver and Dukes study. Since Beaver and Dukes' research design was similar to the design of this study, Gonedes and Dopuch's criticism is overcome to some extent by use of the models aggregately in the Mann-Whitney U test. Secondly, use of models aggregately in the test provides sample sizes of comparisons substantially above twenty which enables the Mann-Whitney U test to be more powerful according to Siegel (81).

The results in Table X show that up to a 6.5 per cent level of significance every associated probability but one indicate nonrejection of the null hypothesis. The one exception is the SCS Group of original data with a probability of .0029 indicating a rejection of the null hypothesis. If a ten per cent level of significance is selected, two more of the probabilities would fall into the rejection level thus involving three of the eight probabilities indicating rejection of the null hypothesis. The preponderance of evidence provided by Table X, then, is in favor of not rejecting the null hypothesis which implies no particular preference for any of the earnings per share measures. In short, rejection of the null hypothesis would have provided evidence

supporting preference of a particular measure so non-rejection provides no evidence supporting preference for a particular measure.

The data used in conducting the Mann-Whitney U test was only a small percentage of the data generated by this study. The proportions of the data used when compared to the total possible data are shown as percentages in Table X. As may be seen, the highest percentage is 7.28 per cent. Therefore, any significant conclusions made from these results would have to be considered dangerous. The evidence provided by the Mann-Whitney U test does supplement the evidence already provided by this study. Also, Siegel (81, p. 126) states that the Mann-Whitney U test is an excellent alternative to the t test and the t test is considered to be the most powerful parametric test.

Comparisons of Risk Among Sample Groups

The computation of the API involves the use of the market model to determine the residual term, μ_{it}. In using the market model, a β_i term is also generated. The β_i term is called beta and is a measurement of the systematic risk for each firm in the sample groups. To make a comparison of risk among the sample groups, the β_i of each firm for each of the four years in the study (1969-1972) was computed through use of the market model. The period used for the computation of each firm-year β_i was seventy-two months with the year of the firm-year β_i being eliminated from the market model regression time period. The firm-year β_i's were then averaged over the four years to determine the average beta per firm, $\bar{\beta}_t$; and the $\bar{\beta}_t$'s were then averaged across all firms in the CCS and SCS Groups to determine the average beta, $\bar{\beta}_T$, of each

sample group. The average betas, $\overline{\beta}_T$, of the two sample groups are shown in Table XI.

TABLE XI

AVERAGE BETAS FOR SAMPLE GROUPS
FOR THE YEARS 1969-1972

Sample Group	Number of Firms in Sample Group	Average Beta
CCS	103	1.335
SCS	147	1.077

The results in Table XI show a lesser average beta, $\overline{\beta}_T$, for the SCS than the CCS Group. These results are consistent with a priori expectations. The CCS Group has dilutive securities and this group would be expected to have a higher beta or higher risk. The SCS Group $\overline{\beta}_T$ is very close to the average beta of one which indicates these firms would fluctuate in price directly with the market factor. In relation to this study, the comparisons of risk provide little, if any evidence, toward the acceptance or rejection of the research hypotheses.

An interesting point which might be raised, however, from the comparison of risks among the sample groups is that if PEPS and FDEPS have real economic significance, the market under an efficient structure could use that economic information in forecasting the beta of firms with complex capital structures. The information provided by PEPS and

FDEPS would then help decrease the error that would likely occur from forecasting the beta risk of the firm. The results of the risk comparisons made in Table XI show a definitely higher risk for the CCS Group (23.95% higher when compared with SCS Group), but how much higher or lower the prediction of risk might be if PEPS and FDEPS were not disclosed in annual reports cannot be ascertained from these comparisons.

Interpretation of the Results of the Statistical Tests

The results of the statistical tests have been interpreted in the sections pertaining to each test and the interpretations are summarized in this section. The results of the binomial test show strong support for information content, or inclusion in the information set impounded by the market, of earnings per share numbers even at a 99 per cent confidence level (one percent level of significance). Thus additional evidence is provided for acceptance of the first research hypothesis.

The Mann-Whitney U test results show little support for the three earnings per share measures coming from different populations implying littler preference among the measures. The confidence levels of the Mann-Whitney U test also indicate support for the preceding inference from the 90 per cent level to the 99 per cent level. These results were based on only a small percentage (approximately five per cent) of the data but provide no additional evidence to support acceptance of the second research hypothesis.

