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# 6

## Some Thoughts on Materiality

**Kenneth W. Stringer**

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### Introduction

The invitation for this paper resulted from discussions with Professor Stettler at and subsequent to the 1981 Deloitte Haskins & Sells AuditSCOPE Update Seminar. The purpose of that seminar was to stimulate academic interest and research on the subject of materiality. That subject was chosen because the author and his associates involved in planning the seminar believe materiality is a pervasive problem that needs further attention by those who have responsibilities for financial reporting.

Management is forced to make decisions about materiality in preparing financial statements and auditors are forced to make similar decisions in planning, performing and reporting on audits of such statements. Both management and auditors face the potential need to defend their decisions in the event of challenges by those who use financial statements and audit reports as one of the various sources of information used in making investment decisions. Although not a pleasing prospect to either management or auditors, this potential is reasonable because the underlying concept of materiality is oriented toward the influence of financial information on users' decisions.

Yet no quantitative standards or guidelines have been developed by professional organizations in the U.S. and, in my view, relatively little useful results have been provided by user-oriented academic research. Research to date that relates, directly or indirectly, to materiality has consisted largely of behavioral experiments and opinion surveys based on hypothetical situations, and studies of the impact of accounting information on stock market prices. The latter, however, have been concerned more directly with the efficient market hypothesis and with policy questions concerning the establishment of accounting principles than with questions about materiality with reference to the financial statements of individual companies. Therefore, I believe management and auditors are sailing the uncharted waters of investors decisions without taking soundings to map the decision-making process and the parameters that lie below the surface.

I think the hazard and the challenge arising from this situation are obvious. From this perspective, I will comment briefly on the efforts of the FASB to deal with materiality, and make a few observations and suggestions for consideration by others.

## **FASB Actions**

The FASB included a project on materiality on its initial agenda and assigned a relatively high priority to the project for some time thereafter. As a result, a comprehensive Discussion Memorandum was issued, substantial effort was expended by various organizations in performing research and preparing written responses, and public hearings were held for oral presentations to and discussions with the Board. From this encouraging beginning, the mountain labored and brought forth a mouse in the form of a few paragraphs dealing with materiality in Statement of Accounting Concepts No. 2, "Qualitative Characteristics of Accounting Information." In these paragraphs the Board reiterated the usual generalities that are expressed when the subject is discussed, but did little or nothing to add to or clarify existing concepts and provided no quantitative guidance. It included the obvious comments about the need for judgment in dealing with unusual situations, but said nothing about points of departure or benchmarks for the usual situations. In declining to do so, the Board indicated that those respondents who wanted it to issue quantitative guidelines were in the minority. Without knowing the Board's rules for weighing responses, it is interesting to observe that the three organizations that represent the preparers, the auditors, and a major segment of users of financial statements all endorsed the issuance of such guidelines by the Board. Excerpts from the responses of the Financial Executives Institute, the American Institute of Certified Public Accountants, and the Financial Analysts Federation are attached as Appendix A to this paper.

Appendix B is a report on a research study, "The Impact of Earnings on Stock Prices," which I conducted at the request of the AICPA and submitted to the FASB in response to its Discussion Memorandum. The premise underlying this research was that knowledge of the sensitivity of stock prices to reported earnings is relevant to materiality decisions in view of the user-oriented concept of materiality. Although this study was described in the Discussion Memorandum and commented upon favorably by several Board members at the public hearing, it was buried without the dignity of even a footnote reference in Statement No. 2. Instead, the Board described the general approach and referenced it to an article that was written by two professors who had been given a research grant by my firm's Foundation to review the approach and other aspects of the subject while the research was in progress. The board concluded that the approach was "too blunt an instrument to be depended on to set materiality guidelines."

