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CROSS-SECTIONAL DIFFERENCES IN THE INFORMATION CONTENT OF ANNUAL EARNINGS ANNOUNCEMENTS

by

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A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Business Administration in the Graduate College of The University of Iowa

May, 1976

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CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D. thesis of

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has been approved by the Examining Committee for the thesis requirement for the degree of Doctor of Philosophy in the Department of Business Administration at the May, 1976 graduation.

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I. INTRODUCTION

A classic study in accounting has demonstrated that on average no more than about 10 to 15 percent of the information conveyed by the annual earnings number of a firm has not been anticipated by the month of the annual earnings report.[1] This study was followed by one which found that there was on average "unusual" behavior in both the price and volume statistics, both adjusted for market-wide movement, of a sample of listed common stocks in the week of their annual earnings announcement.[2]

One common inference generally drawn from these two studies is that annual accounting reports as well as annual earnings announcements have information content in the sense that they lead either to changes in market equilibrium prices or portfolio holdings of individual investors or both. In these studies differences in the information content of the annual reports of different firms have been observed but not systematically investigated.

The objective of this study is to determine the extent to which the information content of the annual earnings announcement of a sample of firms is related to the existence of non-annual report sources of information.

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[1] Ball and Brown [7], pp. 170, 175-176.

[2] Beaver [9].

Types of Interim Information

By definition, information about a firm available during a fiscal year from non-annual report sources is interim information. The existence of such sources of information is well recognized. In fact, the prospective as well as the present investor in a common stock has been portrayed as having to consider a "plethora" of interim information.[3]

Potentially relevant non-annual report sources of information are many. The major sources include the daily financial press, trade publications, prospectuses, registration statements, reports from companies providing statistical services, agencies of the federal government, stock exchange listing statements, investment advisory services, and quarterly earnings reports.

Interim information has many dimensions and that obtainable from the sources just listed is no exception. Different types of interim information obtainable from the major sources differ on dimensions such as timeliness, reliability, relevance, accessibility, recurrence, and quantity. It would be presumptuous to consider all these dimensions in an empirical study such as this one. However, an important subset is considered. Specifically, the subset of interim information considered in this study consists of the types which are publicly available (or accessible) and are of recurring nature.

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[3] Davis [16], p. 2.

Typical examples of publicly available and recurring interim information about some firms include auto and steel production figures, railroad carloadings, building contract awards, crop reports, quarterly earnings reports, monthly retail sales stories, registration statements, prospectuses, trade publications, and reports from companies providing statistical services. Some of the interim information is published on a firm by firm basis and some is published for a whole industry. Also, some of the interim information is available for every firm listed on a major stock exchange via required quarterly earnings reports and stock exchange listing statements. Since these types of interim information are common to all of the sample firms in this study they are not given any emphasis.

Careful investigation of the many sources of interim information will lead one to believe that the flow of interim information to the capital markets may differ systematically across firms and industries.[4]

The daily financial press is a major source of interim information about some individual firms. For example, weekly and monthly sales and production figures for the major firms in the automotive industry are published regularly in a prominent place in The Wall Street Journal.[5] Building contract awards to some individual firms are also published regularly in the same journal. Fairchild Publications, Inc. runs a story each month on retail sales for the major

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[4] Some of the important firm and industry characteristics which tend to induce this differential flow are mentioned briefly in a part of this chapter and discussed in detail in Chapter II.

[5] The data are usually published in pages 2-5 or on the back page of this journal.

retail firms. By the mid-point of each month the previous month's retail sales stories appear in Women's Wear Daily or Daily News Record. There is also a continuing series of reports on the earnings and dividends prospects of some individual firms from some of the major investment advisory and statistical service companies. Registration statements (and prospectus, a summary of the essential information in the registration statement) prepared by individual firms that attempt to raise capital from the investing public contain information such as the nature and history of the firm, the proposed use of the proceeds of the security issue, financial statements, the management and directors and their security holdings, and legal opinions.

Some of the interim information is available on an aggregate basis, like industry groups. Again the financial press is a major source of such aggregate information. For example, The Wall Street Journal publishes regularly weekly raw steel production indices for the steel industry.[6] The steel industry production indices are published on an industry-wide basis and for regional areas. Various departments of the federal government are also some of the major sources of aggregate economic statistics such as monthly crop reports (Department of Agriculture), wholesale price indices, and inventory data (Department of Commerce). Trade publications for the major

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[6] The indices are issued by The American Iron and Steel Institute, a trade association of about 80 major companies located in the Western Hemisphere.

industries are also available on a regular basis from their trade associations.

Relationship Between Interim Information and Information Content of Annual Earnings Announcements

It is not clear that all the different types of interim data are regarded as information by common stock investors. However, the findings of some studies tend to support the contention that some of these types of interim data may be actually regarded as information. For example, Brown and Kennelly [13] found that the information contained in quarterly earnings per share reports could be used to obtain aggregate abnormal ex post rates of return on the common stocks to which annual earnings per share numbers relate.[7] Davis [16] also found that automotive 10-day sales data and steel production data have information content for investors and that this information is reflected quickly in stock prices after it becomes available. He also observed that there was price adjustment one to two days prior to the date of publication and one to three days after the publication of the data.

If non-annual report sources of information differ across firms and industry groups, it is plausible to assume that cross-sectional differences in the information content of firms' annual earnings announcements are to be expected. For example, Beaver [9], in passing,

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[7] Kiger [26] and May [30] also found that changes in price of a sample of listed stocks were greater during the weeks in which the sample firms made quarterly earnings announcements than during weeks in which announcements of earnings were not made.

suggests that for the retail and food processing firms which tend to report financial statement data monthly (a non-annual report source of information) both the price and volume reactions (measures of the information content of annual earnings announcements) were less dramatic than for the other firms in his sample. Although Kiger [26] was examining the information content of quarterly earnings report announcements, he was concerned that cross-sectional differences in the availability of interim data might bias his findings. Specifically, he hypothesized (but did not test) that the stock activity of firms in his sample which make monthly or more frequent reports about sales or earnings or make announcements a few days in advance of the release of the quarterly earnings report will be less than that of firms which only release quarterly earnings reports.[8]

Insofar as some types of interim data are regarded as information by some investors, it may be expected that changes in these investors' expectations concerning a firm's annual earnings or an industry's general annual performance seem much more likely to be developed from observation of some types of interim data than from annual earnings data at the time they are reported.[9] This assumption may explain the observation made by Beaver [9] that for the retailers and food processors which report financial statement data monthly, both the price and volume reactions were less dramatic than for the

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[8] Kiger [26], p. 122.

[9] Benston [10], pp. 3, 23, and Parker [36], p. 16.

other firms in his sample.

An immediate implication of this assumption is that differential flow of interim information about firms, ceteris paribus, will tend to induce differences in the information content of their annual earnings announcements. Specifically, ceteris paribus, when the annual earnings of those firms for which the types of interim data identified so far are more readily available to investors are announced, changes in investors' expectations (as measured by residual price changes) will be less than when the annual earnings of firms for which the types of interim data identified so far are not more readily available to investors are announced. The rationale behind this inference is that publicly available interim information may resolve in some continuous manner uncertainties that surround annual earnings; the potential consequent effect is an increase in the degree of predictability of annual earnings.[10]

The theoretical discussions in the preceding paragraphs have been undertaken to establish a basis for expecting differences in the information content of the annual earnings announcements of firms. The major proposition derived from the discussions is that, ceteris paribus, differences in the information content of the annual earnings announcements of firms are related to differences in the amount of interim information that is publicly available about firms.

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[10] Note that it is possible that some firms' annual earnings may be highly predictable (none known to this author at this time) although there is no or relatively little interim information that is publicly available about them.

Research Strategies

There are potentially three approaches that can be employed to examine the research proposition. The first is a direct approach to quantifying interim data that are publicly available about each sample firm. The following four basic steps are involved in this attempt:

(1) Identifying both the major sources of interim data and the major different types of interim data for each sample firm.

(2) Devising a system of scoring (weighting) the different types of interim data on the basis of their perceived usefulness to investors in terms of their correlation with future annual earnings or stock prices or both.

(3) Aggregating the scores for each sample firm.

(4) Relating each sample firm's price response (as the dependent variable) in the period of its annual earnings announcement to its aggregate score for interim data (as the independent variable).

Steps 2 and 3 present some major problems of judgment and measurement which are still unresolved in the accounting literature. The implementation of Step 2 will require in part some knowledge about investors' inherently heterogeneous decision models and how the different types of interim data serve as inputs into these models. If the different types of interim data are used by investors in a combined manner (that is, if they are complementary) they cannot be scored independently. If some of the interim data are used in a combined manner there appears to be no obvious method for aggregating the scores, that is, implementing Step 3.

The second approach involves classifying the sample firms into groups on the basis of the magnitude of their price responses in the period of their annual earnings announcements and investigating for differences in the amount of interim data that is publicly available for the groups. For example, the sample firms may be classified into two groups of low and high price responses. The major problem with this approach is still the difficulty in quantifying interim data expressed in the first approach. There are some other statistical problems associated with this approach. Most of the statistical techniques available for investigating group differences with respect to some variables (in this case quantity of interim data) require that the groups be discrete and identifiable.[11] This requirement will not be satisfied because price response is inherently a continuous variable. There will also be a loss of sample information by deleting "middle area" observations to be able to study "extreme end" observations.

The third approach involves surrogation and it is the one that will be used to examine the research proposition. It is subject to some criticisms but is relatively easy to work with.[12] Interim

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[11] An example of the many statistical techniques available for investigating group differences is discriminant analysis.

[12] The major criticism relates to the difficulty of unambiguously interpreting the results. For example, only association can be determined.

information is considered as any economic good the amount of which will be generated is determined by the economic laws of supply and demand (or cost and benefit). Some factors or variables are identified which may determine the quantity of interim information that will be generated about a firm. The interim information may be generated by either the firm itself or its industry or any interested party.

A detailed theoretical and, to some limited extent, empirical investigation of the interim information generation process (to be discussed in detail in Chapter II) will suggest that the following variables are some of the important ones which individually or jointly are related to the quantity of publicly available interim information about a firm: (1) size of the firm, (2) type of industry to which the firm belongs, (3) degree of seller concentration in the firm's industry, (4) frequency the firm engages in external financing, and (5) number of stockholders in the firm. These five proxy variables for the quantity of interim information are employed in a multiple regression framework to explain differences (or variation) in the information content (price responses) of the annual earnings announcements of a sample of firms.

Research Assumptions

Two assumptions are made in formulating the research question. First, it is assumed that the accounting process, an information supplying process, is conducted in a competitive setting. Second, it is assumed that, other things being equal, differences in the information content of the annual earnings announcements of the sample

firms are due entirely to differences in the quantity of publicly available interim information that is generated about the sample firms or that the effect of other information is random and insignificant.

The assumption that accounting operates in a competitive setting has been suggested in the accounting literature. For example, Gonedes [23] has argued that:

> In particular it appears that the accounting process - qua supplier of information - does not possess strict monopoly power over the supply of information pertinent to the evaluation of a firm. Instead, it appears that the accounting process - qua supplier of information - functions within a competitive context.

The contention that accounting functions in a competitive setting is based on (1) the finding by Ball and Brown [8] that accounting numbers include information that reflects economy-wide events and industry-wide events and the assumption that this type of information can also be obtained from other indicators such as industrial production reports and national income reports, and (2) again the evidence by Ball and Brown [7] on the existence of anticipatory price movements that precede the announcement of accounting numbers. Thus, it has been argued that if there were no other sources competing with accounting information one would expect to observe rapid price movements when accounting data are disseminated.

The second assumption, that is, attributing differences in market response to firms' annual earnings announcements to differences in the quantity of interim information that is publicly available

about firms, is a derivative of the first assumption. This assumption rules out the possibility of attributing differences in market reactions to firms' annual earnings announcements to some explanatory factors other than interim information.

One potential explanatory variable not considered in this study is the stability of the process which generates a firm's annual earnings. It may be argued that the process generating some firms' annual earnings is more stable than that of others. One implication of this argument is that the future annual earnings of firms with more stable earnings generation process will be more predictable than those of firms with less stable earnings generation process. Given that the information content of firms' annual earnings announcement is measured by some absolute changes in their equilibrium prices in the report period relative to the non-report period, the earnings stability argument further implies that the information content of the annual earnings announcement of firms with more stable earnings generation process will be less than that of firms with less stable earnings generation process.[13]

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[13] This implication supposes that information content is an increasing function of forecast errors. The stability argument and even the present study assume that the annual earnings number of a firm is a desirable object of prediction by investors. This assumption is supported by the evidence that earnings numbers (both annual and quarterly) are related to stock prices. See Ball and Brown [7], Brown and Kennelly [13], Kiger [26], May [30], Miller and Modigliani [31], and Neiderhoffer and Regan [33].

It is possible that the earnings stability argument holds. However, it is not easy to identify the nature of the underlying earnings generation process for each of the sample firms. An attempt could be made by assuming some processes and verifying which ones fit the firms' earnings series better, but such an attempt constitutes a separate research project which cannot be undertaken in this study.[14]

Research Question

Two propositions from which the research question is derived were posited earlier in the chapter. First, the information content of a firm's annual earnings announcement is a monotone decreasing function of the quantity of interim information that is generated about the firm. Second, the following five characteristics of the firm may determine the quantity of interim information that is generated about the firm: size, industry, degree of seller concentration in its industry, frequency of external financing, and number of stockholders (this latter proposition is discussed in detail in Chapter II).

All the characteristics with the exception of the industry characteristics are assumed to be positively related to the quantity of interim information that is generated about a firm. This assumption together with the first proposition imply that the information content of a firm's annual earnings announcement is a monotone decreasing function of its size, the degree of seller concentration in its

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[14] The earnings stability argument could have been dismissed by taking the position (or asserting) that there is no reason to believe that earnings stability is systematically related to quantity of interim information.

industry, its number of stockholders and the frequency it engages in external financing.

With the type of industry characteristic it is assumed that there are significant differences in the quantity of interim information that is generated about firms depending on their industry affiliations. In other words, the quantity of interim information generated about some firms and groups of firms in some industries is greater than that of some firms and groups of firms in other industries. This assumption implies significant industry differences in the information content of annual earnings announcements of firms and groups of firms.

The overall research question can be stated as follows:

Is there a significant relationship between the information content of a firm's annual earnings announcement and each of, or a combination of, the following surrogate measures for the quantity of interim information:

(1) size of a firm,
(2) degree of seller concentration in a firm's industry,
(3) type of industry to which a firm belongs,
(4) frequency a firm engages in external financing, and
(5) number of stockholders of a firm?

Relevance of Research Question

There is some justification for examining the behavior of firms at the macro level. The evidence established at the macro level provides the basis for investigating further differences in group or individual behavior. In this respect the finding by Professor Beaver [9] that on average announcement of the annual earnings of

firms leads to changes in equilibrium prices provides the empirical basis and motivation for this study.

There is also some justification for examining the behavior of firms at the micro level. There is a growing trend in the micro level analysis in accounting. For example, given the macro statement that firms do attempt to smooth reported income, Smith [44] has investigated whether the tendency to smooth reported income is related to the type of control in a firm. Micro level analysis of this type may provide important inputs for policy prescriptions.

Few people will have any difficulty in accepting the proposition that there will be differences in the information content of the annual earnings announcements of firms. One major perceived contribution of this study is the explanation of these differences both at the theoretical and empirical level in terms of five measurable characteristics of firms which are assumed to be related to the quantity of interim information generated about firms.

Prior studies adjusted the market price response of firms' common stocks for only one market-wide factor. However, recent evidence by Fama and MacBeth [18] and others suggests that the effect on the market price of an event specific to a given firm can be studied more precisely by adjusting the market price response for two market-wide factors. This study accordingly will adjust the market price response for two market-wide factors as well as one market-wide factor for comparability with results of prior studies.

The second major contribution of this study is its potential

implications for future research designs of empirical studies. If the five surrogate measures for the quantity of interim information are found to explain a significant portion of the variation in the information content of firms' annual earnings announcements it may be concluded that researchers in this area of study should consider these firm characteristics in designing their research. For example, it may be misleading to generalize the findings of a study based on a sample of firms which differ on most of these characteristics to all firms. The conclusions of Beaver's study [9] contain this potential bias.

On the other hand, the implications of this study are not obvious if the five surrogate variables are found not to explain a significant variation in the information content of firms' annual earnings announcements. One negative implication is that the five characteristics are either poor surrogates for the quantity of interim information or that interim information is not as relevant as other factors not considered explicitly in the model for formation of equilibrium prices. Such a possibility is partially tested by a limited empirical test of counting non-annual report sources of information for a number of firms in the sample (for example, one firm at each decile of the distribution of the information content measure) and computing rank correlation of the number of non-annual report sources of information and the measure of information content of annual earnings announcement.

Another reason for negative results even if the surrogation is

good is that the cost of reconstructing the firm's specific events (annual earnings number in this instance) from numerous non-annual report sources is probably prohibitive.[15] As a result, such a reconstruction of events may not be undertaken by investors since the cost may exceed the perceived benefits. The implication of this is that interim information correlated with the one conveyed by the annual earnings announcement will not be acted upon by investors, implying that interim information effects will not be impounded in stock prices. Thus, if some firm-specific information is not provided by the firm, even if it is available from other sources to the market, it may not be used. This fact has been suggested to be consistent with an efficient market in which transaction costs do exist in the following statements of Ronen [38]:

> Moreover, a market equilibrium in which transactors do not seek information because of the high cost of search, even when they know that it exists, is consistent with the evidence collected about efficient markets. And when accounting information is provided about firms' specific events for which alternative sources of information are too costly to seek out, transactors are justified in relying on the accounting information.

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[15] The other reason (or implication) given in the previous paragraph for negative results is one of measurement while this reason invokes the existence of a competing hypothesis not to be tested in this study.

II. LITERATURE REVIEW AND TESTABLE HYPOTHESES

Introduction

Prior studies in economics, finance, and accounting have related certain activity measures of firms and industries to characteristics of those firms and industries. The activity measures, mostly economic performance and behavior oriented, which have been related to characteristics of firms and industries include profit rates,[1] variability of profit rates,[2] degree of competition,[3] smoothing of income,[4] and quality of disclosure in the annual report.[5] The characteristics of firms and industries to which these activity measures have usually been related include size of a firm, distribution of a firm's stock ownership, nature of a firm's product, degree of concentration in an industry, and ease of entry into an industry. None of these prior studies related quantity of interim information to characteristics of firms and industries.

One major objective of this chapter is to review the available literature in order to develop theoretical and empirical bases for

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[1] Osborne [35], p. 58, and Steindl [45].

[2] Alexander [2], p. 229.

[3] Bain [3], pp. 313-314, and Stigler [46], pp. 67-68.

[4] Gordon et. al. [24], and Smith [44].

[5] Cerf [15], and Singhvi and Desai [43].

relating five characteristics of firms to the quantity of interim information that will be publicly available about them. The five characteristics are size of a firm, type of industry to which a firm belongs, degree of seller concentration in a firm's industry, number of stockholders of a firm, and frequency a firm engages in external financing.

Another major objective of this chapter is to review the literature relating to the measurement of the information content of a firm's annual earnings announcement. The five characteristics of firms, as surrogate measures for quantity of interim information, will be employed in later chapters to explain statistical variation in the information content of firms' annual earnings announcements.

Review of the literature relating to quantity of interim information and measurement of the information content of firms' annual earnings announcements provides the basis for formulating testable research hypotheses at the end of the chapter.

Size

The size of a firm is a multidimensional concept including stock and flow magnitudes.[6] Dimensions of size include, for example, sales revenue, value added, total assets, number of employees, and other aspects of the firm's operations. There are some interdependencies among some of these dimensions of size. However, Stigler has suggested that we measure a firm's size by sales, in a product market; by

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[6] Needham [32], p. 12.

employees, in a labor market; by materials, in a material market; by assets, in a capital market.[7] Since this study is concerned with capital markets the size of a firm is, following Stigler, appropriately measured by its total assets (per financial statements).

While the size of a firm has been associated with the quantity of information publicly available about it, no attempt has been made to explain why such a relationship may exist. For example, concerning his sample selection, Beaver cautioned that:

> The effect of selecting larger firms would tend to induce a bias against earnings reports because the larger firms are generally associated with greater flow of additional information that smaller firms.[8]

Since Beaver was dealing with annual earnings reports he must have been referring to greater flow of interim information about larger firms.