The comparison of average betas, $\overline{\beta}_T$, of two sample groups provided little evidence in relation to the two research hypotheses. The

comparisons did provide an interesting insight into the risks of the CCS and SCS groups.

Summary

The data results have been outlined in the previous sections of this chapter. The most important factor remaining at this juncture is to evaluate the results as a whole in relation to the research hypotheses.

Research hypothesis number one concerned the postulation that earnings per share numbers had information content. The percentage association tests and the binomial test results presented a considerable body of evidence supporting the information content of earnings per share numbers as specifically noted in the relevant sections pertaining to those tests. The inference from this evidence is to accept the first research hypothesis within the bounds specified by the research design.

Research hypothesis number two postulated that the market preferred one of the three earnings per share measures. The percentage association tests results of the CCS Group presented mixed and inconclusive evidence. A slight preference was shown for FDEPS but the underlying strength of this evidence was weak. The percentage association tests of the SCS Group showed a slight preference for SEPS but again the underlying strength of the evidence was weak. The Mann-Whitney U test results indicate inconclusive evidence regarding preference among the three measures of the CCS Group. The body of evidence accumulated from the above results imply that the second research hypothesis cannot be accepted within the bounds of the study.

The interpretation of the data results of this study, when summarized, is that earnings per share numbers have information content but the market shows little preference as to the three selected earnings per share measures; SEPS, PEPS or FDEPS.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

A review of only two APB opinions, Number 15 (Earnings Per Share) and 20 (Accounting Changes) provides insight into the numerous earnings per shares measures that are required by the APB in various circumstances. Earnings per share numbers must be disclosed for income before and after extraordinary items and income before and after considering dilution to cite just a few instances where varying earnings per share measures are required. Evidence is needed concerning the interpretation of these measures by the capital markets. This study focused on providing such evidence for three earnings per share measures, SEPS, PEPS, FDEPS, computed after consideration of extraordinary items.

The research hypotheses formulated concerned (1) the information content of the three earnings per share measures, and (2) the capital market preference for the three earnings per share measures. Previous research on the information content of accounting data indicated that the efficient capital market theoretical structure was a valid structure on which the research in this study could be based. Two sample groups were chosen to form the data base of this study. The primary sample group was the Complex Capital Structure Group (CCS) which consisted of firms having dilutive securities in their capital structure. The CCS Group was the primary group because the firms in this group contained

all three earnings per share measures utilized in at least one of the four years tested. The second sample group, the Simple Capital Structure Group (SCS), consisted of firms having no dilutive securities in their capital structure and included only two of the earnings per share measures utilized. The SCS Group provided evidence primarily related to the information content hypothesis but also provided limited evidence as to the market preference for two measures.

To generate the evidence needed in this study, the research hypotheses were tested by a methodology which linked unexpected earnings per share changes with unexpected security price changes. To determine unexpected earnings per share changes, investor expectation models, which developed forecasts of earnings per share for each measure, were used and the forecasts were compared with the actual earnings per share numbers and the resulting difference represented the forecast error. The forecast errors represented the unexpected earnings per share changes. The unexpected price changes were determined through the use of the Abnormal Performance Index (API) which was a cumulative index of unexpected price changes over a twelve-month period. The forecast errors and API's developed had both positive and negative signs and by comparing the number of times the signs were the same, a percentage association was developed. Results of the percentage association tests provided the basic evidence from which to evaluate the two research hypotheses. An analysis as to which expectation model provided the best fit to the earnings per share generating process was also undertaken.

Conclusions

Strong support for information content of all three earnings per share measures arose from the evidence developed by this study. This support is, of course, appealing since, in general, only the denominator of the measures differed. The evidence was especially strong for information content when both sample groups were viewed as a whole although truncation of the CCS Group showed lesser support for information content. The preponderance of the evidence implies that SEPS, PEPS and FDEPS are part of the information set impounded by the capital market (NYSE) in setting security prices. The preceding implication is consistent with the conclusions reached by previous empirical researchers on the information content of earnings.