Beaver's untested assertion can be developed by considering interim information as an economic good with dimensions of supply and demand.[9] On the supply side, larger firms on average can afford the cost of generating and disseminating a given quantity of interim data than smaller firms. Also, the greater need for internal communication in larger firms (in part because of geographical and product line

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[7] Stigler [47], p. 30.

[8] Beaver [9], p. 71.

[9] Economic goods also have cost-benefit dimensions which are not necessarily independent of supply-demand dimensions. In fact, cost-benefit considerations may lead to the same set of propositions developed from supply-demand considerations.

diversity) will tend to make larger firms, on average, accumulate and process more data (including interim data) than smaller firms. These supply considerations, however, do not help in explaining why and how some of the interim data will be publicly available. Two factors, internal and external to the firm, may explain why and how some of the interim data may become publicly available. The external factors are mainly demand considerations.

There is a long hierarchy of internal users of the interim data generated by larger firms and there is no reason to believe that some of them will not be leaked to the public. This assumption, that a substantial part of the relevant accounting data generated for internal use may be leaked to the market before the formal release of the annual earnings report by more timely media such as statements by company officials and reports by financial analysts, is consistent with the finding by Ball and Brown [7] that, on average, only 10-15 percent of the price adjustment of a sample of listed stocks took place in the month of annual earnings announcement.

Factors external to the firm may in no small way pressure or require larger firms on average to supply more interim data than smaller firms. The external factors may include the effects of regulation, social responsibility, and public attention. Their cumulative effect is to get the public to demand more information from larger firms than smaller firms.

Larger firms generally are more visible and have more power than smaller firms. Friedman suggests that because smaller firms

have no appreciable power and visibility, it is hard to argue that they have social responsibility except that which is shared by all citizens. He also suggests that larger firms are more newsworthy and are given more attention than smaller firms.[10] In essence there is a general bias and tendency to overemphasize the importance of the larger versus the smaller. The outgrowth of this social threat posed by larger firms is that the disclosure rules or laws of most regulatory agencies, for example, SEC and FTC, are often directed more towards larger firms than smaller firms because of the assumed or perceived greater impact the operating and financing decisions of larger firms have on the social and economic performance of the whole economy.[11] This discriminating tendency of regulation may have the

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[10] Friedman [21], p. 106.

[11] Most of the propositions that are made in this part and subsequent parts of this chapter are theoretical. It is implicitly assumed that a sample of firms with characteristics specified in the development of the propositions can be found to subject the propositions to empirical testing. For example, concerning the proposition for size, it is assumed that sufficient number of larger and smaller firms which are subject to different forms of public reporting (disclosure) rules will be included in the sample. It is thus hoped that variation in total assets (measure of size) for the sample of firms will be large enough to make the distinction between larger and smaller firms meaningful. It may be the case that all the firms in the sample will be large enough to be subject to SEC public reporting rules. Some firms in the sample may operate in specific industries which have additional (if not different) public reporting rules specified by their industry regulatory agencies (for example, FTC, ICC, and CAB). The industry characteristic (to be discussed next) may be able to capture quantity of interim information differences induced by differences in public reporting requirements.

effect of getting larger firms to disclose more information (including interim information) which comes to the domain of the investing public or the capital market.

Type of Industry

It was pointed out in Chapter I that aggregate economic statistics are published on regular basis for some industries. Examples of the industries include automotive, steel and iron, retail, farming, construction, and railroads. This observation by itself may be sufficient to expect differences in the quantity of interim information that flows about firms. However, additional arguments can be developed to support this assumption.

It has been suggested that some firms and some industries are more sensitive than others to the disclosure of information.[12] Such firms include those in the extractive industries (where a major discovery may have significant influence on the firm's future), the electronics industry, and the high technology or other "hot" issue industries. For firms in these industries, disclosure of information is a delicate issue since their expectations may not be realized in which case they may be accused of disclosing misleading information. The "gray" nature of this disclosure issue may discourage these firms to disclose more information on interim basis.

A survey of security analysts by Cerf indicated that trade

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[12] Burson [14], pp. 370-371.

publications are the third most frequent source of financial information employed by security analysts.[13] Trade publications are issued on a regular basis by some trade associations for some industries. The information these publications convey about the operations of their industries can be assumed to vary. The unavailability of such publications for some industries and the assumed differences in the information they convey may induce differences in the quantity of interim information that is available for the investing public to make inferences about operating and financing decisions of firms in those industries.

Some firms operating in some industries are regulated while others in some other industries are not. The effect of the regulation normally ensures that some minimum quantity of information is publicly available about firms in regulated industries.

Industry Concentration

It would appear that if there were any significant industry differences in the quantity of interim information that is publicly available about a firm, the type of industry variable should capture them. However, industries are known to differ on many dimensions. One major dimension along which industries have been differentiated from each other is the degree of seller concentration.[14]

The degree of seller concentration, to a first approximation,

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[13] Cerf [15], pp. 14-15.

[14] Bain [4], Chapter 4.

has been measured by the number and size distribution of all firms supplying goods within the industry. Size of each selling firm is measured by the proportion of the total output of the industry which it supplies. Thus, the proportion (or percentage) of the total output of the industry accounted for by the 4 largest, 8 largest, 20 largest, and 50 largest firms have been constructed - they are called concentration ratios. It has been suggested that the degree of seller concentration, so measured, seems potentially significant as a determinant of the character and intensity of competition in any industry, establishing as it does whether in a structural sense, the industry is atomistic, oligopolistic, or monopolistic.[15]

The relationship between the character and intensity of competition in any industry and the quantity of interim information that is publicly available about firms in that industry is not clear. For example, on one hand, the power, visibility, newsworthy, and regulatory pressure arguments developed in part to support the assumption that larger firms on average will tend to have greater quantity of interim information about them than smaller firms may lead to the inference that firms in oligopolistic or monopolistic industries will on average have greater quantity of interim information than firms in automistic industries. On the other hand, it can also be argued that a firm in an atomistic industry has nothing to lose by disclosing more interim information since it has no effect on price and market

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[15] Ibid.

behavior in general. The monopolist or oligopolist may wish to avoid publicity so that no new competitors will be induced to enter the industry to compete away excess profits. Thus, aversion to publicity by firms in either monopolistic or oligopolistic industries will suggest disclosure of less interim information.

Casual observations suggest that publicity given to the activities of firms in oligopolistic and monopolistic industries is greater than that given to firms in atomistic industries. For example, the most powerful and efficient trade associations are found in oligopolistic industries. One of the major functions of such associations has been suggested as dividing the market among their member firms.[16] Stigler has the opinion that:

> When a small number of firms control most or all of the output of an industry, they can individually and collectively profit more by cooperation than by competition.[17]

Stigler's opinion is consistent with the formation of trade associations. The trade association provides the cooperative mechanism to which Stigler alludes. It allows the firms in oligopolistic industries to have intra-industry communication (that is, exchange of trade information to ensure that no firm captures more than its "assigned" share of the market) without violating the anti-trust laws. And since trade publications have been ranked as the third most frequent source of financial information employed by security analysts

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[16] Stigler [48], p. 14.

[17] Ibid., p. 5.

(Cerf [15]), and also, since the trade publications are publicly available on a regular basis, it is plausible to assume that the quantity of interim information that is publicly available about firms in more concentrated industries will be greater than that of firms in less concentrated industries.

Number of Stockholders

The basic assumption is that firms having a larger number of stockholders will tend to have a greater flow and quantity of interim information about them than firms having a smaller number of stockholders.[18] Two reasons are offered to support this assumption.[19] First, firms having a larger number of stockholders will tend to be more in the public eye and are, therefore, more subject to stockholders' and analysts' pressures for more interim information. Second, firms having a larger number of stockholders may supply more interim information either to minimize pressure from regulatory agencies or, if they are not already regulated, to minimize the threat of eventual regulation.

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[18] The number of stockholders as a surrogate measure for the flow and quantity of interim information is considered in addition to the size variable because it is not generally true that the number of stockholders of a firm is a function of the firm's size as measured by its total assets. Some firms may be large in size as measured by their total assets but may have small number of stockholders - this is generally the case of some large closely-held firms.

[19] The two reasons are among the many Singhvi and Desai [43] offered to develop the hypothesis that a positive relationship exists between the number of stockholders and quality of disclosure in the annual report.

Frequency of External Financing

One of the major arguments advanced in support of a consistent flow of firm news is that it will help to foster a broad and active market for the firm's securities at fair price levels.[20] It has also been suggested that managements of firms which go frequently to the securities market make a special effort to provide more adequate, accurate, and timely disclosure of financial information to encourage investments in their firms' securities.[21]

In his survey of security analysts Cerf [15] also found that the second most frequent source of financial information employed by security analysts is the prospectus, a summary of the essential information in a registration statement. A registration statement is required of firms listed on the major exchanges that attempt to raise capital from the investing public. The major new information a registration statement contains is the intended use of the proceeds of the security issue. This information gives the public an indication of the future operating policies of the firm as Scholes indicates in the following statements about primary distributions (or new issues):

> They are often associated with important events such as expansion of programs, changes in capital structure and the like. These events and what they mean to management's view and intentions have not always been completely anticipated and discounted by the market so that price adjustments, sometimes of fairly substantial size, accompany the announcement of a new issue by the firm. In many cases, where the news happens to be particularly good, there may

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[20] Burson [14], p. 370.

[21] Ibid., and Cerf [15], pp. 21-22.

> well be a sizeable price increase on the announcement. In other cases, there may be a substantial fall...[22]

The frequency of external financing variable, as measured by the number of registration statements a firm files with the SEC, is related to the flow and quantity of interim information to the extent that it conveys new information about the firm. Specifically, it is asserted (or assumed) that the more frequent a firm engages in external financing the greater will be the flow and quantity of interim information that is publicly available about it.

The frequency a firm engages in external financing together with the other four surrogate measures for the flow and quantity of interim information (namely, size, type of industry, industry concentration, and number of stockholders) will be related to the information content of firms' annual earnings announcements in later chapters. The literature relating to the measurement of the information content of the annual earnings announcements of firms is reviewed next.

Information Content

Previous studies have characterized a firm's earnings report as having information content:

> ... if it leads to a change in investors' assessments of the probability distribution of future returns (or

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[22] Scholes [39], p. 213.

> prices), such that there is a change in equilibrium value of current market price.[23]

This characterization of information reflects changes in the expectations of the market as a whole as reflected in changes in equilibrium prices. To be able to measure these changes in the market expectations two assumptions are usually made. The first assumption is that the capital market is efficient in the sense that stock prices "fully reflect" available public information.[24] In other

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[23] Beaver [9], pp. 68-69. A similar characterization was employed by Kiger [26] and May [30]. Beaver [9] adopted another working concept of information: "... a firm's earnings report possesses informational value only if it leads to an altering of the optimal holding of that firm's stock in the portfolios of individual investors," p. 68. This characterization of information considers changes in the expectations of individual investors as reflected in the volume of trading in contrast to the whole market. Results obtained with both concepts were consistent although the price reaction was twice as much as the volume reaction (67 and 33 percent above-normal respectively). Although both reactions need not be observed, these results tend to suggest that price reaction is more likely to be observed than volume reaction. Also, there are no well-developed theories describing the process generating the equilibrium volume of trading in a security. Therefore, this study restricts attention to only price reactions.

[24] For a summary of the evidence and the theory, see Fama [17]. The semi-strong form of the efficient market hypothesis is implicitly assumed in our asserted relationship between the existence of interim information and the information content of a firm's annual earnings announcement. If the firm's publicly available interim data have information content they will be reflected in the firm's stock price continuously and therefore the amount of price adjustment that will be required when the firm announces its annual earnings will be smaller than if there were no publicly available interim data about the firm.

words, given capital market efficiency of the semi-strong form, changes in investors' expectations consequent upon the announcement of the annual earnings numbers should be reflected in stock prices at or before the annual earnings numbers become known to investors.

The second assumption relates to a model of equilibrium pricing of risky capital assets. The most widely used equilibrium asset pricing models consider only two parameters of the distribution of rates of return on capital assets, namely, the expected value and dispersion of the distribution. The two-parameter models of Sharpe [40] and Lintner [28], and Black [11] provide identical definitions of risk and similar linear relationship between risk and expected value of rate of return. Black's asset-pricing model [11] asserts that:

$$E(\tilde{R}_{jt}) = E(\tilde{R}_{zt}) + [E(\tilde{R}_{mt}) - E(\tilde{R}_{zt})]\beta_j, \qquad (1)$$

where:

E = the expectation operator, taken immediately prior to t;

$\tilde{R}_{jt}$ = rate of return on security j during period t, a random variable (denoted by the tilde, ~);

$\tilde{R}_{zt}$ = rate of return on the "efficient" (that is, minimum-variance) portfolio whose return is uncorrelated with the return on the market portfolio, $\tilde{R}_{mt}$, that is, $Cov(\tilde{R}_{zt},\tilde{R}_{mt}) = 0$;

$\tilde{R}_{mt}$ = rate of return on the market portfolio, composed of all securities in the market, in period t;

β_j = ratio of the covariance between $\tilde{R}_{jt}$ and $\tilde{R}_{mt}$ to the variance of $\tilde{R}_{mt}$, that is, the relative risk of the jth security in the market portfolio.

In words, equation (1) states that the expected return on security j is $E(\tilde{R}_{zt})$, the expected return on an efficient portfolio whose return is uncorrelated with $\tilde{R}_{mt}$, plus a risk premium that is β_j times the difference between $E(\tilde{R}_{mt})$ and $E(\tilde{R}_{zt})$.

The Sharpe [40]-Lintner [28] version assumes that $\tilde{R}_{zt}$ has no variance and can be replaced by a known rate, R_{ft}. That is:

$$E(\tilde{R}_{jt}) = R_{ft} + [E(\tilde{R}_{mt}) - R_{ft}]\beta_j, \tag{2}$$

Equations (1) and (2) are in terms of expected returns. However, the following two stochastic return-generating processes have been suggested to be consistent with the Black's formulation and Sharpe-Lintner formulation respectively:

$$\tilde{R}_{jt} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_j + \tilde{U}_{jt}, \tag{1a}$$

and

$$\tilde{R}_{jt} = \alpha_j + \beta_j\tilde{R}_{mt} + \tilde{e}_{jt}, \tag{2a}$$

where:

$\tilde{\gamma}_{0t}, \tilde{\gamma}_{1t}$ = returns on the two market-determined factors, $\tilde{R}_{zt}$ and $(\tilde{R}_{mt} - \tilde{R}_{zt})$, respectively in period t;

$\tilde{U}_{jt}, \tilde{e}_{jt}$ = disturbance of security j in period t for equations (1a) and (2a) respectively;

α_j, β_j = constants for security j;

$\tilde{R}_{jt}, \tilde{R}_{mt}$ = rate of return on security j and the market portfolio respectively.

Equation (1a) states that the return on a security in period t is a function of the disturbance term, $\tilde{U}_{jt}$, which is specific to an individual security, and two market-wide (or market-determined) variables, $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$. The period-by-period stochastic return-generating process specified by equation (1a) is accordingly referred to as the "two-factor market model" to distinguish it from its variant, "one-factor market model" specified by equation (2a). The one-factor market model specified by equation (2a) states that the return on a security in period t is a function of the disturbance term, $\tilde{e}_{jt}$, and one market-wide factor, $\tilde{R}_{mt}$, return on the market portfolio.

Unlike the one-factor market model, which assumes that the parameters α_j and β_j are constant (and therefore independent of t) the two-factor market model allows the parameters $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ to vary stochastically from period to period. The dependent variable in the one-factor market model is $\tilde{R}_{mt}$ while the dependent variable in the two-factor market model is β_j. This implies that the one-factor market model is estimated for each security by pooling that security's data from different time periods while the two-factor market model is estimated for each time period by pooling different firms' data.

The empirical evidence does not seem to be consistent with the one-factor market model. For example, it has been found that at least in the post-World War II period, estimates of $\tilde{R}_{zt}$ seem to be significantly greater than R_{ft}.[25] Fama and MacBeth [18] also conclude

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[25] Black, Jensen, and Scholes [12].

that there is period-to-period variation in the estimate of $\tilde{R}_{zt}$ which is above and beyond pure sampling error and therefore it can be interpreted that $\tilde{R}_{zt}$ is a market factor in addition to $\tilde{R}_{mt}$ that influences the return on all securities. A further implication is that estimates of the disturbance term $\tilde{e}_{jt}$ (residuals) obtained from the one-factor market model contain variation in the market factor $\tilde{R}_{zt}$. This observation leads Fama and MacBeth to suggest that:

> Thus, if one is interested in the effect on a security's return of an event specific to the given company, this effect can probably be studied more precisely from the residuals of the two-...factor market model...than from the one-factor model...[26]

Both the one-factor and the two-factor market models do not consider another factor, industry-wide effects, which was found to explain about 11 percent of the variation in an individual firm's security price change.[27] Two reasons are usually given for not considering the industry-wide effects. The first reason is the high cost of constructing rate of return indexes for industries.[28] The second is the low explanatory power of the industry-wide effects compared with the 31 percent found for the market-wide factor. The benefit of the second reason cannot be extended to Beaver's study [9] since market-wide factors could explain only 6 percent of the variation in an individual firm's security price change. The low explanatory power of the market-wide factors for Beaver's sample is consistent with two possible states. First, it is possible that during his study

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[26] Fama and MacBeth [18], p. 624.

[27] King [27].

[28] May [30], p. 130, footnote number 29.

period (1961-1965) the slope of the capital market line was not significant. Second, it is possible that the one-factor market model (which was the best among the available return-generating models at the time he conducted his study) is better specified for monthly rates of return than it is for weekly rates of return which Beaver employed to estimate the parameters of the model. In fact, Abdel-khalik [1] has collected some evidence to this effect - the use of monthly return data induces more stability in the estimated parameters of one-factor market model than daily or weekly data.

Some of the discussions and comments made in the preceding two paragraphs have implications for Beaver's findings and design of this study. Factors other than the effect of annual earnings announcement might have been impounded in the residuals obtained in Beaver's study. Some transformation of the residuals is used to infer the information content of annual earnings announcements. Specifically, the observed 67 percent above-normal average price reaction in the week of the annual earnings announcement probably overstates the information content of annual earnings announcement.

Two factors which might have been impounded in the residuals obtained in Beaver's study are industry-wide factors and the market-wide determined factor, $\tilde{R}_{zt}$. Because of the high cost involved in constructing rate of return indexes for individual industries the industry-wide factors are not included in the asset pricing models in estimating the residuals. However, in the analysis of the relationship between the information content of firms' annual earnings

announcements (which are obtained through a transformation of the residuals evaluated in the report period) and quantity of interim information, a type of industry variable (as an indicator variable and one of the surrogate measures for quantity of interim information) is considered explicitly which may account for quantity of interim information differences as well as industry-wide effects impounded in the residuals.

The parameters of the return-generating models are estimated by using monthly return data because of the finding by Abdel-khalik [1] that their use induce greater stability in the estimate of the parameters. Also, the findings by Black, Jensen, and Scholes [12], and Fama and MacBeth [18] suggest the two-factor market model instead of the one-factor market model should be used in studying the effect on the return of a firm's security of its annual earnings announcement. However, because of the need for comparability with the findings of prior studies (Beaver's in particular) both asset pricing models are used. The literature relating to the use of the two return-generating models to measure the information content of firms' earnings announcement is reviewed next.

Measurement of Information Content

The two security return-generating models given by equations (1a) and (2a) further assert that the expected return on security j, conditional upon the ex post value of the one (two) market-wide variable(s), is also a linear function of the one (two) market-wide variable(s). That is:

$$E(\tilde{R}_{jt}|\gamma_{0t},\gamma_{1t}) = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_j, \quad (3)$$

and

$$E(\tilde{R}_{jt}|R_{mt}) = \alpha_j + \beta_j\tilde{R}_{mt}, \quad (4)$$

where $E(\tilde{U}_{jt})$ and $E(\tilde{e}_{jt})$ are each equal to zero since it is assumed that the market is in equilibrium and is also efficient. Subtracting (3) from (1a) and (4) from (2a) gives:

$$\tilde{R}_{jt} - E(\tilde{R}_{jt}|\gamma_{0t},\gamma_{1t}) = \tilde{U}_{jt}, \quad (5)$$

and

$$\tilde{R}_{jt} - E(\tilde{R}_{jt}|R_{mt}) = \tilde{e}_{jt}, \quad (6)$$

If it is assumed appropriately that the market's response to the announcement of the annual earnings of firm j is a disequilibrium phenomenon,[29] then equations (3) and (4) indicate the rate of return on firm j's security that would have occurred (as predicted by the two-factor and one-factor market models respectively) if the earnings (and correlated events) had not been announced. Equations (5) and (6) therefore each provide a measure of disequilibrium (or changes in investors' expectations) associated with the announcement of firm j's earnings. By comparing the behavior of a transformation of both $\tilde{U}_{jt}$ and $\tilde{e}_{jt}$ (discussed below) in the report period to their behavior in the non-report period it can be inferred whether the announcement of firm j's annual earnings, assuming its relative market risk, β_j, is constant, leads to changes in equilibrium price; in other words, whether the announcement of firm j's annual earnings has any information content.

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[29] Ball [6], p. 343, and Ball [5].

Assume that estimates of γ_{0t}, γ_{1t}, α_j, and β_j specified in equations (3) and (4) are respectively as follows: $\hat{\gamma}_{0t}$, $\hat{\gamma}_{1t}$, $\hat{\alpha}_j$, and $\hat{\beta}_j$.[30] Substituting these estimates in equations (3) and (4) yields:

$$E(\tilde{R}_{jt}|\gamma_{0t}, \gamma_{1t}) = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}\hat{\beta}_j, \tag{7}$$

expected rate of return on security j in period t using the two-factor market model, and

$$E(\tilde{R}_{jt}|R_{mt}) = \hat{\alpha}_j + \hat{\beta}_j R_{mt}, \tag{8}$$

expected rate of return on security j in period t using the one-factor market model.

The residuals for each month in the report period for the kth annual earnings announcement are obtained by subtracting the expected rate of return given by each of the two return-generating models from the ex post rate of return. These residuals are as follows:

$$\bar{R}_{jnk} - (\hat{\gamma}_{0nk} + \hat{\gamma}_{1nk}\hat{\beta}_{jk}) = \hat{U}_{jnk}, \tag{9}$$

and

$$\bar{R}_{jnk} - (\hat{\alpha}_{jnk} + \hat{\beta}_{jk}\bar{R}_{mnk}) = \hat{e}_{jnk}, \tag{10}$$

where:

$j = 1,2,\ldots,J$ (J is the number of securities or firms);

$n = -q, -q+1,\ldots,0,1,2,\ldots,Q$ (q and Q are positive integers indicating number of months before and after the announcement month, n=0, respectively; the interval between -q and Q is the report period);

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[30] The estimation procedures are described in detail in Chapter III.

$k = 1,2,\ldots,K$ (K is the annual earnings announcement number). The bar ($\bar{}$) on top of R_{jnk} and R_{mnk} indicates that they are ex post values. Transformations performed on the residuals given by equations (9) and (10) are the same and therefore they are performed on only one, $\hat{e}_{jnk}$.

The estimated residual for security j in report month n for the kth annual earnings announcement, $\hat{e}_{jnk}$, can be either positive or negative or zero depending on the relative magnitudes of the ex post monthly return and the expected monthly return. The working concept of information adopted for this study says nothing about the direction of the change in equilibrium prices. It is concerned only with the magnitude of the change in equilibrium prices.

Two approaches have been employed to convert $\hat{e}_{jnk}$ to only its magnitude. One simple approach is to take the absolute value of $\hat{e}_{jnk}$, that is, $|\hat{e}_{jnk}|$. This was the approach followed by May [30] in his study of the information content of quarterly earnings announcements.[31] The other approach is to square $\hat{e}_{jnk}$ to get rid of its sign. This approach was followed by Beaver [9] in his study of the information content of the annual earnings announcements. Beaver's more commonly accepted approach is adopted for this study which is also concerned with the information content of annual earnings announcements to make the results of this study comparable to Beaver's.

The variance of the disturbance term, $\tilde{e}_{jt}$, in equation (2) is given by:

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[31] May [30], pp. 135–136, and footnote number 41.

$$\text{Var}(e_j) = E[e_{jt} - E(e_{jt})]^2, \tag{11}$$

The estimate of $\text{Var}(e_j)$ is given by the sample variance:

$$S^2(e_j) = \frac{\sum_{t=1}^{T} [e_{jt} - E(e_{jt})]^2}{T}, \tag{12}$$

where T is the number of observations used to estimate α_j and β_j in equation (2a).

If it is appropriate to assume that the market is in equilibrium during the non-report period, then $E(\tilde{e}_{jt}) = 0$ for all t. This assumption implies that:

$$S^2(e_j) = \frac{\sum_{t=1}^{T} (e_{jt})^2}{T}, \tag{13}$$

that is, the mean of $(e_{jt})^2$ during the non-report period is simply the sample variance of that variable, $S^2(e_j)$.

The information content hypothesis states that $(\hat{e}_{jnk})^2$ for n=0 [equation (10)] should be greater than $S^2(e_{jk})$. Specifically, if the annual earnings announcement of firm j possesses any information content, the following condition should hold for the two-factor and one-factor market models respectively:

$$\frac{(\hat{U}_{jn})^2}{S^2(U_j)} > 1, \qquad \text{for } n=0 \tag{14}$$

and

$$\frac{(\hat{e}_{jn})^2}{S^2(e_j)} > 1, \qquad \text{for } n=0 \tag{15}$$

ratios of the squared residual in the month of the earnings announcement and the average of the squared residuals during the non-report period.

Define these ratios as U_{jk} and E_{jk}, information content of firm j's kth annual earnings announcement respectively.

Summary and Testable Hypotheses

The basic research question is whether the information content of a firm's annual earnings announcement is related to the quantity of interim information that is publicly available about the firm. The literature reviewed in this chapter has given empirical content to the major concepts in the research question, namely, information content and quantity of interim information.

Five characteristics of a firm, namely, its size, number of stockholders, frequency it engages in external financing, degree of seller concentration in its industry, and the type of industry to which it belongs, have been asserted (based on theoretical arguments), with exception of the type of industry characteristic, to be positively related to the quantity of interim information that is publicly available about the firm. The statistical hypotheses are therefore based on these five surrogate measures for the quantity of interim information and the measure of information content developed in this chapter.

It has also been asserted in this chapter that the information content of a firm's annual earnings announcement is a monotone decreasing function of the quantity of interim information that is publicly available about the firm. Therefore, with exception of the type of industry variable the relationship between the information content of a firm's annual earnings announcement and each of the other four

surrogate measures for quantity of interim information is also asserted to be monotone decreasing. The information content of a firm's annual earnings announcement is simply asserted to be related to the type of industry to which the firm belongs.

The statistical hypotheses stated in their alternative forms are as follows:

There is a significant statistical relationship between the information content of a firm's annual earnings announcement and each of, or a combination of, the following five surrogate measures for the quantity of interim information:

(1) size of a firm,
(2) number of stockholders of a firm,
(3) frequency a firm engages in external financing,
(4) degree of seller concentration in a firm's industry, and
(5) type of industry to which a firm belongs.

III. RESEARCH DESIGN AND METHODOLOGY

Selection of Sample

The study covers the years 1965 through 1969. The following four criteria are used in the selection of the sample firms:

(1) the firm must be a member of the New York Stock Exchange (NYSE),

(2) the firm's fiscal year must end on December 31,

(3) the firm announced no dividends in the same calendar month as the annual earnings announcements, and

(4) the firm announced no stock splits during the two months before the announcement of earnings, one month after the announcement of earnings, and the month of the announcement (these four-month period is the report period).

Criterion (1) is used since: (a) monthly rates of return data for NYSE firms are relatively easy to obtain, (b) the two market-wide estimates of $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ are available for only NYSE firms, and (c) the NYSE has been found to be efficient in the semi-strong form - this ensures that publicly available new (interim) information will be fully reflected in stock prices.

Criterion (2) is employed since: (a) a greater proportion of the fiscal years of NYSE firms end on December 31; this ensures that a large sub-population is available for selecting a large sample of

firms, and (b) it ensures that some of the firms in the oligopolistic industries (for example, most firms in the steel and automotive industries fiscal years end on December 31) are included in the sample. At the same time criterion (2) may lead to a large clustering of announcements in the months of February, March, and April. This large clustering may potentially constitute market-wide events so that attempts to remove the effect of market-wide events would eliminate the effects of the annual earnings announcements as well.

One way to assess the impact of the announcement clustering is to compute and examine the price residuals in the report period on both weekly and monthly basis so that if the clustering effects exist they will be more pronounced in the behavior of the monthly residuals than in the weekly residuals. However, for the following reasons only monthly residuals will be examined. First, only monthly estimates of the second market-wide factor, $\tilde{\gamma}_{0t}$, are available. Second, the task of collecting weekly prices and constructing weekly market index will be overwhelming. Third, the capital asset pricing models employed in this study to isolate price residuals appear to be better specified with monthly prices than weekly prices. Hopefully, the trade-off between the possibility of eliminating the effects of the annual earnings announcements and well-specified asset pricing models will be in favor of the latter.

Criteria (3) and (4) are specified because prior studies have found that stock splits and dividend announcements have information

content.[1] If stock splits and dividend announcements are not excluded during the annual earnings report period it will be difficult to associate observed price reactions in the month of the earnings announcements with only the earnings announcements.

Meeting all the four criteria for at least one year is a necessary condition for a firm's inclusion in the sample. It is also necessary that at least 88 monthly rates of return data be available for the firm. Eighty-four of these (covering the non-report period) are used to estimate the relative market risk of the firm's security, β_j, while the remaining four (covering the report period) are used in computing the unexpected price changes, that is, the residuals.

Data Collection

Announcement Dates

The date of the annual earnings announcement is taken as the date that the preliminary annual earnings report is published in The Wall Street Journal. The preliminary date is taken because of the observation that the preliminary report usually contains the same numbers for net income and earnings per share as are given later with the final report.[2] The dates of the earnings announcement are obtained

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[1] Beaver [9], footnote number 11, Fama et al. [19], and Pettit [37].

[2] Ball and Brown [7], p. 166.

from The Wall Street Journal Index.[3]

Independent Variables

The independent variables are the five surrogate measures for the quantity of non-annual report information, namely, size of the firm, type of industry, degree of concentration in the firm's industry, number of stockholders of the firm, and frequency of external financing. The size of a firm is measured by its total assets. The total asset figures are taken from the Moody's Manuals (Industrials, Public Utility, and Transportation) and the COMPUSTAT tape if the firm is listed on the tape.

A firm's type of industry is defined as its Industry Group, that is, 3-digit level as defined by the Securities and Exchange Commission (SEC). SEC codes are derived from U. S. Government Standard Industrial Classification (SIC) codes. SEC codes apply to the entire firm while SIC codes apply to "establishments", for example, a single plant of a firm. Admittedly, given the diversified nature of the operations of most of the sample firms the SIC codes are more meaningful than the SEC codes since they recognize that a firm can belong to more than one Industry Group. However, classifying the sample firms into multiple Industry Groups is a major research project which is beyond the scope

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[3] The dates of the stock split and dividend announcements are also taken from the same source. The dates are not confirmed by tracing them to the appropriate Wall Street Journal issues because of the expected low error rate. Of the 1,319 quarterly earnings announcement dates traced to the appropriate Wall Street Journal issues May [30] found that only two were in error.

of this study. Therefore, the SEC 3-digit codes are used to classify firms into Industry Groups. All the sample firms file annual reports with the SEC which then classifies them into one of the many Industry Groups.[4]

The degree of seller concentration in an industry is approximated by Concentration Ratios (CRs) compiled by the Bureau of the Census of the U. S. Department of Commerce for the Manufacturing Industry. The CRs are available for the largest 4, 8, 20, and 50 firms in each SIC 4-digit industry for the years 1947, 1954, 1958, 1963, 1966, and 1967.[5] The 4-digit SIC code numbers have their corresponding SEC code numbers at the 3-digit level.[6] An effort is made to derive the CRs for the 3-digit level from their 4-digit CRs. This is done by employing four different weighting schemes to the 4-digit SIC CRs within 3-digit SEC code. The weights are (a) number of 4-digit SIC codes within the 3-digit SEC code, (b) 4-digit SIC CRs, (c) value of shipments, and (d) number of companies in the 4-digit SIC Code.[7]

It cannot be established conclusively that any of the four

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[4] U. S. Securities and Exchange Commission [50].

[5] U. S. Department of Commerce [49], Chapter 9.

[6] U. S. Security and Exchange Commission [50], pp. LV-X.

[7] The four weighting schemes can be illustrated with the ff. data:

weighting schemes used to derive the 3-digit SEC Crs gives a better approximation of the actual 3-digit SEC CRs that would have been obtained through original research efforts. Therefore, in the statistical analysis all of the four different 3-digit SEC CRs are employed, one at a time.

SIC 4-digit Code	Number of Companies (NC_j)	Value of Shipments (VS_j)	1967 CRs 4 Largest (CR_j)
3541	865	$2,127.2 m.	0.21
3542	344	714.0	0.23
3544	6,532	2,202.3	0.04
3545	1,073	1,309.9	0.20
3548	409	1,158.1	0.26
	9,223	$7,511.5 m.	0.94

The four weighting schemes give CRs for 3-digit (354) of:

(a) $$\frac{\sum_{j=1}^{5} CR_j}{5} = \frac{(.21 + .23 + \ldots + .26)}{5} = 0.19$$

(b) $$\frac{\Sigma (CR_j)^2}{\Sigma (CR_j)} = \frac{[(.21)^2 + (.23)^2 + \ldots + (.26)^2]}{0.94} = 0.22$$

(c) $$\frac{\Sigma CR_j \cdot VS_j}{\Sigma VS_j} = \frac{[(.21)(\$2,127.2) + (.23)(\$714) + \ldots + (.26)(\$1,1581.1]}{\$7,511.5}$$

$$= 0.17$$

(d) $$\frac{\Sigma CR_j \cdot NC_j}{\Sigma NC_j} = \frac{[(.21)(865) + (.23)(344) + \ldots + (.26)(409)]}{9,223} = 0.09$$

The most recent 4-digit SIC CRs which are consistent with the basis of the SEC industry classification scheme are available for only 1967 and also only for the Manufacturing Industry. Therefore, in this study the derived 1967 3-digit SEC CRs are used based on the assumption that they are representative for the five-year study period. Also, since the CRs are available for only the Manufacturing Industry when the analysis is extended to the degree of industry concentration as an independent variable, nonmanufacturing firms in the sample are excluded.

The frequency of external financing surrogate variable is obtained from 1960-1969: A Decade of Corporate and International Finance.[8] The following information is noted for each firm in each of the five-year study period: (a) the number of times the firm engaged in external financing, (b) the kind of issue, and (c) the amount or size of the issue.

The number of stockholders of the firms is taken from the Moody's Manual. This number, as at the end of a firm's fiscal year is found usually under the Management Section of the financial review of the firm in the Moody's Manual.

Dependent Variable

The data required to compute E_{jk} and U_{jk}, measure of the information content of firm j's kth annual earnings announcement derived from the one-factor and two-factor market models respectively, consist

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[8] Hillstrom and King, eds. [25], pp. 63-202.

of 88 monthly rates of return for each firm and the market portfolio for the kth annual earnings announcement. They are obtained from the new version (January 1975) of the Center for Research in Security Prices (CRSP) tape of the University of Chicago. Depending on its availability the proxy chosen for the market portfolio will be either the Fisher's Arithmetic Investment Performance Index or the Fisher's Arithmetic Index.[9] How eighty-four of the 88 monthly rates of return data are used to obtain estimates of γ_{0t}, γ_{1t}, α_j, and β_j, parameters of the two return-generating models described in Chapter II, is described next.

Estimating Parameters of Return-Generating Models

The two models assumed to be generating period-by-period returns on securities were given as:

$$\tilde{R}_{jt} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_j + \tilde{u}_{jt} \qquad (1a)$$

and

$$\tilde{R}_{jt} = \alpha_j + \beta_j\tilde{R}_{mt} + \tilde{e}_{jt} \qquad (2a)$$

$\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ in (1a) are estimated for each time period by pooling different firms' data. In other words, the two-factor market model is a cross-sectional model. The monthly estimates of $\tilde{\gamma}_{0t}$ and $\tilde{\gamma}_{1t}$ derived in the Fama MacBeth study are used.[10]

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[9] For a detailed discussion on the construction of the two indexes and how they compare with each other and other market indexes, see Fisher [20], and Lorie and Hamilton [29].

[10] Fama and MacBeth [18]. These two estimates are available for CRSP months 97 to 552.

α_j and β_j are estimated for each security by pooling that security's data from different time periods. Fama et al. found that the usual linear regression assumptions are well-satisfied if continuously compounded rates of return on security j and the market portfolio are used to estimate α_j and β_j in equation (2a).[11] Since the natural logarithm of security j's price relative, $\ln \cdot PR_{jt}$, and the market portfolio's price relatives, $\ln \cdot PR_{mt}$, gives the continuously compounded rates of return on security j and the market portfolio in period t these are accordingly used to estimate α_j and β_j, that is:

$$\ln \cdot PR_{jt} = \alpha_j + \beta_j \ln \cdot R_{mt} + \tilde{e}_{jt} \qquad (2b)$$

where $\ln \cdot$ denotes the natural logarithmic function, PR_{jt} and PR_{mt} are the ex post price relatives of security j and the market portfolio for period t respectively, and $\tilde{e}_{jt}$ is the disturbance of security j in period t.[12]

α_j and β_j are estimated in equation (2a) for the kth annual earnings announcement of firm j by the method of Ordinary Least Squares (OLS) regression. They are parameters that can vary from security to security. They are also allowed to vary for each security from one annual earnings announcement to another announcement. Hence,

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[11] Fama et al. [19], pp. 189-190, including footnote number 9.

[12] The price relative of a security is defined as dividends plus closing price, divided by opening price. It is equal to the discrete rate of return in period t (R_{jt} and R_{mt} as defined earlier) plus unity.

they should be subscripted with a k, that is, α_{jk} and β_{jk}. Thus, in a limited sense this study takes account of relative market risk changes between announcements (Gonedes [22]).

Eighty-four monthly price relatives are used in the regression; seventy-four of them are consecutive monthly price relatives immediately preceding the first month of the report period and the remaining ten are consecutive monthly price relatives immediately following the last month of the report period. That is, price relatives in the four month reporting period (starting two months before the announcement month and ending a month after the announcement month) surrounding the preliminary announcement date are excluded. This exclusion procedure is adopted so that if annual earnings announcement has any information content the assumption that the expectation of $\tilde{e}_{jt} = 0$ will not be violated.[13]

An output in addition to $\hat{\alpha}_{jk}$ and $\hat{\beta}_{jk}$, estimates of α_{jk} and β_{jk}, of the regression is an estimate of the sample variance of the residual, $S^2(e_{jk})$, for the non-report period required to infer the information content of firm j's kth annual earnings announcement. The $\hat{\beta}_{jk}$ obtained from the regression together with the estimates of γ_{0t} and γ_{1t} are used to compute the expected rate of return on a security as predicted by the two-factor market model. The sample variance of the residuals for the non-report period derived from the two-factor market model is obtained by summing the square of the

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[13] Fama et al. [19], pp. 189-190, including footnote number 9, p. 190.

residual for each non-report month and averaging over the number of months in the non-report period.

Given estimates of α_{jk}, β_{jk}, γ_{0t}, γ_{1t}, $\text{Var}(U_j)$, and $\text{Var}(e_j)$ the two measures of information content are:

$$\frac{(\hat{U}_{jn})^2}{S^2(U_j)} = U_{jk} , \tag{14a}$$

and

$$\frac{(\hat{e}_{jn})^2}{S^2(e_j)} = E_{jk} , \tag{15a}$$

which are evaluated at n=0 (announcement month) to infer information content. The statistical model which is used to relate the five surrogate measures for quantity of interim information to these two measures for the information content of a firm's annual earnings announcement is described next.