The evidence of this study when related to a market preference for one of the three earnings per share measures was inconclusive. The results of the tests on the data indicated no strong preference for any of the measures. The conclusion arising from these results is that the capital market has no strong preference for one over the other of the three earnings per share measures tested. One of the measures, SEPS, is a measure which is not "visible" in annual reports and the evidence supported the information content of this measure and a preference by the market which was not significantly different from PEPS or FDEPS. Because of the low cost in providing SEPS, this measure may be particularly appealing when considering which earnings per share measure should be presented on the face of the income statement. The assumption was made that the costs of computing the three earnings per share measures was the same. If this assumption is relaxed, then PEPS and FDEPS computation costs become greater than the cost of computing

SEPS since PEPS and FDEPS are more complicated measures to compute. The increase in cost of computing PEPS and FDEPS when compared to the cost of computing SEPS is not known, but to reiterate, SEPS is particularly appealing because of its low computation cost. Unless PEPS and FDEPS can be shown to have greater economic significance than SEPS, then the low computation cost and simplicity of computation would tend to favor SEPS over PEPS and FDEPS.

The difficulty in generalizing any conclusions reached in this study may be explained by examining the limitations of the study. The first limitation that may be noted is that the conclusions reached in this study are inherently related to the expectations models employed and such models do not constitute the entire set of expectations models nor are such models ones that are necessarily applied by a majority or any investors. The evidence in regard to the first research hypothesis was consistent with related studies that provided similar evidence without employing investor expectations models. The preceding statement attributes at least some validity to the expectations models used in this study. A second limitation was the social choice implications of market preference. The conclusions made in regard to market preferences are social choice conclusions and are made with the following considerations:

(1) market preference conclusions are made within a restricted setting as provided by the research design;

(2) market preference conclusions are related to a simplified preference ordering provided by the research design of this study;

(3) market preference conclusions are based only on the preference of active actors (buyers and sellers) in the market for the years 1969-1972.

The conclusions reached in the preceding paragraphs of this section should be considered, then, within the limitations of the study.

Recommendations

Six investor expectations models were selected in this study to provide forecasts of earnings per share numbers. Other expectation models exist and, after evaluating the results of the expectations models selected for this study, further research is recommended employing other expectations models and also the models of this study. In studying expectation models further, particular attention might be devoted to the aspect of the age of the historical data and to the question of whether use of more recent data, less recent data, or a combination of both provide better predictability in expectations models. The more recent data, one year and up to three year old data, provided better predictability in this study when compared with data up to five years old.

The expectation at the beginning of the research undertaken in this study was that the market would prefer one of the earnings per share measures. The evidence indicating a lack of significant preference for one particular measure over the others implies that most likely the market considers no economic difference in the three earnings per share measures. Related to all earnings per share measures, the preceding implication is not meant to be a generalization but is made within the bounds of the study. The implication arises from the

evidence that each measure has information content and is part of the information set used by the market in setting security prices but that the evidence shows no preference for any particular measure. In short, economic significance is indicated for each of the three measures but differences in the economic significance of the three measures is not indicated. The recommendation for disclosure of earnings per share information, based upon the small differences in preferences among the three measures of earnings per share tested, is that a simple or weighted average earnings per share would provide the basic information needed on the face of the income statement. Since some slight support was shown for FDEPS, a further recommendation is that FDEPS be studied by the FASB as to the choice of (1) presenting FDEPS on the face of the income statement, or (2) presenting FDEPS as supplementary information, or (3) not presenting FDEPS but supplying supplementary information about dilutive securities. Little support was shown for PEPS and the recommendation is that disclosure requirements for PEPS be eliminated. Unless PEPS is shown to have economic significance when compared with measures such as SEPS, then the use of PEPS adds nothing to the information set used by investors in setting security prices. Continuing to compute PEPS then becomes irrelevant and adds unnecessary data to the financial statements.

Since earnings per share numbers were indicated to have information content, the FASB might be interested in developing an earnings per share measure more economically significant than the current measures appear to be. The recommendation, resulting from evidence of this study, is that the FASB should conduct an intensive theoretical and empirical study of any earnings per share measures proposed. The

computation of such measures should not be so complicated that investors (even accountants) cannot determine the significance of information provided by such measures. Alternatively, the FASB should consider the possibility that a simple earnings per share measure provides as much information as is needed by the market for earnings per share numbers.

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APPENDIX A

SAMPLE GROUP OF COMPLEX CAPITAL STRUCTURE FIRMS

AMF, Inc.