Statistical Model

The research hypotheses have been formulated as follows:

> There is a relationship between the information content of a firm's annual earnings announcement and each of, or a combination of, the following five surrogate measures for the quantity of interim information: size of a firm, number of stockholders of a firm, frequency a firm engages in external financing, degree of concentration in a firm's Industry Group, and Industry Group of a firm.

Beside the Industry Group variable the relationship between the information content of a firm's annual earnings announcement and each of the other four variables has been asserted to be monotone decreasing.

The research hypotheses can be expressed by the following mathematical formula:[14]

$$E_{ijk}(U_{ijk}) = f_1(S_{jk}, NS_{jk}, FEF_{jk}, CR_j, IG_i), \quad (16)$$

where:

$E_{ijk}(U_{ijk})$ = dependent variable, information content of the kth annual earnings announcement of firm j in the ith. Industry Group, k=1,2,...,K (K is the annual earnings number, maximum k is 5), j=1,2,...J (J is the number of firms), and i=1,2,...,I (I is the Industry Group number);

f_1 = functional relation between the dependent variable and the set of independent variables described below;

S_{jk} = size of firm j corresponding to the kth annual earnings announcement;

NS_{jk} = number of stockholders of firm j corresponding to the kth annual earnings announcement;

FEF_{jk} = number of times firm j engages in external financing that corresponds to the kth annual earnings announcement;

CR_j = concentration ratio for the Industry Group of firm j, assumed to be the same for all values of k;

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[14] The interaction or cross-product terms are not considered in the mathematical formulation since no specific hypotheses have been developed concerning them and also there will be many of such terms to make the formulation more cumbersome. The interaction terms are however considered explicitly in the statistical analyses.

IG_i = Industry Group i of firm j, assumed to be the same for all values of k,

= 1 if firm j is in the ith Industry Group,

= 0 otherwise.

A single statistical relation between the dependent variable and the set of independent variables can be developed by "pooling" the observations across the number of annual earnings announcements as well as firms. This can potentially be accomplished by introducing three more independent variables to account for "firm effects," "year effects," and random disturbance effects.[15] Since there is a maximum of five sets of observations on both the dependent and independent variables for each firm the firm effects cannot be handled meaningfully by the statistical technique, cross-section multiple regression, that is employed to test the research hypotheses.[16] Therefore, firm effects are not considered in formulating the following statistical relation:

$$E_{ijk}(U_{ijk}) = f_2(S_{jk}, NS_{jk}, FEF_{jk}, CR_j, IG_i, T_k, V_{jk}), \qquad (16)$$

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[15] An alternative to the "pooling" method is to conduct two separate analyses: "year-by-year" and "average." A year-by-year analysis will relate $E_{ijk}(U_{ijk})$ to the value of the interim information variables corresponding to the kth announcement. An average analysis will also relate $E_{ij}(U_{ij})$ averaged over k to the value of the interim information variables also averaged over k. The pooling method is selected because it leads to more precise statistical inferences pertaining to parameters of equation (16). See Neter and Wasserman [33], Chapter 9, p. 304.

[16] Five data points cannot be used for separate regressions for each firm and the pooling method does not overcome this deficiency in the number of observations.

where $E_{ijk}(U_{ijk})$, S_{jk}, NS_{jk}, FEF_{jk}, CR_j, and IG_i are the estimates of the true values of the same set of variables identified and defined earlier, f_2 is a statistical relation between the dependent variable and the set of independent variable, T_k is the year effects which assumes two values - unity if $E_{ij}(U_{ij})$ relates to the kth annual earnings announcement, and zero otherwise, and V_{jk} is a random disturbance term assumed to be independent and normally distributed with mean zero and constant variance.[17]

If it is assumed that f_2 is linear (in the parameters) and additive, then equation (16) can be rewritten explicitly as follows:

$$E_{ijk}(U_{ijk}) = \beta_0 + \beta_1 S_{jk} + \beta_2 NS_{jk} + \beta_3 FEF_{jk} + \beta_4 CR_j + \beta_5 IG_1 + \beta_6 IG_2 + \ldots + \beta_{(I+3)} IG_{(I-1)} + \beta_{(I+4)} T_1 + \beta_{(I+5)} T_2 + \ldots + \beta_{(I+K+2)} T_{(K-1)} + V_{jk} \qquad (17)$$

where $\beta_0, \beta_1, \ldots, \beta_{(I+K+2)}$ are parameters to be estimated. The statistical technique, mentioned earlier, that is used to obtain estimates of these parameters is Cross Section Multiple Regression.

The functional relation between $E_{ijk}(U_{ijk})$ and S_{jk}, NS_{jk}, FEF_{jk}, and CR_j has been asserted to be monotone decreasing. That is, $E_{ijk}(U_{ijk})$ decreases (algebraically) as S_{jk}, NS_{jk}, FEF_{jk}, and CR_j individually increases. This asserted relation implies the following statistical hypotheses concerning the parameters β_1, β_2, β_3, and β_4:

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[17] Appropriateness of the assumptions concerning the distribution of the random disturbance term is checked through residual analyses.

H1. $C_1: \beta_p \geq 0$

$C_2: \beta_p < 0$

for $p = 1,2,3,4$.[18]

A second hypothesis that is tested is whether there is a significant statistical relation between the dependent variable, $E_{ijk}(U_{ijk})$, and the <u>set</u> of independent variables. Notationally, this hypothesis can be written as follows:

H2. $C_1: \beta_p = 0$, for all $p = 1,2,\ldots,(I+K+2)$

$C_2:$ not all β_p equal zero

A third set of hypotheses that is tested is whether there is a significant statistical relation between the dependent variable and <u>each</u> of the independent variables. In other words, the following statistical hypotheses are tested:

H3. $C_1: \beta_p = 0$, for $p = 1,2,\ldots,(I+K+2)$

$C_2: \beta_p \neq 0$

H1, H2, and H3 are tested by conducting one-tail t-tests, F-test, and t-tests respectively.

When interaction terms are explicitly introduced in the model to account for the possibility that the relation between an independent variable and the dependent variable is affected by the level of another independent variable, the parameters of such terms are included in the set of parameters specified in H2 and H3.

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[18] C_1 is the null hypothesis and C_2 is the alternative hypothesis. If instead the reciprocals of S_{jk}, NS_{jk}, FEF_{jk}, and CR_j are used in equation (17) because their use gives a "better" fit C_1 and C_2 in H1

The proportionate reduction of total variation in the dependent variable associated with the use of the set of independent variables and each of the independent variables are measured by the Coefficient of Multiple Determination, R^2, and Coefficient of Partial Determination respectively. The latter is obtained by running reduced models.[19]

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are interchanged, that is: $C_1:\beta_p \leq 0$, $C_2:\beta_p > 0$ for p=1,2,3,4. Such a possibility is explored.

[19] Neter and Wasserman [33], Chapter 7.

IV. RESULTS OF ANALYSES

In this chapter results of the sample selection criteria, the regression analysis conducted to estimate the parameters of the two market models assumed to be generating period-by-period rates of return, the information content analysis, and the analysis of the differences in the information content of the sample firms' annual earnings announcements are reported and discussed. The analyses suggest two tentative conclusions. First, although the annual earnings announcements of the sample firms possessed, on the average, information content, most of the sample firms' annual earnings announcements did not have information content. Second, a significant but only a weak relationship was found to exist between the information content of a firm's annual earnings announcement and the surrogate variables for non-annual report sources of information.

Sample Selection

During the study period, that is, years 1965 through 1969, 679 annual earnings announcements of 236 firms met the four sample selection criteria. The effect of the selection criteria on the sample size is given in Table 1.

Distribution of announcement dates together with number of announcements and firms classified by Major Industry Group (2-digit SEC code) is given in Tables 2 and 3 respectively. Table 2 suggests

a large clustering of announcements in the months of January and February. When earnings announcements cluster they may be interpreted as a form of market-wide price indices. Thus, the effects, if any, of earnings announcements may be eliminated as well when, in a later analysis, the effects of market-wide events are removed from individual securities' rates of return via the one-factor and the two-factor market models.[1]

The sample is dominated by two major industry groups, manufacturing and utilities. The major industry group, manufacturing, consists of eighteen industry groups (3-digit SEC code) while the major industry group, utilities, consists of three industry groups (Table 4). Firms in the utility industry are characterized by low relative market risk, beta, and therefore their significant representation in the sample will exert a downward effect on the average relative market risk.

Parameters of One-Factor Market Model

Estimates of α and β for the kth announcement of firm j of the one-factor market model,

$$R_{jt} = \alpha_j + \beta_j R_{mt} + e_{jt},$$

were obtained by means of Ordinary Least Squares (OLS) regression. Firms' monthly rates of return, R_{jt}, were obtained from the June 1975

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[1] Ball [5], pp. 30-31 and Beaver [9], p. 71.

TABLE 1

Effect of Selection Criteria on Sample

CRSP Tape, June 1968 Version*		2,036
Less:	Firms with incomplete monthly returns data	1,256
		780
Less:	Non-December 31 Fiscal Year Firms	447
		333
Less:	Firms with earnings, dividend, and stock splits announcement in the same month	97
Sample Size (Number of Firms)		236

*The June 1975 version, from which rates of return were obtained for the analysis, was not available when the sample was selected.

TABLE 2

Distribution of Announcement Dates

	Month				
Year	January	February	March	April	Total
1966	48	61	22	2	133
1967	52	59	17	1	129
1968	61	57	14	2	134
1969	64	51	18	2	135
1970	71	58	16	3	148
Total	296	286	87	10	679

TABLE 3

Distribution of Announcements and Firms by Major Industry Group

Major Industry Group	SEC Codes	Number of Announcements	Number of Firms
Mining	100	23	7
Manufacturing	221-372	395	150
Transportation	400-450	60	21
Utilities	491-493	201	58
Total		679	236

TABLE 4

Distribution of Announcements and Firms by Industry Group

Industry Group	Number of Announcements	Number of Firms	Industry Group	Number of Announcements	Number of Firms
100	23	7	349	19	5
221	7	3	352	17	7
231	12	5	354	15	5
264	8	4	366	30	10
281	37	14	369	17	8
283	30	9	371	37	13
291	28	13	372	17	6
321	4	4	400	33	13
324	13	6	450	27	8
327	23	7	491	129	38
331	45	19	492	27	8
335	36	12	493	45	12

version of the CRSP tape. The proxy chosen for the market index, R_{mt}, was the equally weighted NYSE Arithmetic Index (supplied by Robert Hamada of the University of Chicago).

In estimating α and β, 84 natural logarithm of the return relatives (R_{jt} + 1 and R_{mt} + 1) were used in the regression. Return relatives for the report period, defined as two months before and one month after the month of the earnings announcement, were excluded. The 84 return relatives used for the regression consisted of 74 consecutive monthly returns preceding the first month of the report period and 10 consecutive monthly returns following the last month of the report period.

Although the study covers 236 firms a total of 679 regressions were run since α and β were allowed to vary for each firm from one earnings announcement to another announcement. Table 5 contains a summary (across 679 regressions) of the relevant regression statistics.

The distribution of β (beta), an operational measure of a security's (or a firm's) riskiness relative to the market, suggests the sample firms are less risky (that is, mean beta of .909 which is less than unity, the risk of the market portfolio). An inspection of the distribution of R^2, the coefficient of determination, lends support to the contention that the one-factor market model is better specified for monthly rates of return that it is for weekly rates of return. The mean R^2 of .287 compares favorably with that obtained in King's study [27] and is much higher than the 0.06 obtained in Beaver's

study [9] which used weekly data. An examination of the distribution of the Durbin-Watson statistic suggests that the degree of autocorrelation among the error terms in the one-factor model (the parameters of which were estimated from time series data and therefore autocorrelation among the error terms could be a problem) is to a large extent not statistically significant at an α-level of .05.[2]

Summary of regression statistics for each announcement year contained in Table 6 is consistent with that given in Table 5 for all the 679 regressions. That is, the sample firms are less risky; a greater proportion of the variation in their rates of return can be explained by the market index; and autocorrelation among the error terms does not seem to be a major problem.

Information Content Analysis

The parameters of the one-factor market-model, α_{jk} and β_{jk}, were estimated based on data from the non-report period so that variance of the residuals, e_{jk}, during the non-report period could also be estimated. Variance of the residuals, u_{jk}, for the two-factor market model during the non-report period was estimated using the estimates of the two parameters of the model, γ_{0t} and γ_{1t}, derived in the Fama-MacBeth study [18] together with β_{jk} estimated from the one-factor

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[2] Sixty-eight regressions had R^2 less than .138, the point at which the level of statistical significance of the F statistic is greater than zero. The degree of autocorrelation among the error terms of regressions relating to 18 announcements was either statistically significant at an α-level of .05 or inconclusive, that is, the Durbin-Watson statistic lies between the lower and upper bounds given by Durbin and Watson (see Neter and Wasserman [34], p. 358). Later analysis is conducted with and without the two set of observations.

TABLE 5

Summary of Regression Statistics
(Over 679 Regressions)

Statistics	Beta	R^2	Durbin-Watson
Mean	.909	.287	2.159
Mode	.443	.257	2.026
Median	.857	.287	2.162
Std. Error	.017	.004	.009
Fractile:			
.10	.41	.14	1.854
.25	.56	.20	2.010
.50	.86	.29	2.162
.75	1.18	.37	2.312
.90	1.57	.43	2.451

market model. It is through the comparison of the behavior of these two variances during the non-report period with their behavior during the report period that we are able to attribute information content to the earnings announcement. The magnitude of these variances is reported and described below.

Reaction During Non-Report Period

Individual α_{jk} and β_{jk} were used to compute expected returns predicted by the one-factor market model for each of the 84 non-report period months. The expected returns were subtracted from the ex post returns to obtain the unexpected return, estimated residual, $\hat{e}_{jt}$. That is,

$$\hat{e}_{jt} = R_{jt} - (\hat{\alpha}_{jk} + \hat{\beta}_{jk}R_{mt}).$$

TABLE 6

Summary of Regression Statistics
for Each Announcement Year

Summary	Beta					R^2					Durbin-Watson				
Statistics	1966	1967	1968	1969	1970	1966	1967	1968	1969	1970	1966	1967	1968	1969	1970
Mean	.947	.930	.903	.899	.874	.308	.289	.288	.266	.286	2.193	2.126	2.140	2.147	2.187
Mode	.395	.426	.409	.325	1.076	.268	.097	.193	.275	.276	2.276	2.079	1.950	1.911	2.139
Median	.815	.867	.860	.888	.796	.301	.291	.299	.268	.277	2.215	2.101	2.139	2.166	2.213
Std. Error	.040	.039	.038	.040	.034	.010	.009	.010	.010	.009	.020	.020	.020	.020	.020
No. of Regressions	133	129	134	135	148	133	129	134	135	148	133	129	134	135	148

The sample variance of the residuals, $s^2(\hat{e}_{jk})$, obtained from the regression is given by:

$$s^2(\hat{e}_{jk}) = \frac{\sum_{t=1}^{84} (\hat{e}_{jt})^2}{82} .$$

The expected returns predicted by the two-factor market model for each of the 84 non-report period months were computed as follows:

$$E(R_{jt}) = \hat{\gamma}_{0t} + \beta_{jk} \hat{\gamma}_{1t} .$$

Subtracting the expected returns from the ex post returns gives the unexpected returns, estimated residual, $\hat{u}_{jt}$, for the two-factor market model. That is,

$$\hat{u}_{jt} = R_{jt} - (\hat{\gamma}_{0t} + \beta_{jk}\hat{\gamma}_{1t}).$$

The sample variance of the residuals of the two-factor market model is given by

$$s^2(\hat{u}_{jk}) = \frac{\sum_{t=1}^{T} (\hat{u}_{jt} - E(u_{jt}))^2}{T-2} .$$

Computationally,

$$s^2(\hat{u}_{jk}) = \frac{\sum_{t=1}^{84} (\hat{u}_{jt} - \bar{u}_j)^2}{81} .$$

Unlike the computation of $s^2(\hat{e}_{jk})$, three degrees of freedom are lost because two degrees of freedom are lost in estimating α_{jk} and β_{jk}, and an additional degree of freedom is lost in using the sample mean of $\hat{u}_{jt}$, $\bar{u}_j$, instead of $E(u_{jt})$. Individual $\hat{u}_{jt}$s are adjusted by the sample mean, $\bar{u}_j$, since there is no statistical constraint (such as, $\Sigma u_{jt} = 0$) on the error term.

Some distributional properties of $s^2(\hat{e}_{jk})$ and $s^2(\hat{u}_{jk})$ are reported in Tables 7 and 8. Table 7 contains summary statistics across firms and announcement years while Table 8 contains summary statistics across only j for the kth announcement year.

The distributional properties given in Table 7 are nearly the same for the two models. Since Beaver [9] did not report the distribution of $s^2(\hat{e})$ obtained in his study, no direct comparison can be made. However, given the relatively high R^2 observed in this study, it is likely that the residuals for the non-report period reported here are smaller than those obtained in Beaver's. The exclusion of return relatives for the report period in estimating α_{jk} and β_{jk} and also computing both $s^2(\hat{e})$ and $s^2(\hat{u})$ based on the non-report period return relatives should have a downward effect on the mean $s^2(\hat{e})$ and $s^2(\hat{u})$ if the information content hypothesis holds. In other words, if price variability is higher during the report period (especially in the announcement month), then excluding those observations in computing $s^2(\hat{e})$ and $s^2(\hat{u})$ should result in lower $s^2(\hat{e})$ and $s^2(\hat{u})$. This bias, fortunately, is in favor of finding information content since $s^2(\hat{e}_j)$ and $s^2(\hat{u}_j)$ are divisors in the computation of the information content measure.

The two-factor market model is employed in this study in addition to the one-factor market model because it has been suggested that it leads to a more precise study of the effects of significant events (for example, annual earnings announcements) compared to the one-factor market model (Fama and MacBeth [18]). Specifically,

TABLE 7

Summary Statistics of Reactions During Non-Report Period

Summary Statistics	One-Factor Model $s^2(\hat{e})$	Two-Factor Model $s^2(\hat{u})$
Mean	.00441	.00475
Mode	.00324	.00265
Median	.00321	.00325
Std. Error	.00001	.00001
Fractile:		
.10	.00155	.00133
.25	.00207	.00192
.50	.00321	.00325
.75	.00549	.00606
.90	.00949	.01043

because the two-factor market model removes another variation (γ_{0t}, period-to-period variation in the risk-free rate) in individual securities' rates of return, the variance of the residuals derived from the model is supposed to be generally smaller than that derived from the one-factor market model. However, as observed earlier, an inspection of Tables 7 and 9 indicates that the distributional properties of the sample variance of the residuals during the non-report period derived from the two market models are nearly the same.

Table 8 indicates no major shifts in the statistics through announcement years. In most cases the magnitude of the statistics is the same for the two market models as well as each announcement

TABLE 8

Summary Statistics of Reactions During Non-Report Period
(By Announcement Year)

Summary Statistics	One-Factor Model $s^2(\hat{e}_k)$					Two-Factor Model $s^2(\hat{u}_k)$				
	1966	1967	1968	1969	1970	1966	1967	1968	1969	1970
Mean	.0040	.0041	.0042	.0047	.0047	.0044	.0045	.0045	.0051	.0052
Mode	.0020	.0016	.0020	.0025	.0023	.0037	.0021	.0043	.0035	.0017
Median	.0027	.0030	.0030	.0033	.0035	.0027	.0029	.0031	.0035	.0038
Std. Error	.0003	.0003	.0003	.0003	.0003	.0004	.0004	.0003	.0004	.0004
Total	133	129	134	135	148	133	129	134	135	148

year. This is, however, logical since most of the observations are the same for the firms appearing more than once in the sample.

Reaction During Report Period

The report period has been defined as two months before and one month after the announcement month. If the announcement month is defined as n=0, then the report period is n=-2,-1,0,1. The following two predictive equations (equations 9 and 10, Chapter II) for the one-factor and the two-factor market models respectively were evaluated to obtain the estimated residuals:

$$\hat{e}_{jnk} = R_{jnk} - (\hat{\alpha}_{jk} + \hat{\beta}_{jk} R_{mnk}),$$

and

$$\hat{u}_{jnk} = R_{jnk} - (\hat{\gamma}_{0nk} + \hat{\beta}_{jk} \gamma_{1nk}),$$

where n=-2,-1,1,0 and k=1,2,...,5 (maximum).

$\hat{e}_{jnk}$ and $\hat{u}_{jnk}$ were both squared to remove sign effects and make their scale consistent with the sample variance of the residuals, $s^2(\hat{e}_{jk})$ and $s^2(\hat{u}_{jk})$ respectively, estimated over the non-report period and the following two squared ratios computed:[3]

$$E_{jnk} = \frac{(\hat{e}_{jnk})^2}{s^2(\hat{e}_{jk})}, \quad n=-2,...,1 \text{ and } k=1,2,...,5 \text{ (maximum)}$$

and

$$U_{jnk} = \frac{(\hat{u}_{jnk})^2}{s^2(\hat{u}_{jk})}, \quad n=-2,...,1 \text{ and } k=1,2,...,5 \text{ (maximum)}$$

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[3] These ratios, as measures of information content, were originally suggested by Beaver [9]. May [30] adopted a variant of these ratios in his quarterly earnings' announcement study.

The information content hypothesis, as developed originally by Beaver [9], specifically states that if the kth annual earnings announcement of firm j possesses any information content, the following condition should hold for the one-factor and the two-factor market models respectively:

$$E_{jnk} > 1 \quad \text{for} \quad n=0,$$

and

$$U_{jnk} > 1 \quad \text{for} \quad n=0.$$

$\bar{E}_n$ and $\bar{U}_n$ (averaging across firms and years (that is, j and k)) as well as $\bar{E}_{nk}$ and $\bar{U}_{nk}$ (averaging across only j for the kth announcement) were computed for each of the four months of the report period. The results and the statistical summary of averaging across firms and years appear in Table 9.

An inspection of Table 9 indicates that the mean reaction in the announcement month for both the one-factor and the two-factor market model is greater than unity (that is, above-normal). A strict interpretation of the information content hypothesis would thus imply that on average annual earnings announcements possess information content. However, the cumulative frequency distribution (given in deciles) of the reaction in the announcement month indicates that 65 and 63 percent of the individual reactions are less than unity (that is, below-normal) for the one-factor and the two-factor market models respectively. Specifically, a greater proportion of

TABLE 9

Summary Statistics of Information
Content Measures
(Across j and k)

Summary Statistics	One-Factor Model (E_n) n				Two-Factor Model (U_n) n			
	-2	-1	0	1	-2	-1	0	1
Mean	1.404	1.693	1.643	1.727	1.202	1.431	1.410	1.227
Mode	0*	0	.002	0	0	0	.001	0
Median	.430	.477	.486	.344	.445	.606	.573	.444
Range:								
Min.	0*	0	0	0	0	0	0	0
Max.	46.813	91.254	45.893	240.054	15.840	22.937	21.797	32.185
Variance	11.333	20.917	14.946	96.053	4.400	4.483	4.990	7.450
Std. Error	.129	.176	.148	.376	.081	.084	.086	.105
Deciles:								
.10	.001	.018	.015	.019	.012	.025	.031	.020
.20	.045	.072	.061	.055	.049	.097	.075	.076
.30	.130	.158	.148	.125	.116	.214	.203	.137
.40	.259	.305	.264	.220	.239	.381	.370	.251
.50	.430	.477	.486	.344	.446	.603	.573	.445
.60	.672	.739	.763	.605	.693	.888	.849	.704
.70	1.058	1.356	1.205	1.013	1.065	1.513	1.403	1.086
.80	1.635	2.365	2.014	1.601	1.626	2.371	2.322	1.542
.90	3.227	4.066	3.695	3.177	3.259	3.930	3.662	3.001
Cum. Frequency at Break Point**	.668	.649	.655	.695	.680	.630	.630	.683

* less than .001

** Break Point is defined as the point where $E_n(U_n)$ equals 1.

the earnings announcements of the sample firms does not seem to have information content.[4]

A further inspection of Table 9 also indicates that the mean reaction in each of the two months preceding the announcement month and in the month following the announcement month is above-normal. A graphical representation of the mean reactions during the four-month report period is given in Figure 1. As in the case of the reactions in the announcement month, a greater proportion of the individual reactions in the remaining three months of the report period is less than unity, that is, below normal.[5]

Two plots showing the relative frequency of the computed information content measures in the announcement month (Figures 2 and 3) and a Kolmogorov-Smirnov (K-S) goodness-of-fit test suggest gross departure from normality.[6] Therefore the usual parametric tests,

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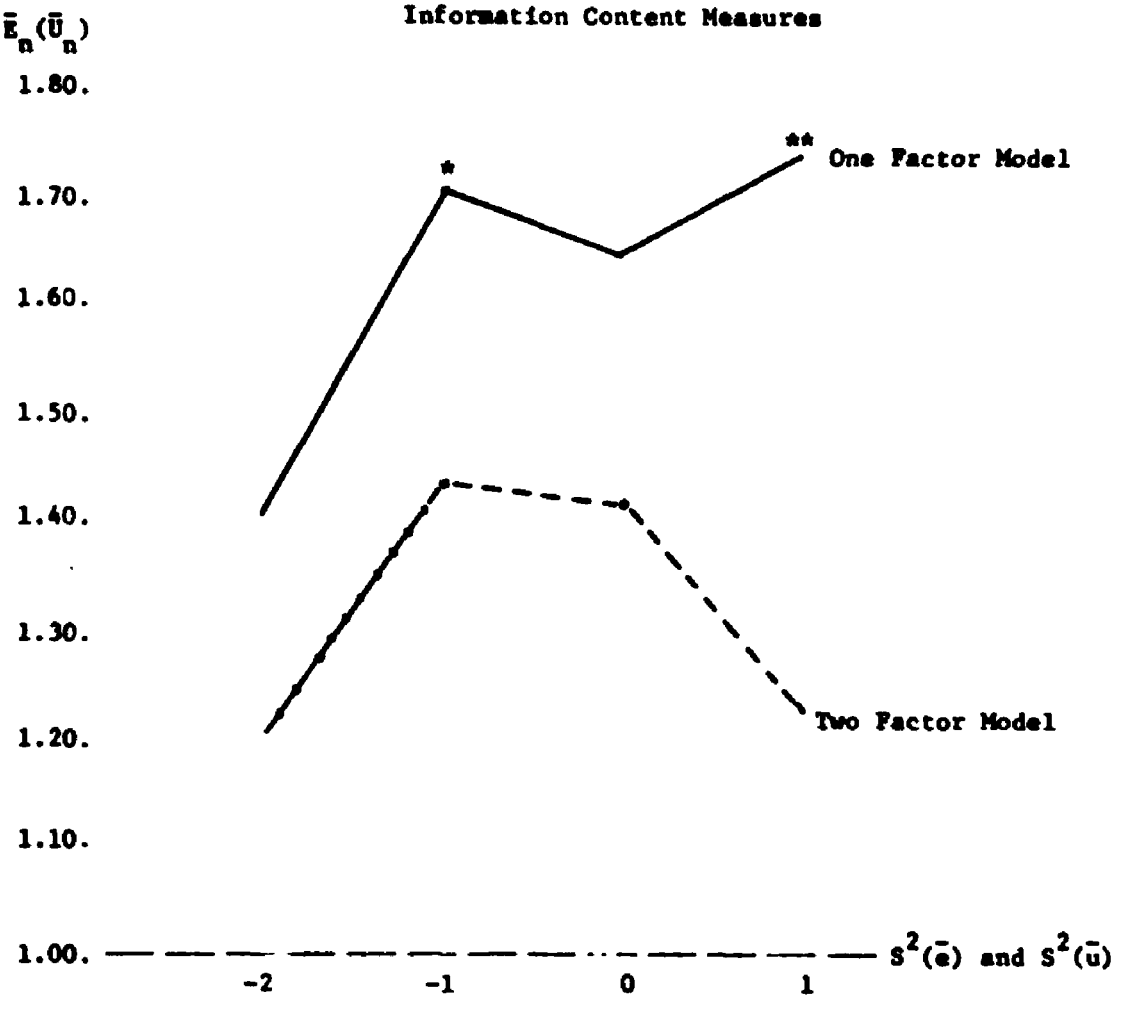
[4] Cross-sectional analyses (results of which are reported later) to explain differences in the information content are conducted for the total sample as well as the two sub-samples, that is, below-normal and above-normal information content measures.

[5] The observations made so far are based on the assumption that the mean is an appropriate description of the central tendency of the distribution of the computed information content measures. Relative to other statistics (for example, the median) for describing the central tendency of a distribution, the mean, in general, tends to be influenced more by the extremes. The computed information content measures have extreme values as indicated by the range. About 70 percent of them are less than the mean. This suggests that the mean may not be an appropriate description of the central tendency of the distribution of the computed information content measures.

[6] The probability that there is no difference between the distribution of the computed information content measures in each report-period month and the normal distribution is essentially zero. The theoretical information content measure, derived as a ratio of

FIGURE 1

Information Content Measures



Key

$S^2(\bar{e})$ = .00441

$S^2(\bar{u})$ = .00475

_ _ _ Mean Reaction During Non-Report Period

* Includes One Reaction = 91.254

** Includes One Reaction = 240.054

FIGURE 2

Relative Frequency of One-Factor Market Model
Information Content Measures
in Announcement Month

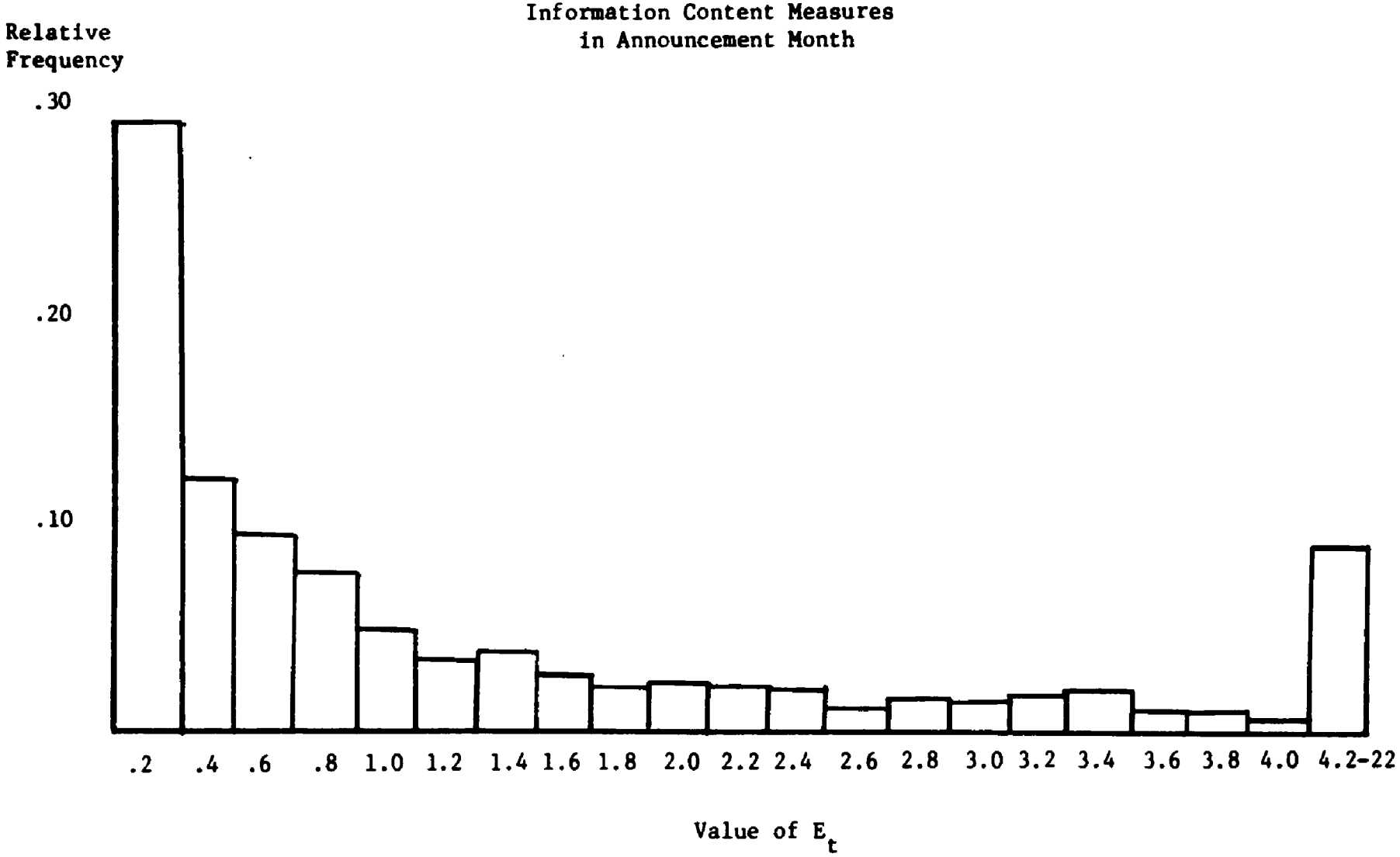
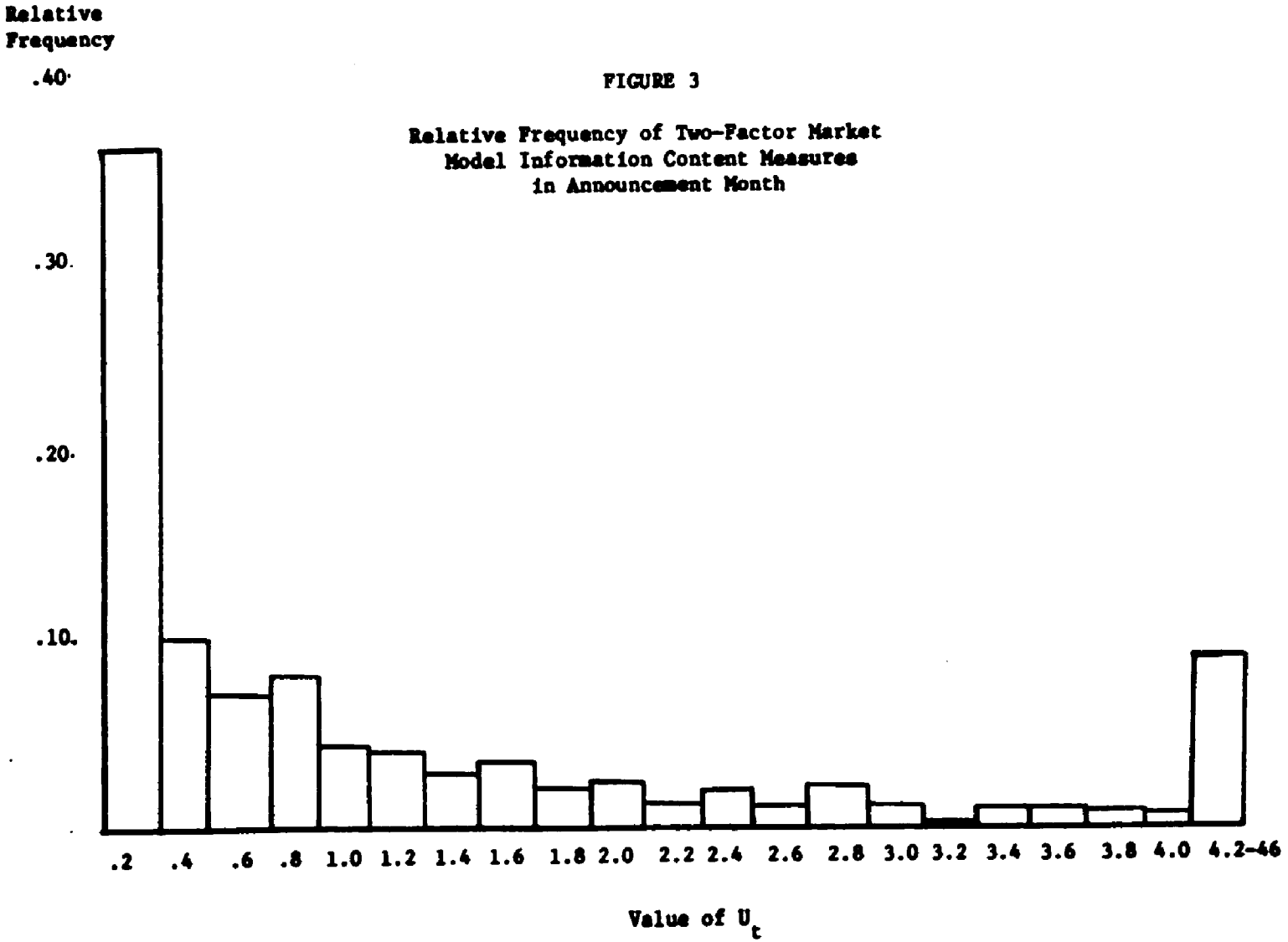


FIGURE 3

Relative Frequency of Two-Factor Market Model Information Content Measures in Announcement Month



t and F, may not be appropriate in the analysis of the computed information content measures. Since nonparametric tests do not require the assumption of normality they are accordingly used in the analysis of the computed information measures - uniqueness of the information content measures in the announcement month relative to the other report-period months and comparison between the information content measures derived from the one-factor and the two-factor market models.[7]

A Wilcoxon matched-pairs ranked-signs test was used in testing the statistical null hypothesis that there is no difference between the information content measures in the announcement month and those observed in the other report-period months against the alternative that the information content measures in the announcement month are generally larger than those observed in the other report period months.[8] This test was conducted because two previous studies, using

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the squared error in the report-period month and the variance of the error over the non-report period months, is probably distributed as an F, a ratio of two chi-square distributions (the error is assumed to be distributed normally). However, an inspection of Figures 2 and 3 suggests that the computed information content measures seem to be exponentially distributed.

[7] Since the information content measure is a ratio and most of the available nonparametric tests relate to differences in the median (suggested earlier to be probably a better descriptive statistic for the distribution of the computed information content measures) it is possible that not all the available information inherent in the information content measure is used.

[8] Siegel [42], pp. 75-83.

essentially the same information content metric employed in this study but using weekly price data, found that not only was the mean reaction in the week of the earnings announcement greater than unity (that is, above-normal) but it was significantly greater than the mean reactions in the weeks surrounding the announcement week and that the mean was an accurate description of the central tendency of the distribution of the observed information content measures.

The results of the Wilcoxon test conducted for the one-factor and the two-factor market model information content measures are reported in (a) and (b) parts of Table 10 respectively. These results suggest that, with exception of the month preceding the announcement month, the information content measures in the announcement month are generally larger than those observed in other non-report period months. The nonuniqueness of the information content measures in the announcement month relative to the month preceding it indicates possible leakage of information and anticipation by the market of the information finally conveyed by the earnings announcement.

Although the general conclusion that a greater proportion of the sample firms' annual earnings announcements does not seem to possess any information content applies to both the one-factor and the two-factor market models, the two-factor market model appears to perform better than the one-factor market model. Specifically, the sample variance of the information content measures derived from

TABLE 10

Wilcoxon Matched-Pairs Ranked-Sign Tests

	Null Hypotheses (H_0)	Alternative Hypotheses (H_A)	Sig. Level (α)
(a) One-Factor Model			
1.	$E_0 \leq E_{-2}$	$E_0 > E_{-2}$	.057
2.	$E_0 \leq E_{-1}$	$E_0 > E_{-1}$	.230
3.	$E_0 \leq E_1$	$E_0 > E_1$	.005
(b) Two-Factor Model			
1.	$U_0 \leq U_{-2}$	$U_0 > U_{-2}$	.008
2.	$U_0 \leq U_{-1}$	$U_0 > U_{-1}$	.262
3.	$U_0 \leq U_1$	$U_0 > U_1$	less than .001
(c) One-Factor and Two-Factor Models			
1.	$U_{-2} \leq E_{-2}$	$U_{-2} > E_{-2}$	.420
2.	$U_{-1} \leq E_{-1}$	$U_{-1} > E_{-1}$	.001
3.	$U_0 \leq E_0$	$U_0 > E_0$	.009
4.	$U_1 \leq E_1$	$U_1 > E_1$	.084

the two-factor market model is numerically much smaller than that of the one-factor market model for each of the four-month report period.[9] In addition, the two-factor market model information content measures in the announcement month are generally larger than those of the one-factor market model as suggested by the results of the Wilcoxon test contained in part (c) of Table 10.[10] In other words, the two-factor market model captures more of the information, if any, conveyed by the annual earnings announcements relative to the one-factor market model. Therefore, in reporting the results obtained in subsequent analyses more emphasis is given to the two-factor market model.