Amco, Inc.

Allegheny Ludlum Industries, Inc.

Allied Stores Corporation

ALCOA

American Airlines

American Brands

ABC, Inc.

American Can Company

American Metal Climax, Inc.

Amstar Corporation

Ashland Oil Company

Avnet, Inc.

Bendix Corporation

Boeing Company

Braniff Airways, Inc.

Budd Company

Burlington Industries, Inc.

Celanese Corporation

Certain-Teed Corporation

Champion International Corporation

Cluett-Peabody & Co., Inc.

Colt Industries, Inc.

CBS, Inc.

Columbia Pictures Industries, Inc.

Consolidated Freightways, Inc.

Continental Airlines, Inc.

Continental Oil Company

Cooper Industries, Inc.

Crane Company

Crown Zellerbach Corporation

Curtiss-Wright Corporation

Dart Industries, Inc.

Dow Chemical Company

Dresser Industries, Inc.

Eaton Corporation

Emerson Electric Company

Englehard Minerals & Chemical Corporation

FMC Corporation

Fibreboard Corporation

Flintkote Company

Foremost-McKesson, Inc.

Fruehauf Corporation

GAF Corporation

General American Transportation Corporation

Genesco, Inc.

Grace, W. R. and Company

Grumman Corporation

Heinz, H. J. and Company

Interco, Inc.

International Minerals and Chemical Corporation

Interstate Stores, Inc.

Johns-Manville Corporation

Kaiser Aluminium Chemical Corporation

Kerr-McGee Corporation

Kraftco Corporation

Kresge (S.S.) and Company

Kroger Company

Libby-Owens Ford Company

Liggett and Meyers, Inc.

Loew's Corporation

Lone Star Industries, Inc.

Macy (R.H.) and Company, Inc.

Martin Marietta Corporation

May Department Stores Company

McCrory Corporation

Mead Corporation

Monsanto Company

Nabisco, Inc.

National City Lines, Inc.

Northrop Corporation

Otis Elevator Company

Owens-Illinois, Inc.

Penn-Dixie Cement Corporation

Penney, J. C. and Company

Phillip Morris, Inc.

Pillsbury Company

Purex Corp., Ltd.

Ralston Purina Company

Raytheon Company

Revere Copper & Brass, Inc.

Reynolds, R. J. Industries, Inc.

Rockwell International Corporation

Ryder System, Inc.

SCM Corporation

Sherwin-Williams Company

Singer Company

Standard Oil Company of Ohio

Stauffer Chemical Company

Stevens, J. P. & Company, Inc.

Stokeley-Van Camp, Inc.

Sun Oil Company

Swift & Company

TRW, Inc.

Twentieth Centruy-Fox Film Corporation

Union Oil Company of California

Uniroyal, Inc.

United Merchants and Manufacturers, Inc.

Walgreen Company

Western Air Lines, Inc.

White Motor Corporation

Winn Dixie Stores, Inc.

Woolworth, F. W. Company

APPENDIX B

SAMPLE GROUP OF SIMPLE CAPITAL STRUCTURE FIRMS

ACF Industries

Acme Markets, Inc.

Allied Chemical Corporation

Allis Chalmers Corporation

American Cyanmid Company

American Home Products Corporation

American Motors Corporation

American Standards, Inc.

Amsted Industries

Anaconda Company

Anchor Hocking Corporation

Anderson Clayton and Company

Armco Steel Corporation

Armstrong Cork Company

Atlantic Richfield Company

Avon Products, Inc.

Beatrice Foods Company

Bell & Howell Company

Bethlehem Steel Corporation

Black & Decker Manufacturing Co.

Borden, Inc.

Borg-Warner Corporation

Bristol-Myers Company

Brunswick Corporation

Bucyrus-Erie Company

Burroughs Corporation

CPC International

Campbell Soup Company

Carrier Corporation

Caterpillar Tractor Company

Cerro Corporation

Chrysler Corporation

Cities Service Company

Clark Equipment Company

Coca-Cola, Inc.

Colgate-Palmolive Company

Combustion Engineering, Inc.

Consolidated Foods Corporation

Continental Can Company, Inc.

Crown Cork & Seal Company, Inc.

Deere & Company

Del Monte Corporation

Diamond International Corporation

Diamond Shamrock Corporation

ESB, Inc.