The results and the statistical summary obtained by averaging the information content measures across firms for the kth announcement year appear in Table 11. With the exception of earnings announcement year 1969, the year-by-year information content analysis reported in Table 11 supports the observations made concerning the overall information content analysis (averaging across firms and

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[9] The parametric F-test for equality of variances is not used because, as indicated earlier, the computed information content measures are not normally distributed.

[10] The direction of the alternative hypothesis reflects the suggestion that the two-factor market model is a better description of the process generating securities' period-by-period returns. In other words, if annual earnings announcements have information content the two-factor market model should capture more of it than the one-factor market model. Although the mean one-factor market model information content measure is larger than that of the two-factor market model in each report period month, it has been suggested earlier that the mean does not seem to describe accurately the central tendency of the distribution of the computed information content measure. The Wilcoxon test compares the medians of the two distributions.

TABLE 11

Summary Statistics of Information Content Measures
(Across j for the kth Announcement Year)

kth Announcement Year	Models	Mean n				Mode n			
		-2	-1	0	1	-2	-1	0	1
1966 (133)	One-Factor	1.991	3.002	2.756	3.840	.004	.001	0*	.005
	Two-Factor	1.194	1.529	1.287	1.168	0	.336	.115	.001
1967 (129)	One-Factor	1.990	1.889	1.539	1.516	.002	0	.002	.034
	Two-Factor	1.620	2.086	1.731	1.562	0	.002	.004	.096
1968 (134)	One-Factor	1.200	1.516	1.836	1.334	0	0	.002	.001
	Two-Factor	1.274	1.416	1.758	1.140	0	.061	.042	0
1969 (135)	One-Factor	.961	.776	.673	.551	0	.003	0	0
	Two-Factor	1.117	.932	.999	.651	.004	.001	.001	.001
1970 (148)	One-Factor	.956	1.342	1.442	1.441	0	0	.002	0
	Two-Factor	.858	1.241	1.298	1.595	0	.712	.004	0

* less than .001

TABLE 11 (cont'd.)

Median				Variance				Std. Error			
n				n				n			
-2	-1	0	1	-2	-1	0	1	-2	-1	0	1
.809	.674	.762	.435	12.848	79.206	34.579	449.321	.311	.772	.510	1.838
.479	.658	.733	.444	3.980	3.950	2.300	5.170	.173	.172	.132	.197
.307	.714	.719	.381	30.939	8.184	15.121	18.979	.490	.252	.342	.384
.465	.691	.737	.455	8.440	12.700	6.080	16.700	.256	.314	.217	.359
.435	.477	.337	.446	4.882	7.095	15.747	8.418	.191	.230	.343	.251
.538	.690	.637	.686	4.150	3.190	10.100	2.790	.176	.154	.275	.144
.433	.238	.181	.202	1.619	1.958	1.540	.847	.110	.120	.107	.079
.442	.365	.313	.266	2.680	1.900	3.650	.998	.141	.119	.165	.086
.251	.449	.426	.476	6.869	7.513	6.996	9.059	.215	.225	.217	.247
.268	.611	.545	.481	2.880	2.390	2.800	11.100	.140	.127	.138	.275

announcement years). That is, mean reactions in the announcement months are above-normal but so also are the mean reactions surrounding the announcement month with the exception of the mean reactions occurring two months before the announcement month; a greater proportion of the individual reactions is below-normal; the variance of the one-factor market model information content measures is much larger (numerically) than that of the two-factor market model; and the two-factor market model information content measures are generally larger than those of the one-factor market model in each announcement year (except 1966).

The mean reactions for 1969 are below-normal for each report month, including the announcement month, except the two months preceding the announcement month for the two-factor market model. The results of a Mann-Whitney U test (Siegel [42]) suggest that the median information content for each announcement year is greater than that of 1969 (α-level of .05). In terms of the relationship between the information content measures and the surrogate variables for interim information, a separate analysis conducted for the 1969 information content measures does not suggest anything unique about the 1969 information content measures.

Because there is both theoretical and empirical evidence to support the contention that annual earnings announcements may possess information content, four separate analyses were performed on the reactions. In the first analysis the reactions were analysed on the basis of major industry groups (2-digit SEC code) to assess possible

differential earnings announcement effects among the major industry groups. The second analysis involved exclusion of 68 announcements whose one-factor market model regressions during the non-report period had R^2 of less than .138. The .138 is the level at which the F-statistic for the one-factor model regression with 82 d.f. is significant at an α-level of less than .0001. It is also consistent with one of the main concerns of this study, that is, emphasis on goodness-of-fit. In the third analysis, in addition to excluding 68 announcements because of low R^2, 18 announcements were excluded because the degree of autocorrelation in the error terms of the regressions associated with them was either statistically significant at an α-level of .05 or inconclusive (that is, the Durbin-Watson statistic was between the upper and the lower bounds). Finally, the analysis was conducted excluding 64 announcements whose reactions in any of the four months of the report period was greater than 10. This is the least objective exclusion procedure. However, it was conducted mainly to assess the impact of the unusually large reactions on the results reported earlier. The results of these four separate analyses are reported in Tables 12, 13, 14, and 15 respectively.

First, Table 12, analysis by major industry group. Using the Kruskal-Wallis one-way analysis of variance technique, the null hypothesis that the medians of the two-factor market model information content measures in the announcement month of the five

TABLE 12

Summary of Information Content Measures by
Major Industry Groups

Major Industry Group		Mean n				Mode n			
		-2	-1	0	1	-2	-1	0	1
Mining (23)	One-Factor	2.107	2.793	2.915	2.890	.471	1.156	.303	.406
	Two-Factor	1.228	1.945	1.342	1.215	.086	.240	.133	.128
Manufacturing (395)	One-Factor	1.474	1.898	1.596	1.892	0*	0	0	0
	Two-Factor	1.244	1.456	1.262	1.225	0	0	0	0
Railway (33)	One-Factor	2.270	2.126	2.974	2.737	2.121	.711	.092	.032
	Two-Factor	1.036	.782	.831	.833	1.340	.619	.064	.121
Air Transportation (27)	One-Factor	2.599	3.644	2.779	2.859	1.114	2.149	.032	1.461
	Two-Factor	.996	1.521	1.226	1.333	.265	1.161	.176	.884
Utility (201)	One-Factor	.883	.830	1.217	.953	.002	0	.001	.001
	Two-Factor	1.173	1.419	1.826	1.284	5.723	.023	0	4.089

* less than .001

TABLE 11 (cont'd.)

Median				Variance				Std. Error			
n				n				n			
-2	-1	0	1	-2	-1	0	1	-2	-1	0	1
.816	1.374	.627	.768	11.300	11.500	46.600	43.200	.704	.708	1.425	1.371
.413	.653	.390	.476	2.89	6.93	8.51	5.88	.354	.549	.608	.506
.421	.482	.397	.339	14.0	31.6	16.3	155.0	.188	.283	.203	.628
.449	.545	.555	.412	5.06	5.69	4.41	8.25	.113	.120	.106	.144
.862	.708	.582	.545	19.2	13.3	49.5	32.5	.764	.637	1.226	.994
.642	.496	.262	.298	2.36	.816	1.26	1.5	.268	.157	.196	.213
.895	2.562	1.541	1.743	27.9	16.3	11.9	18.8	1.017	.777	.664	.835
.382	.908	.544	.778	3.72	3.27	2.45	2.96	.371	.348	.302	.331
.362	.369	.673	.279	2.17	1.51	3.05	5.42	.104	.087	.123	.164
.420	.652	.856	.460	3.74	3.75	6.49	7.69	.136	.137	.180	.196

major industry groups are equal against the alternative that at least one of the five major industry groups has a median different from the others was rejected at an α-level of .05.[11] The results of a Mann-Whitney U test suggest that the utility major industry group has a median information content measure different from the others. Specifically, the Mann-Whitney U test indicates that median of the utility major industry group's information content is greater than that of mining, manufacturing, and railway (α-level of .05). This observation is contrary to the assertion made often that the process generating earnings of firms in the utility industry is more stable (and therefore announcement of their earnings may lead to a smaller change in investors' expectations) than that of firms in other industries. Despite the fact that the median of the utility major industry group's information content measures is greater than that of mining, manufacturing, and railway, like the others, its median information content measure is less than unity.

The results of the second analysis, that is, excluding 68 announcements with low R^2 for their one-factor market model regression, reported in Table 13 show no significant departure from the results reported earlier. The mean beta and R^2 for the group excluded are .336 and .089 respectively, implying that

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[11] Siegel [42], pp. 184-193. A similar null hypothesis for the one-factor market model information content measures could not be rejected at .05 α-level. A separate statistical test conducted for only reactions greater than unity for the two market models suggests that the medians of the information content measures for the five major industry groups are not different statistically.

TABLE 13

Summary Statistics of Information Content Measures
(Excluding 68 Announcements with R^2 Less than .138)

Summary Statistics	One-Factor Model n				Two-Factor Model n			
	-2	-1	0	1	-2	-1	0	1
Mean	1.399	1.750	1.654	1.772	1.189	1.444	1.406	1.250
Mode	0*	0	0	.001	.047	0	0	0
Median	.426	.478	.514	.368	.435	.580	.582	.450
Variance	11.9	22.7	14.6	104.0	4.460	5.060	4.740	7.870
Std. Error	.140	.193	.155	.414	.085	.091	.088	.113
Fractile:								
.10	.011	.016	.016	.021	.016	.025	.019	.021
.25	.079	.107	.113	.092	.091	.144	.141	.105
.50	.426	.477	.517	.369	.435	.577	.582	.451
.75	1.259	1.771	1.611	1.317	1.224	1.844	1.930	1.337
.90	3.224	4.106	3.813	3.177	3.178	3.959	3.686	3.288
Cum. Frequency at Break Point	.697	.643	.651	.689	.689	.625	.632	.676

* less than .001

TABLE 14

Summary Statistics of Information Content Measures
(Excluding 68 Announcements with R^2 Less
than .138 and 18 Announcements
with Autocorrelated Error Terms)

Summary Statistics	One-Factor Model n				Two-Factor Model n			
	-2	-1	0	1	-2	-1	0	1
Mean	1.399	1.753	1.675	1.794	1.188	1.452	1.422	1.257
Mode	0*	0	0	.001	.043	0	0	0
Median	.427	.478	.514	.366	.438	.591	.598	.451
Variance	12.2	23.2	15.0	108.0	4.45	5.12	4.84	8.04
Std. Error	.144	.198	.159	.427	.087	.093	.090	.116
Fractile:								
.10	.012	.016	.017	.021	.018	.029	.019	.021
.25	.078	.104	.111	.084	.092	.144	.141	.104
.50	.426	.477	.517	.366	.438	.594	.600	.451
.75	1.250	1.853	1.648	1.287	1.237	1.860	1.957	1.337
.90	3.195	4.106	3.855	3.216	3.129	3.959	3.709	3.293
Cum. Frequency at Break Point	.700	.646	.651	.693	.686	.626	.629	.676

* less than .001

TABLE 15

Summary Statistics of Information Content Measures
(Excluding 64 Announcements with Reaction in any
of the Report Period Months Greater than 1.0)

Summary Statistics	One-Factor Model n				Two-Factor Model n			
	-2	-1	0	1	-2	-1	0	1
Mean	.917	1.056	1.080	.862	.977	1.190	1.198	.959
Mode	0*	0	.002	.001	.043	0	0	0
Median	.387	.427	.428	.325	.407	.527	.558	.407
Variance	2.07	2.13	2.58	1.61	2.34	2.50	2.42	2.05
Std. Error	.058	.059	.065	.051	.062	.064	.063	.058
Fractile:								
.10	.009	.016	.013	.016	.011	.023	.011	.020
.25	.061	.100	.092	.081	.071	.140	.124	.102
.50	.388	.427	.426	.326	.408	.527	.558	.409
.75	1.132	1.405	1.351	1.082	1.176	1.643	1.654	1.235
.90	2.502	3.232	2.965	2.499	2.466	3.321	3.365	2.583
Cum. Frequency at Break Point	.720	.688	.686	.727	.706	.655	.646	.704

* less than .001

the group is not representative of the sample as a whole. About 44 percent of this group are utility firms explaining the low mean beta for the excluded group.

The third analysis (that is, excluding 68 announcements with low R^2 and 18 announcements with autocorrelated error terms in their one-factor market model regression) also reveals no significant departure from the overall results. The mean beta and R^2 for the sub-group of 18 announcements with autocorrelated error terms in their one-factor market model regression are 1.176 and .303 respectively. This sub-group is more risky than the sample as a whole (and the market portfolio) and also a greater proportion of the variation in their rates of return can be explained by the market factor. The sub-group is not dominated by firms in any one major industry group.

The mean reactions observed in the fourth analysis (that is, excluding 64 announcements with reaction in any of the report-period months greater than 10) are in the direction as reported in previous studies (Table 15). That is, mean reactions increasing up to the announcement month and falling afterwards. Most of the individual reactions are still below-normal as indicated by the cumulative frequency at the break point. The mean beta (1.162) and R^2 (.313) for the one-factor market model regression relating to the group excluded from the analysis are greater than those observed for the whole sample. As expected, there is a decrease in the mean and variance of the reactions for the reduced sample.

Discussion of Results of Information Content Analysis

Results of the information content analysis reported and described so far seem to suggest that the information, if any, conveyed by the sample firms' annual earnings announcement is not reflected in the information content metric adopted for this study. However, two previous studies, one examining the information content of annual earnings announcements (Beaver [9]) and the other examining the information content of quarterly earnings announcements (May [30]), employed essentially the same information content metric and found that the announcement of the sample firms' earnings had significant impact on the sample firms' residual stock price changes in the week of the announcement. Not only was the reported mean reaction in the week of the announcement greater than unity (that is, above-normal) but it was significantly greater than the mean reactions in the weeks surrounding the announcement week and also the mean was an appropriate description of the central tendency of the distribution of the computed information content measures.[12]

In terms of design, the first major difference between this study and Beaver's is the time-base of the observations, monthly versus weekly. The second major design difference is the sample selection criterion, specifically December 31 firms versus

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[12] Although the general design employed in this study is somewhat similar to that employed in May's and therefore the results of the two studies may be comparable the rest of the discussion is related mostly to Beaver's study because the design, in terms of detail, employed in the two studies are more similar than that employed in May's.

non-December 31 firms.

The choice of the month instead of the week or the day as the time-base for measuring residual stock price changes attributable to annual earnings announcement was based on (i) the evidence that the assumptions of the OLS regression technique used to estimate the parameters of the one-factor market model are well-satisfied by using monthly rates of return,[13] (ii) the fact that effects of many events besides the announcement of earnings, for example stock splits and dividend changes, have been isolated by examining the behavior of monthly residual price changes, (iii) to a lesser extent, the fact that monthly rates of return were more readily available than weekly rates of return, and (iv) also to a lesser extent, monthly estimates of the γ_{0t} and γ_{1t} parameters of the two-factor market model used in the study were available.

The mean R^2 of .287, interpreted as a measure of the goodness-of-fit of monthly data, obtained in this study is much greater than that reported in Beaver's and May's, .06 and .11 respectively.

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[13] The one-factor market model, suggested by Sharpe [41], leaves undefined the time-base of the observations to be used in estimating its parameters. However, most of the studies employing the model have used monthly rates of return in estimating the model's parameters. The conclusions made in Fama et al. [19] that the model conforms well to the assumptions of the OLS regression were derived using monthly rates of return. As to how the conclusions might have been different if weekly or daily rates of return data had been used, Abdel-khalik [1], in an unpublished study, found that the use of monthly rates of return induced more stability (a required assumption of the OLS regression technique) in the estimated parameters than daily or weekly. Abdel-khalik's finding seems consistent with the low R^2 obtained in studies which estimated the parameters with weekly data.

Despite the relatively high R^2 obtained through the use of monthly data, it is still possible that a report period of one month is too long for the effects, if any, of annual earnings announcements on stock prices to be precisely measured. Effects of annual earnings announcement occurring neither at the beginning nor close to the end of the month must be strong enough to persist else they may not be wholly, if any at all, be reflected in rates of return computed using beginning and end of month prices. In order for this argument to hold it has to be demonstrated at both the theoretical and empirical level that at least the effects of events besides announcement of earnings which have been isolated through examination of monthly residual price changes are different in some underlying manner from those of earnings announcements.[14]

The second major design difference, the fact that the sample for this study consisted of December 31 firms and Beaver's consisted of non-December 31 firms, may also explain why most of the reactions observed in this study are below-normal in the announcement month. In this study, about 85 percent of the 679 annual earnings announcements were made in January or February. If this large clustering of announcements was interpreted as market-wide events, then in

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[14] A study by Benston [10], using monthly stock price data, found only a relatively small relationship between the rates of change of data found in corporate published reports and rates of change of stock prices. However, Benston's unfavorable findings have been attributed to factors other than the use of monthly data (see Beaver [9] and May [30]).

removing the market factor from the sample firms' return the effect of annual earnings announcements, if any, might have been removed as well.[15] Given that the potential effect of the first design difference is in the same direction as the potential effect of this clustering argument there appears to be no way to isolate the effect of either design difference. Also, if it can be demonstrated that the economic behavior of December 31 firms is different from that on non-December 31 firms it is possible that the results obtained in this study could differ from Beaver's.

Concerning the information content measure adopted from Beaver's for this study (it is the ratio of the squared error for the report period month to the sample variance of the error during the non-report period), a strict interpretation should permit a researcher to infer from its magnitude how many times the reaction observed in a report period month is above or below normal. It is suggested that such a strict interpretation of the measure may become less meaningful in many extreme cases observed in this study. For example, if the measure was correctly derived or calculated how

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[15] Ball [5], pp. 30-31, and Beaver [9], p. 71. While Ball [5] argues against the use of the market and cross-sectional models when the events "bunch" in time, he offers no empirical evidence to support his position. It is interesting to note that in Ball and Brown [7] the sample consisted of firms with fiscal years ending December 31 and the annual earnings announcement dates bunched in the months of January and February but the authors were satisfied that they had isolated the effects of annual earnings announcements by using the one-factor market model.

meaningful, in terms of interpretation, is information content ratio of 46 in the announcement month as observed in this study? In other words, it may be the case that demands being placed on the information content measure adopted for this study are not modest. This is one of the main advantages of the "sign-of-the-residuals" studies reported in the accounting and finance literature (for example, the Abnormal Performance Index studies) although the sign studies have the disadvantage of not using all available information and therefore not being able to test more demanding hypotheses.

The results of the information content analysis and observations made in discussing these results have major implications for the next phase of this study, that is, explaining differences in the information content of individual sample firms' annual earnings announcements in terms of their non-annual report sources of information on interim information. First, the multiple linear regression model proposed originally to explain the cross-sectional differences in the information content of individual sample firms' annual earnings announcements may not be appropriate for the following two reasons: first, the raw information content measures are not normally distributed and second, the raw information content measures seem to lack meaningful interpretation as ratio measures and even to some extent as interval-scale measures. This implication suggests that nonparametric techniques should be employed in the analysis and they are accordingly employed. Second, in designing the study, it was assumed that most of the sample firms' annual earnings announcements

would have information content because the available theoretical literature, which in most cases does not consider the time dimension explicitly in developing the relationship between earnings and stock prices, and at least the results of the two previous studies based on weekly data, were all supportive of such a position.[16] This second implication suggests that the analysis of the relationship between the information content of a firm's annual earnings announcements and its non-annual report sources of information (the results are reported below) should be conducted for the complete sample as well as the sub-sample consisting of firms whose annual earnings announcements have information content.

Analysis of Information Content Differences

The basic objective of this study is the determination of the extent to which the information content of the annual earnings announcement of the sample firms is related to the existence of non-annual report sources of information. E_{jk} and U_{jk} discussed in the preceding sections are the two separate measures of the information content of the kth annual earnings announcement of firm j. Non-annual report sources of information are approximated by five

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[16] The naivety of this position is evident from Chapter III where no hypotheses concerning the information content of the annual earnings announcements were formulated for later testing. Although Benston's [10] unfavorable findings should have moderated the complete reliance on available theory and evidence, reasons suggested by Beaver [9] and May [30] for Benston's unfavorable results seemed compelling.

variables of the firm, namely total assets, number of stockholders, frequency of external financing, industry concentration, and industry group.

Two sets of results are reported and described in this section: results obtained via the multiple linear regression technique (the technique originally proposed for investigating the relationship between the information content measures in the announcement month and the five variables of the firm) and results obtained via non-parametric statistical techniques (necessary because the raw as well as the transformed information content measures seem to violate some of the assumptions of the parametric technique, that is, multiple linear regression). Before describing and reporting these results some summary statistics for the five variables of the firm (surrogate measures for non-annual report sources of information) are discussed.

Six hundred and seventy-five information content measures in the annual earnings announcement month of 234 firms constitute the number of observations for the analysis.[17] The average total assets and number of stockholders for the sample are $679 million and 43,000 respectively. The 234 firms belong to 24 industry groups according to SEC 3-digit industry code classification. The mean for the

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[17] The original samples of 236 firms and 679 announcements were reduced to 234 and 675 respectively because one firm's financial statements were stated in Mexican currency and another firm's number of stockholders could not be obtained. Neither of these is an extreme reaction firm.

frequency of financing variable is 0.5 suggesting that most of the sample firms do not engage in external financing in most of the five-year study period. External financing is more frequent among the utility, air transportation, and railway transportation firms and less frequent among the manufacturing and mining firms. No mean industry concentration ratio is reported for the complete sample since it is available for only the manufacturing firms. The industry concentration ratio variable is included only when the analysis is restricted to firms in the manufacturing industry.

Multiple Regression Analysis

In the multiple regression, the information content measure in the announcement month of a sample firm in an announcement year is the dependent variable and the five variables of the firm as surrogate measures for existence of non-annual report sources of information (one of which is a set of indicator variables to represent the 3-digit SEC industry group of a firm) together with a set of indicator variables to represent the year of the announcement (that is, the dependent variable is "pooled" across firms, industry groups, and announcement years), constitute the independent variables.[18] The analysis involves two regressions, one using the one-factor market model information content measures and the other using the two-factor market model information content measures in the announcement month.

A Kolmogorov-Smirnov goodness-of-fit test indicated that the

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[18] The complete multiple regression model was developed in pages 53-58 of Chapter III. The regression equation to be estimated is given by equation 17, page 56.

residuals obtained from the first regression run, using the raw information content measures as values of the dependent variable, were not normally distributed as expected. A Spearman rank correlation test also indicated that the variance of the regression residuals was not constant. A runs-test, however, suggested randomness or independence among the regression residuals. The correlation between total assets and number of stockholders was very high (.901) suggesting multicollinearity and also the fact that one of the two variables would have to be dropped in the analysis. To summarize, most of the assumptions of the regression model were violated by the raw data.

The coefficient of determination, R^2, was statistically significant at an α-level of .02 but was relatively small, .074 and .066 for the one-factor and the two-factor model regressions respectively. Apart from some of the industry group indicator variables none of the major surrogate variables for interim information had a coefficient statistically different from zero and each coefficient was not in the predicted negative direction.

In other applied economic work, transformations of either the dependent variable or the independent variables have been found helpful not only in normalizing the distribution of the residual term and linearizing the relationship between the dependent and the set of independent variables but also in achieving constancy of the variance of the residual term. Three such transformations of the raw data were made, namely square root, reciprocal, and logarithmic.

Only the natural logarithmic transformation of the one-factor market model information content measures as the dependent variable proved somewhat helpful in the sense that distribution of the regression residual was statistically not different from normal at an α-level of .01, the variance of the residual was stabilized, and the R^2 increased to .104 (α-level of essentially zero).

Excluding the coefficients of the two sets of indicator variables for the industry group and the announcement year, the partial regression equation is given by:

$$\ln(E) = -.973 - .00155NS + .294FEF + \ldots$$
$$\qquad\quad (-2.660) \quad (-1.701) \quad (1.455)$$

where ln(E) is the natural logarithm of the one-factor market model information content measures in the announcement month, NS is the number of stockholders, FEF is the frequency of external financing, and the numbers in parentheses below each coefficient are t values. The frequency of financing variable in this equation represents firms that engaged in external financing and is treated as an indicator variable because it cannot be properly construed as having been measured on at least an interval scale (the dollar amount of the financing is ignored in measuring the frequency of external financing). It assumes values of unity if the firm engaged in any external financing and zero if it did not.

The coefficient of the number of stockholders variable is statistically significant at .05 level by one-tail t-test and in the hypothesized negative direction. While the coefficient of the

financing variable is greater than its standard error it is not statistically different from zero and also not in the predicted negative direction. The coefficients of the indicator variables for industry group are all not statistically different from zero by a two-tail t-test.[19]

A separate regression analysis was conducted for only the manufacturing firms so that the relationship between the information content measures and the degree of concentration in a firm's industry group could be assessed. The correlation among the eight measures of concentration discussed in Chapter III is very high. The industry concentration measure based on the percentage of the value of shipments accounted for by the four largest firms in the industry and weighted by the total number of firms in that industry group has the highest correlation and in the predicted negative direction with each of the two dependent variables (-.122 and -.104 with the one-factor and the two-factor market model information content measures respectively) and therefore is chosen as one of the independent variables for the regression.

The multiple R^2 and value of the F statistic are .093 and 1.563 (α-level of .042) respectively for the one-factor model regression, and .095 and 1.760 (α-level of .011) respectively for the two-factor model regression. The regression coefficient for

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[19] Limiting the definition of the industry group variable to major industry group, that is, 2-digit SEC Code, also does not alter the conclusion. Introduction of interaction terms, mainly frequency of financing and industry group, and total assets (or number of stockholders) and industry group, results in no improvement in the multiple R^2.

for the industry concentration ratio variable in the one-factor model regression is greater than its standard error but not statistically different from zero (although it is in the predicted negative direction). The regression coefficient for the same variable in the two-factor model regression is, however, less than its standard error.

The theory developed in Chapter II relates to explaining differences in the information content measures of firms whose annual earnings announcements have information content, that is, information content ratios greater than unity, and not those whose annual earnings announcements do not have information content, that is, information content ratios less than or equal to unity. To this end, separate regression equations were estimated for firms whose annual earnings announcements seemed to have information content (234 for the one-factor market model and 251 for the two-factor market model). Multiple R^2 obtained for the one-factor and the two-factor model regressions are respectively .181 (α-level of .042) and .151 (α-level of .115). Although there is an improvement in the R^2, none of the major variables of the firm with exception of the indicator variables representing firms that engaged in any financing in the two-factor model regression and industry group has a coefficient greater than its standard error. The coefficient of the indicator variable representing firms that engaged in any financing in the two-factor model regression is statistically different from zero by a one-tail t-test at an α-level of .05 but

not in the predicted negative direction. Some of the industry group indicator variables have coefficients greater than their standard errors but none is statistically different from zero at an α-level of .05.

The results obtained by restricting the sample ex post to firms whose annual earnings announcements seemed to have information content would tend to suggest that if most of the sample firms earnings announcements had possessed information content, as was assumed at the start of this paper, the set of independent variables might have performed better in explaining the variation, if any, in their information content measures.

It was suggested in the previous section that the demand being placed on the information content measures might not be modest in the sense that the information content ratio seems to lack meaningful interpretation as a strict ratio measure. Consistent with that suggestion, the information content measures were grouped into two, one group consisting of information content ratios greater than unity and the other group consisting of information content ratios less than or equal to unity, and discriminant analysis was performed on the two groups. The inequality of the size of the two groups, 234 versus 441 for the one-factor model and 250 versus 425 for the two-factor model, was incorporated in the analysis as prior probabilities. For each market model, the set of independent variables, namely the number of stockholders, total assets, frequency of external financing, and industry group, was able to classify correctly about

sixty-five percent of the observations. The classification was found to be statistically significant by a Chi-Square test (α-level of essentially zero in each case).

The results of the regression analysis, with and without transformation, do not appear to support most of the relationships asserted in this study, namely a significant monotone decreasing relationship between the information content of a firm's annual earnings announcement and its total assets, number of stockholders, frequency of external financing, and degree of industry concentration. It is possible that the relationship between the information content measures as dependent variable and the set of independent variables is much greater than that obtained from the regression. In other words, multiple linear regression may not be appropriate for the investigation of the relationships because the observed values of the variables only partially satisfy the assumptions of the regression model. It is also possible that the set of independent variables is not a good surrogate for non-annual report sources of information. The first possibility is examined by relating the information content measures to the set of independent variables by means of nonparametric statistical tests which require the making of fewer and less restrictive assumptions, namely rank correlation, one-way analysis of variance by ranks, and median tests. The second possibility is examined by taking a sample from the original sample and counting the non-annual report sources of information and correlating the scores with the dependent and independent variables by means of rank

correlation test. The results obtained from these nonparametric tests are described next.

Nonparametric Analysis

Where it was appropriate the particular nonparametric test was conducted for the complete sample as well as the sub-sample consisting of firms whose annual earnings announcement seemed to have information content, that is, information content ratios greater than unity. The Spearman correlation coefficients for each of the two information content measures, that is, one-factor and the two-factor market models, and each surrogate variable for non-annual report sources of information appear in Table 16. Parts (a), (b), and (c) of the table contain, respectively, the results obtained for the complete sample, sub-sample consisting of firms whose annual earnings announcements seemed to have information content, and sub-sample consisting of annual earnings announcements for 1970.[20]

An inspection of part (a) of Table 16, that is, the complete sample, indicates that, with the exception of the industry concentration ratio variable, the rank correlation between the one-factor market model information content measures (E) and each of the surrogate variables for non-annual report sources of information is not statistically different from zero. The rank correlation between the one-factor market model information content measures and the degree

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[20] With exception of 1970, rank correlation coefficients obtained for the other announcement years' information content measures and the surrogate variables for non-annual report sources of information are not statistically different from zero at an α-level of .05.

TABLE 16

Spearman Rank Correlation Coefficients

Information Content	Surrogate Variables for Non-Annual Report Sources of Information: Assets	Stockholders	Frequency of Financing	Concentration Ratio	Sample Size (N)
a.					
E	.009	-.003	.048	-.118*	675
	(.406)	(.468)	(.108)	(.010)	
U	.114	.110	.094	-.096*	675
	(.002)	(.003)	(.008)	(.029)	
b.					
E > 1	-.013	-.063	.007	-.100**	234
	(.423)	(.170)	(.459)	(.131)	
U > 1	.109	.113	.160	-.100***	251
	(.043)	(.038)	(.006)	(.127)	
c.					
U(1970)	.237	.144	.281	n.a.	148
	(.002)	(.038)	.001		

The numbers in parentheses below each coefficient are significant levels.
n.a. = not available
* N = 394 ** = 127 *** = 132

of industry concentration ratio variable is statistically different from zero at an α-level of .010 and in the predicted negative direction.

A further inspection of part (a) of Table 16 indicates that the rank correlation between the two-factor market model information content measures (U) and each of the surrogate variables for non-annual report sources of information is statistically different from zero at an α-level of .05. With exception of the industry concentration variable the rank correlation coefficients, though statistically significant, are not in the predicted negative direction. As in the case of the one-factor market model, the rank correlation between the two-factor market model information content measures and the industry concentration variable is not only statistically significant but also it is in the predicted negative direction.[21]

Consistent with the assumption made at the start of this paper, that is, if firms' annual earnings announcements have information content it will be related to the surrogate variables for non-annual report sources of information, a separate rank correlation analysis was conducted for firms' whose annual earnings announcements seemed to have information content. The results of this analysis appear in part (b) of Table 16. The rank correlation between the two-factor

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[21] These favorable results obtained by limiting the rank correlation analysis to only manufacturing firms cannot be extended to the other surrogate variables for interim information since their rank correlation coefficients are not statistically significant.

market model information content measures (U) which are greater than unity is statistically significant but again not in the hypothesized negative direction.

Finally, the rank correlation analysis was conducted for each of the five announcement years. The only significant result, reported in part (c) of Table 16, is for the two-factor market model information content measures of the 1970 announcement year. The rank correlation between the two-factor market model information content measures for 1970 and total assets, number of stockholders, and frequency of external financing is in each case statistically significant and much greater than that observed for the complete and the sub-sample consisting of firms whose annual earnings announcements have information content but as in the case of the other analyses the coefficients are not in the hypothesized negative direction.

On the basis of the results of the rank correlation analysis, it can be suggested that (i) in general, there is a significant statistical relationship between the information content of the sample firms' annual earnings announcements and each of the surrogate variables for non-annual report sources of information, namely total assets, number of stockholders, frequency of external financing, and degree of industry concentration and (ii) this relationship is captured better by the two-factor market model. However, with exception of the industry concentration variable, the evidence does not support the negative direction predicted by the theory developed in Chapter II.

The Kruskal-Wallis one-way analysis of variance by ranks method was employed to test the null statistical hypothesis that the medians of the 24 industry groups' (that is, 3-digit SEC code) information content measures are equal against the alternative that at least one of the industry groups has a median information content measure different from the others.[22] A similar hypothesis was tested for the five major industry groups' (that is, 2-digit SEC code) information content measures. The results of the Kruskal-Wallis test suggest no significant statistical differences between the medians of the 24 industry groups; information content measures (both one-factor and the two-factor market model). The Kruskal-Wallis test gives the same results when the sample is restricted to only firms whose annual earnings announcements seemed to have information content. If the theory developed in Chapter II, that is, the information content of a firm's annual earnings announcement is industry-related, the results of the Kruskal-Wallis test is consistent with error in the classification of the sample firms into 3-digit SEC industry groups. The error in the classification of an entire firm into one industry group is to be expected since industry groups overlap and a firm may operate in more than one industry group.

The potential error in the classification of an entire firm into one industry group is likely to be overcome if an entire firm

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[22] Siegel [42], pp. 184-193. This hypothesis cannot be tested by employing the rank correlation technique.

is classified into one of the major industry groups, that is, 2-digit SEC code, which is a much broader group. Thus the Kruskal-Wallis test was employed to test the null statistical hypothesis that the medians of the five major industry groups' information content measures are equal against the alternative that at least one major industry group has a median information content measure different from the others. This null hypothesis can be rejected at an α-level of .05 for the two-factor market model information content measures while it cannot be rejected at the same α-level for the one-factor market model information content measures. A similar null hypothesis cannot be rejected at an α-level of .05 for both the one-factor and the two-factor market model information content measures when the sample is limited to only firms whose annual earnings announcement seem to have information content.

Given the results that at least one of the five major industry groups two-factor market model information content measures have a median different from the others, the Mann-Whitney U test was employed to examine the information content measures of the major industry groups, two at a time. The results of the Mann-Whitney U test indicates that it is only the median of the utility major industry group two-factor market model information content measures which is different from the others. Specifically, the median of the utility major industry group's two-factor market model information content measures is statistically greater than that of mining, manufacturing, and railway transportation (an α-level of .05). As pointed out in

the information content analysis section of this chapter, this evidence is contrary to the assertion often made that the process generating earnings of firms in the utility major industry group is more stable (and therefore announcement of their earnings may lead to a smaller change in investors' expections) than that of some firms in other industries.

Consistent with the suggestion that the demand being placed on the information content measure as a ratio may be too great, the complete sample was grouped into two: one group consisting of information content measures greater than unity and the other group consisting of information content measures less than or equal to unity. Then the Mann-Whitney U test was employed to examine the differences between these two groups in terms of the surrogate variables for non-annual report sources of information. On the one hand, the results of the Mann-Whitney U test suggest that the two groups formed on the basis of this one-factor market model information content measures do not differ significantly in terms of the surrogate variables for non-annual report sources of information. On the other hand, the results of the Mann-Whitney U test suggest the two groups formed on the basis of their two-factor market model information content measures differ significantly in terms of total assets, number of stockholders, and frequency of external financing. Specifically, the median total assets, number of stockholders, and frequency of financing of firms whose annual earnings announcements seem to have information content is statistically

greater than that of firms whose annual earnings announcements seem to have no information content at an α-level of .05. As in the case of the results obtained from the rank correlation analysis, this evidence is contrary to what the theory behind this paper predicts.

In the preceding nonparametric tests, the frequency of external financing variable has not been treated as an indicator variable to emphasize the possibility that it may not be properly construed as a ratio or an interval-scale measure. Although these nonparametric tests do not require the assumption of a ratio or an interval-scale measure, the information content measures were grouped into two: one group consisting of firms engaging in external financing and the other group consisting of firms not engaging in external financing, so that differences between the information content measures of the two groups could be directly examined. The results obtained from the Mann-Whitney U test is consistent with that reported in the preceding paragraph. Specifically, the median of the two-factor market model information content measures of firms engaging in external financing is statistically greater than that of firms not engaging in external financing at an α-level of .05. This result also is consistent with the results reported earlier that the median of the information content measures of the utility major industry group is greater than that of mining, manufacturing, and railway transportation because most of the firms in the complete sample that engage in frequent external financing are in the utility

industry.

Surrogation Validity

The possibility that the five surrogate variables for non-annual report sources of information could be poor surrogates for non-annual report sources of information was partially verified by counting the number of non-annual report sources of information for a sample and computing Spearman rank correlation coefficients for the number of non-annual report sources of information and each of the two information content measures (that is, one-factor and the two-factor market models) as well as each of the surrogate variables.[23]

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[23] Two sub-samples, consisting of observations at each decile of the distribution of each information content measure, were taken of size 11 each (coincidentally). Not only did each sub-sample consist of different firms but the firms in the combined sub-samples were also different. Thirteen of the 22 firms in the combined sub-sample were in manufacturing and thus making it possible to assess the significance of the degree of industry concentration variable. There were no more than three firms of any given industry group in the combined sub-samples and thus the industry group variable could not be analysed separately.

The counting of the non-annual report sources of information was limited to announcements appearing in The Wall Street Journal. The decision to limit the count of the non-annual report sources of information to The Wall Street Journal is based on the observation that most of the other sources do not publish firm-specific information but instead information for groups (for example, industry groups) and the sample size is not large enough to permit separate analysis to isolate industry effects. Also it is possible that the count may not be exhaustive to cover all sources and therefore the resulting score may be biased. Announcements which were common to all firms were excluded, for example quarterly earnings announcements, from the count. The most frequent non-annual report announcements were acquisitions, financing, new investment decision, price increases, forecasts, and sales data. Rank correlation was used because the principle of the number of non-annual report announcements could not be conceived as an interval measure.

For the combined sub-sample of 22 firms, only sales, a measure alternative to total assets for a firm's size, has significant correlation coefficient (.439 at an α-level of .024) with the number of non-annual report announcements. Limiting the analysis to the one-factor market model information content sub-sample of eleven firms also indicates only sales has a significant correlation coefficient (.538 at an α-level of .045). On the other hand, when the analysis is limited to the sub-sample of eleven firms selected from each decile of the distribution of the two-factor market model information content measures, only the one-factor and the two-factor market models measures of information content have significant rank correlation coefficients (-.538 at an α-level of .030 and -.757 at an α-level of .004 respectively). The signs of the rank correlation coefficients are in the predicted direction, that is, the annual earnings announcements of firms making more frequent announcements tend to have less information content than those of firms making less frequent announcements. Finally, when the analysis is limited to the 13 manufacturing firms in the combined sub-samples, the number of stockholders and degree of industry concentration variable have statistically significant correlation coefficients (.576 at an α-level of .020 and .629 at an α-level of .011 respectively) with the number of non-annual report announcements.

The result reported in the immediate preceding paragraph, though not consistent across the different samples, are supportive of the hypotheses developed from the theory for this study, especially

the significant negative relation between each of the two measures of information content and the number of non-annual report announcements for the sub-sample consisting of only manufacturing firms. However, because the samples upon which the results are based are relatively small and the counting of non-annual report announcements was not exhaustive and, most important of all, because the number of non-annual report announcements was not weighted by some measure of relevance or usefulness, the results ought to be given only limited interpretation in terms of their validity.

V. SUMMARY AND CONCLUSIONS

This chapter summarizes and interprets the results of the empirical evaluation of the information content of the sample firms' annual earnings announcements and the relationship between the information content of the sample firms' annual earnings announcements and the existence of non-annual report sources of information. Limitations of the study are also discussed. Finally, some suggestions are offered for further research to resolve the limitations of the study.