Eastern Gas & Fuel Associates

Eastman Kodak Company

Ex-Cell-O Corporation

Exxon Corporation

Federated Department Stores, Inc.

Firestone Tire and Rubber Company

First National Stores, Inc.

Food Fair Stores, Inc.

General Cable Corporation

General Electric Company

General Foods Corporation

General Mills, Inc.

General Motors Corporation

General Tire and Rubber Company

Georgia-Pacific Corporation

Getty Oil Company

Goodyear Tire and Rubber Company

Grand Union Company

Grant (W. T.) Company

Great Atlantic & Pacific Tea Co., Inc.

Halliburton Company

Hercules, Inc.

Hershey Foods Corporation

Homestake Mining Company

Honeywell, Inc.

Hudson Bay Mining & Smelting Co., Ltd.

Ingersoll Rand Company

Inland Steel Company

Inmont Corporation

Interlake, Inc.

IBM Corporation

International Paper Company

Jewel Companies, Inc.

Johnson & Johnson

Joy Manufacturing Company

Keebler Company

Kimberly-Clark Corporation

Koppers Company, Inc.

Lear-Sigler, Inc.

Libby, McNeil & Libby

Lockheed Aircraft Corporation

Lowenstein (M) & Sons, Inc.

Marathon Oil Company

Marshall Field and Company

McGraw-Edison Company

McGraw-Hill Company

Melville Shoe Corporation

Merck & Company, Inc.

Minnesota Mining & Manufacturing Co.

Motorola, Inc.

Murphy (G. C.) Company

NL Industries, Inc.

National Cash Register Company

National Distillers & Chemical Corporation

National Gypsum Company

National Tea Company

Olin Corporation

Owens-Corning Fiberglas Corporation

PPG Industries, Inc.

Pennwalt Corporation

Pepisco, Inc.

Pfizer, Inc.

Phillips Petroleum Company

Pittson Company

Polaroid Corporation

Procter & Gamble Company

Pullman, Inc.

Quaker Oats Company

RCA Corporation

Revlon, Inc.

Reynolds Metals Company

Richardson and Merrell, Inc.

Rohm and Haas Company

St. Joe Minerals Corporation

St. Regis Paper Company

Scott Paper Company

Scovill Manufacturing Company

Searle (G. D.) and Company

Sears, Roebuck and Company

Shell Oil Company

Simmons Company

Skelly Oil Company

Sperry Rand Corporation

Standard Brands, Inc.

Standard Oil Company of California

Standard Oil Company of Indiana

Sterling Drug, Inc.

Sunbeam Corporation

Texaco, Inc.

Texas Gulf, Inc.

Texas Instruments, Inc.

Textron, Inc.

Time, Inc.

Transunion Corporation

Union Camp Corporation

United Aircraft Corporation

United States Gypsum Company

United States Tobacco Company

Westinghouse Electric Corporation

Whirlpool Corporation

Xerox Corporation

Zenith Radio Corporation

VITA

Russell Frank Briner

Candidate for the Degree of

Doctor of Philosophy

Thesis: AN EMPIRICAL STUDY OF THE ASSOCIATION BETWEEN ALTERNATIVE MEASURES OF EARNINGS PER SHARE AND THE BEHAVIOR OF SECURITY PRICES 1969 - 1972

Major Field: Business Administration

Biographical:

Personal Data: Born in Piqua, Ohio, February 19, 1939, the son of Mr. and Mrs. Melvin W. Briner.

Education: Graduated from Alvin High School, Alvin, Texas in May, 1957; received Bachelor of Business Administration degree from Texas Tech University in May, 1961 with a major in accounting; received a Master of Business Administration degree from Texas A & M University in January, 1963 with a major in accounting; completed requirements for the Doctor of Philosophy degree at Oklahoma State University in May, 1976.

Professional Experience: Staff Accountant, Kennedy, Walston and Company, Alvin, Texas, 1964-1965; Senior Accountant, Masquelette, Bruhl and Company, Houston, Texas, 1965-1967; Graduate Teaching Assistant, Department of Accounting, Oklahoma State University, 1970-1971, 1972-1973; Associate Professor, Department of Accounting, Sam Houston State University, 1967-1970, 1971-1972, 1974-1976.