Summary and Interpretation of Empirical Results

The basic objective of this study was to determine the extent to which the information content of the annual earnings announcement of a sample of firms is related to the existence of non-annual report sources of information. The empirical investigation consisted of two phases: first, determining the information content of annual earnings announcements (information content analysis) and second, explaining the cross-sectional differences in the information content measures in terms of the existence of non-annual report sources of information (cross-sectional analysis).

The information content of annual earnings announcement was measured as a ratio of the variability of residual stock price

changes in the month of the annual earning announcement to the mean variability of residual stock price changes during the non-report period months.[1] If this ratio was greater than unity the annual earnings announcement was inferred to possess information content (the "amount" of information content was measured by the level of the ratio); on the other hand, if the ratio was less than unity the annual earnings announcement was inferred to possess no information content. The existence of non-annual report sources of information was approximated by five firm-specific variables, namely total assets, number of stockholders, frequency of external financing. degree of industry concentration, and industry group because of the difficulty in directly quantifying the information from the numerous non-annual report sources.

The results of the information content analysis (section 3 of Chapter IV) suggested that the annual earnings announcement of an "average" firm (that is, the average information content of firms in the sample) in the sample possessed information content. However, an examination of the distribution of the information content measures indicated that majority of the sample firms' annual earnings announcements possessed no information content. In other words, the mean

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[1] Two market models were used to derive the monthly residual stock price changes, namely the one-factor market model which adjusts for only one market-wide movement in stock price changes and the two-factor market model which adjusts for two market-wide movements in stock price changes. Consequently two measures of information content were computed.

did not provide an appropriate description of the central tendency of the distribution of the computed information content measures (because some of the computed information content measures had extreme values).

There were two major differences between the distribution of the information content measures derived from the two market models. First, the sample variance of the information content measures derived from the two-factor market model was numerically much smaller than that of the one-factor market model for each of the four-month report period. Second, the two-factor market model information content measures in the announcement month were generally larger than those of the one-factor market model. In other words, the two-factor market model seemed to capture more of the information, if any, conveyed by the annual earnings announcements relative to the one-factor market model.

There are at least two interpretations of the results of the information content analysis. The first is a direct interpretation of the results: a majority of the annual earnings announcements of the type of firms sampled possess no information content. The second interpretation is that, even if annual earnings announcements possess information content, it appears not to be reflected in residual changes in monthly stock prices. The no information content interpretation, to a large extent, is consistent with the findings by Ball and Brown [7] that on average no more than about 10 to 15 percent of information conveyed by the annual earnings number of a

firm has not been anticipated by the month of the annual earnings report. On the other hand, the no information content interpretation is not consistent with the findings by Beaver [9] that on average the variability of residual stock price changes was 67 percent greater in the week of the annual earnings announcement than in other weeks. Beaver reported that the mean was an accurate description of the central tendency of the distribution of the information content measures. In other words, extreme values, if any, were few.

The findings by Beaver [9] are suggestive of the second interpretation, that is, the possibility that monthly residual stock price changes may not be able to capture precisely the information conveyed by annual earnings announcements. The second interpretation lacks empirical support. First, previous studies have been able to isolate the effects of events such as stock splits and dividend changes by examining the behavior of monthly residual stock price changes. Second, the evidence relating to the appropriateness of the market models (that is, the sample residuals of the models conform well to the assumptions of the simple linear regression model) as the model generating period-by-period security's returns was based on monthly data (Fama et al. [19]). The explanatory power of the market factor was very low in Beaver's study leading him to suggest that weekly data may have more noise than monthly data. It is thus difficult to interpret unambiguously the observed above-normal price variability in the announcement week.

The relationship between the information content of the sample

firms' annual earnings announcements and the five firm-specific surrogate variables for the existence of non-annual report sources of information was proposed to be investigated by employing a multiple linear regression model. Analysis of the regression residuals indicated that most of the assumptions of the regression model were violated by the raw data. A natural logarithmic formation of the one-factor market model information content measures yielded regression residuals which to a large extent did not violate the assumptions of the regression model. The resulting regression equation indicated that only the coefficient of the number of stockholders variable was statistically significant at .05 level by one-tail t-test and also in the hypothesized negative direction. The multiple R^2 was .104 and statistically significant at essentially a zero level.

The multiple R^2 increased to .181 (α-level of .042) when the sample was restricted ex post to only firms whose annual eanrings announcement seemed to have information content. The higher explanatory power of the set of five firm-specific surrogate variables for the existence of non-annual report sources of information obtained by restricting the sample ex post to firms whose annual earnings announcements seemed to have information content would tend to suggest that if most of the sample firms annual earnings announcements had possessed information content, as was assumed at the start of this paper, the set of independent variables might have performed better in explaining the variation, if any, in their information

content measures.

Because the raw data violated some of the assumptions of the regression model the relationship between the information content measures and the five firm-specific surrogate variables for interim information was re-examined by means of nonparametric statistical methods which require the making of fewer and less restrictive assumptions. Three such nonparametric statistical methods were employed, namely rank correlation, Kruskal-Wallis one-way analysis of variance by ranks, and Mann-Whitney U test, to investigate various aspects of the relationship. The results obtained by employing these methods indicated a significant statistical relationship between the information content of the sample firms' annual earnings announcements and each of the five surrogate variables for interim information, namely total assets, number of stockholders, frequency of external financing, degree of industry concentration in the sample firms' industry group, and major industry group (2-digit SEC code). The relationship was consistent across the complete sample (except the one-factor market model information content measures) as well as the sub-samples consisting of firms whose annual earnings announcements seemed to have information content (again except the one-factor market model information content measures, and major industry groups).

With exception of the degree of industry concentration variable, the statistically significant relationships were <u>not</u> in the negative direction predicted by the theory underlying this paper. Specifically, the results suggest a positive relationship between

the information content of a sample firm's annual earnings announcement and its total assets, number of stockholders, and the frequency of external financing. The rank correlation coefficients, although statistically significant at an α-level of less than .05, were small (with exception of those obtained from a separate analysis conducted for the 1970 two-factor market model information content measures none of the rank correlation coefficients was greater than .20), suggesting possibly a weak relationship. This weak relationship is consistent with two interpretations. First, the five firm-specific variables are not good surrogates for interim information generated about the sample firms. The results obtained by computing rank correlation coefficients between the number of non-annual report announcements made by a sub-sample of 22 firms selected from the whole sample and each of the quantitative firm-specific surrogate variables for interim information are not sufficiently conclusive to support or refute this interpretation.

The second interpretation consistent with the observed weak relationship between the information content measures and the quantitative firm-specific surrogate variables for interim information is that, even if the firm-specific variables are good surrogates for interim information, there is only a weak, if any, relationship between the information content of the sample firms' annual earnings announcements and interim information. This argument may be untenable because there is empirical evidence suggesting strong anticipatory power of the market concerning the information finally

conveyed by the annual report. On the other hand the argument may be consistent with a competing hypothesis not tested by this study, namely the cost of reconstructing the firm's specific events from numerous non-annual report sources may exceed the perceived benefits to be undertaken by investors.

Together with their interpretations the results of both the information content analysis and the analysis of the differences in the information content measures suggest these tentative conclusions:

(1) The new information, if any, conveyed by the sample firms' annual earnings announcements does not appear to be reflected in their monthly residual stock price changes.

(2) The sample variance of the distribution of information content measures derived from the two-factor market model is numerically much smaller than that derived from the one-factor market model. Also the two-factor market model information content measures are generally larger than those of the one-factor market model. In other words, the two-factor market model captures more of the information, if any, conveyed by the annual earnings announcements relative to the one-factor market model.

(3) There is a statistically significant relationship between the information content of the sample firms' annual earnings announcements and their non-annual report sources of information as approximated by the firms' total assets, number of stockholders, frequency of external financing, industry concentration, and major industry group. The relationship is, however, probably weak and also, with the exception of the industry concentration variable, not in the negative direction predicted by the theory behind this paper.

Limitations of the Study

The reliability of the results and conclusions of this study is dependent upon the propriety of the market models and procedures used to obtain those results and conclusions. Accordingly, the results and conclusions of this study should be evaluated with the

limitations of the study in mind. In this section the major limitations of the study are considered.

Previous studies as well as this study ignore industry effects in specifying the market models used to isolate residual stock price changes. To the extent that industry effects have significant explanatory power (King [27]) the assumption of the market models that the residual terms are independent is violated.[2]

Although the relative market risk, beta, for each firm was allowed to vary from one announcement year to the next it is possible that beta was not stationary for an entire announcement year, in which case one of the assumptions of the market models would be violated.[3]

The ratio used to infer information content was adopted from Beaver's study [9]. Many of the previous studies have inferred information content of specific events by conducting analyses which are based only on the sign of the residual stock price changes. Although these "sign" studies may have the disadvantage of using only a limited portion of the information (because they ignore the size of the residuals) they have the advantage of placing modest

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[2] The industry factor was one of the firm-variables in the cross-sectional regression analysis. As qualitative (indicator) variables the industry variables had only little explanatory power. In the market models the industry effects will have to be specified as quantitative variables, that is, industry rates of return.

[3] The portfolio approach attains stationarity of beta. It could not be used in this study because individual information content measures were required for the cross-sectional regression analysis.

demands on the data. More evidence concerning the quantitative empirical relationship between information contained in external accounting reports and stock prices is required before the information content ratios computed in this study can be given their strict ratio interpretation. Until then a ratio of less than unity and greater than unity may have to be given limited interpretation of implying no information content and information content respectively.

The sample consisted of firms with fiscal years ending on December 31. Apart from limiting the generalizability of the results this sample selection criterion resulted in large cluster of annual earnings announcements in the months of January and February. If this large clustering of announcements was interpreted as market-wide events then some of the effects of the annual earnings announcements might have been removed as well when the one market-wide factor of the one-factor market model and the two market-wide factors of the two-factor market model were removed from the sample firms' rates of return.

The analysis of the information content differences has two major limitations. The first limitation is the selection of the surrogate variables for non-annual report sources of information. Although theoretical arguments were developed to link the five firm-specific variables to non-annual report sources of information they have to be regarded as exploratory. Finally, the conclusions are based on the results of nonparametric statistical tests which have limited statistical efficiency and power for testing the more

demanding hypotheses of this study and should be considered as tentative.

Suggestions for Future Research

The effects of the limitations discussed above on the results of this study can in most cases be assessed by further research. Beaver's study [9], examining weekly residual stock price changes, found that the annual earnings announcements of firms with non-December 31 fiscal years had information content. If it is true that the dramatic increase in price variability observed in the announcement week was not due to only the annual earnings announcement but also excessive "noise" in weekly price data then the information content phase of this study, using less noisy monthly price data, can be replicated for firms with non-December 31 fiscal years. The results of such a study will help in assessing the effect of the announcement clustering on the results of this study.

Based on a sub-sample of eleven firms it was found that the rank correlation coefficients for the number of non-annual report announcements and each of the two information content measures were not only high and significant but also were in the predicted negative direction. This limited evidence will suggest that an extensive-scale direct approach to the investigation of the basic research question may prove more fruitful than the surrogation approach. Such a study will not only have to extend the count to sources beside The Wall Street Journal but also assign some weights (based probably on

weights assigned by some user groups) to the information from the many different non-annual report sources.

Finally, discriminant analysis may be used to avoid the suggested limitation on the interpretation of the information content ratios while at the same time retaining the surrogation approach. Although an attempt was made in this direction it was exploratory and conducted on a very limited scale. The results of extensive-scale discriminant analysis may offer insights as to whether the characteristics of firms whose annual earnings announcements have information content are different from or the same as those whose annual earnings announcements have no information content.

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APPENDIX

NAMES AND 3-DIGIT SEC INDUSTRY CODES OF COMPANIES IN THE SAMPLE

APPENDIX

NAMES AND 3-DIGIT SEC INDUSTRY CODES OF COMPANIES IN THE SAMPLE

Company Name	3-Digit SEC Code
Abbot Laboratories	283
Abex Corp.	331
Admiral Corp.	366
Akzona, Inc.	281
Alcan Aluminum, Ltd.	335
Allegheny Lindlum Industries, Inc.	331
Allied Chemical Corp.	281
Allied Products Corp.	349
Allis Chalmers Corp.	352
Aluminum Company of America	335
Amax, Inc.	335
Ambac Industries, Inc.	369
American Airlines, Inc.	450
American Chain & Cable, Inc.	349
American Home Products Corp.	283
Ametek, Inc.	369
AMP, Inc.	369
Anaconda Co.	335
Amphenol Corp.	369
Anchor Hocking Corp.	321
Armco Steel Corp.	331
Arvin Industries Inc.	371
Atlantic Richfield Co.	291
Babcock Wilcox Co.	349
Baltimore Gas & Electric Co.	493
Belding Heminway, Inc.	221
Bliss & Laughlin Industries Inc.	331
Boeing Co.	372
Borg Warner Corp.	371
Boston & Maine Corp.	400
Boston Edison Co.	491
Braniff International Corp.	450
Brooklyn Union Gas Co.	492
Budd Co.	371
C.F. & I Steel Corp.	331
Campbell Red Lake Mines, Ltd.	100
Carolina Power & Light Co.	491
Central Hudson Gas & Electric Corp.	491
Central Illinois Light Co.	493
Central Illinois Public Service Co.	491
Cerro Corp.	335
Certainteed Products Corp.	327

Company Name	3-Digit SEC Code
Champion Spark Plug Co.	369
Checker Motors Corp.	371
Chemetron Corp.	281
Chicago Eastern Illinois R.R. Co.	400
Chicago Milwaukee St. Paul Pacific	400
Chicago Pneumatic Tool Co.	354
Chicago Rock Island Pacific R.R. Co.	400
Chrysler Corp.	371
Cincinnati Gas & Electric Co.	493
Cincinnati Milacron, Inc.	354
Clark Equipment Co.	352
Cluett Peabody Co., Inc.	231
Colts Industries Inc.	354
Columbus Southern Ohio Electric Co.	491
Commercial Solvents Corp.	281
Commonwealth Edison Co.	491
Cone Mills Corp.	221
Consolidated Edison Company of New York, Inc.	491
Consumers Power Co.	493
Continental Oil Co.	291
Continental Steel Corp.	331
Copper Range Co.	335
Crane Co.	349
Crown Zellerbach Corp.	264
Crucible Steel Company of America	331
Curtiss Wright Corp.	372
Cyclops Corp.	331
Dayton Power & Light Co.	493
Delmarva Power & Light Co.	491
Denver Rio Grande Western R.R.	400
Detroit Edison Co.	491
Dome Mines, Ltd.	100
Dover Corp.	352
Dow Chemical Co.	281
Du Pont E. I. De Nemours Co.	281
Eastern Air Lines, Inc.	450
Eaton Corp.	371
Empire District Electric Co.	491
Equitable Gas Co.	492
Fairchild Industries Inc.	372
Fansteel, Inc.	335
Filtrol Corp.	281
Florida Power & Light Co.	491
Florida Power Corp.	491

Company Name	3-Digit SEC Code
Foote Mineral Co.	335
Ford Motor Co.	371
Fruehauf Corp.	371
Gardner Denver Co.	352
General Cable Corp.	335
General Motors Corp.	371
General Portland, Inc.	324
General Signal Corp.	366
General Steel Industries Inc.	331
Getty Oil Co.	291
Grace W. R. Co.	281
Granby Mining, Ltd.	100
Gulf States Utilities Co.	491
Hammermill Paper Co.	264
Harsco Corp.	331
Hercules, Inc.	281
Hoffman Electronics Corp.	366
Homestake Mining Co.	100
Houdaille Industries Inc.	371
Houston Lighting & Power Co.	491
Hudson Bay Mining & Smelting, Ltd.	335
Idaho Power Co.	491
Ideal Basic Industries Inc.	324
Illinois Power Co.	491
Indianapolis Power & Light Co.	491
Industria Electrica De Mexico, S.A.	369
Interlake, Inc.	331
International Mining Corp.	100
Interstate Power Co.	491
Iowa Electric Light & Power Co.	491
Iowa Illinois Gas & Electric Co.	493
Johns Manville Corp.	327
Jones Laughlin Steel Corp.	331
Kansas City Power & Light Co.	491
Kansas Gas & Electric Co.	491
Kennecott Copper Corp.	335
Kerr McGee Corp.	291
Lehigh Portland Cement Co.	324
Libby Owens Ford Co.	321
Long Island Lighting Co.	491
Louisville Nashville R.R.	400
Louisville Gas & Electric Co.	493
Lowenstein M & Sons, Inc.	221
Magnavox Co.	366
Mallory P. R. Co., Inc.	366

Company Name	3-Digit SEC Code
Marathon Oil Co.	291
Marquette Cement Manufacturing Co.	324
McDonnell Douglas Corp.	372
McGregor Doniger, Inc.	231
McIntyre Mines, Ltd.	100
Medusa Corp.	324
Merck Co., Inc.	283
Mesta Machine Co.	354
Middle South Utilities, Inc.	491
Minnesota Power & Light Co.	491
Missouri Kansas Texas R.R. Co.	400
Missouri Public Service Co.	491
Montana Power Co.	493
Motorola, Inc.	366
Munsingwear, Inc.	231
NL Industries Inc.	281
NVF Co.	331
National Gypsum Co.	327
National Steel Corp.	331
Niagara Mohawk Power Corp.	491
Norfolk Western Railway Co.	400
Northern Natural Gas Co.	492
Northern States Power Co., Minn.	491
Northwest Airlines, Inc.	450
Ohio Edison Co.	491
Oklahoma Gas & Electric Co.	491
Oklahoma Natural Gas Co.	492
Olin Corp.	281
Otis Elevator Co.	352
Owens Illinois, Inc.	321
Pacific Gas & Electric Co.	493
Pan American World Airways, Inc.	450
Panhandle Eastern Pipe Line Co.	492
Penn Dixie Industries Inc.	324
Pennsylvania Power & Light Co.	491
Pfizer, Inc.	283
Philadelphia Reading Corp.	231
Phillips Petroleum Co.	291
Pittsburgh Steel Co.	331
Portec, Inc.	331
Public Service Co., Colorado	493
Public Service Co., Indiana, Inc.	491
Public Service Electric & Gas Co.	493
Puget Sound Power & Light Co.	491
Quaker State Oil Refining Corp.	291

Company Name	3-Digit SEC Code
RCA Corp.	366
Raytheon Co.	366
Reading Co.	400
Reichhold Chemicals, Inc.	281
Republic Steel Corp.	331
Reynolds Metals Co.	335
Roper Corp.	352
St. Louis San Francisco Railway Co.	400
San Diego Gas & Electric Co.	493
Sangamo Electric Co.	369
Schering Plough Corp.	283
Seagrave Corp.	321
Seilon, Inc.	352
Sharon Steel Corp.	331
Shell Oil Co.	291
Signode Corp.	349
Skelly Oil Co.	291
Smith A. O. Corp.	371
Smithkline Corp.	283
Soo Line Railroad Co.	400
South Carolina Electric & Gas Co.	491
Southern Railway Co.	400
Square D Co.	369
Standard Oil Co., California	291
Standard Oil Co., Ohio	291
Standard Packaging Corp.	264
Stauffer Chemical Co.	281
Sterling Drug, Inc.	283
Sunshine Mining Co.	100
TRW, Inc.	371
Texaco, Inc.	291
Texas Gas Transmission Corp.	492
Texas Instruments, Inc.	366
Textron, Inc.	372
Thiokol Corp.	372
Toledo Edison Co.	491
Trans World Airlines, Inc.	450
UAL, Inc.	450
UGI Corp.	492
Unarco Industries Inc.	327
Union Camp Corp.	264
Union Carbide Corp.	281
Union Oil Co., California	291
United States Gypsum Co.	327

Company Name	3-Digit SEC Code
United States Industries Inc.	354
UpJohn Co.	283
Virginia Electric Power Co.	491
Vulcan Materials Co.	327
Warner Co.	327
Warner Lambert Co.	283
Washington Gas & Light Co.	492
Washington Water Power Co.	491
Wayne Gossard Corp.	231
Western Air Lines, Inc.	450
Western Maryland Railway Co.	400
Wheeling Pittsburgh Steel Corp.	331
White Motor Corp.	371
Wisconsin Electric Power Co.	491
Wisconsin Public Service Corp.	491
Zenith Radio Corp.	366