Without challenging the Board's conclusion concerning this particular study, the report is being exhumed for an autopsy with the hope that a post-mortem will suggest ways to sharpen the instrument so that it can serve a useful purpose. I remain optimistic that this can be done if academic researchers or research-oriented practitioners study the problem seriously. Such study is particularly timely now because the subject of Materiality and Audit Risk is currently on the agenda of the Auditing Standards Board. With this view in mind, I set forth in the remainder of this paper a brief summary of my observations concerning the research results, some suggestions for further research, and some comments on other matters.

## **Research Results**

The relative correlation between stock prices and the various earnings models summarized in Table 2 of the report conformed generally to my prior expectations, although the lower correlations with the five-year models presumably would not conform with the expectations of those who emphasize the importance of trends and growth rates. The other results in the first phase of the study which conformed to my expectations were the fact that the correlations were better for ordinary earnings than for earnings after extraordinary items or for cash flow. The most surprising result to me was the slightly higher correlation for historical earnings than for forecasted earnings. I had expected the latter to be significantly higher and, as indicated in the report, was unable to explain this result.

The results of the second phase conformed generally to my expectations in that the use of additional variables improved the correlation with stock prices, and that no single variable among those added was predominant, as shown in Table 6. I was surprised, however, that earnings were excluded from the set of significant variables for slightly more than half of the companies, as shown also in Table 6. For 18 of the excluded companies, however, the five-year earnings growth rate was a significant variable. Thus, either earnings or an earnings growth rate was significant for about two-thirds of the companies.

## **Further Research**

As readers may reasonably infer from my earlier comments, I believe further research along the general lines indicated in the accompanying paper would be useful. With the passage of time, quarterly historical and forecasted earnings are now available for more years and such additional data offer the potential for better results.

The variables used in my study included both the levels of stock prices and earnings and the changes in those levels. However, the accompanying paper presented results in terms of levels only because those results appeared to be more significant. Nevertheless, I suggest that changes be studied further in any additional research that is performed. In addition, I suggest that differences between actual changes and expected changes, as indicated by historical standard errors or by variations from forecasts, be considered as possible explanatory variables.

I also suggest further study of both the underlying concept and the parameters of the decision model presented in the accompanying paper. Although I am convinced that the cost of making changes in investment portfolios is one constraint on the sensitivity of changes in stock prices to changes in earnings as discussed in the accompanying paper, there may be other and possibly more important constraints that should also be considered. For example, the cost of analyzing financial information for use in making investment decisions may be more important than the cost of executing the related transactions. Further, behavioral limitations on decision-making processes may be another form of constraint that should be considered. The report of my study focused entirely on composite results for the 100 companies for

each of the models considered. This was done in the interest of simplicity and what I then considered would be most useful for the FASB's purposes. However, the reported results could be improved substantially by using for each company the model that gave the best correlation for that company. This methodology as a starting point for applying judgment in individual situations may be worthy of further consideration in lieu of generalized quantitative guidelines.

## **Other Matters**

The effect of an item on the trend of earnings is mentioned frequently in discussions of materiality, with the implication that this is a more stringent consideration than those that apply in determining the effect of an item on earnings for the current period. I believe these implications have resulted in an overemphasis or possible misunderstanding, because the effect on the current period will equal or exceed the effect on a projection of a trend to the next period with the limited exception of projections of a trend computed from either two or three periods only.\* These exceptions, of course, should be considered in any situation in which users might reasonably be expected to rely on trends for two or three periods only, which presumably would be rare.

Some discussions of materiality also attribute additional significance to an item that changes a loss to a profit, or a downward trend to an upward trend. Beyond the actual effect of trends on projections as explained above, I believe this perception is more subjective than substantive.

The research study focused entirely on public companies, and primarily on earnings as the critical component or primary interest of the external users of financial statements of such companies. The primary interest of such users, however, is likely to shift from earnings to financial position if there is a significant concern about the liquidity or solvency of the company. Further, the principal external users of financial statements of private entities ordinarily are the present or prospective creditors and their primary interest is likely to be in liquidity or solvency, with earnings being of interest primarily in that context.

When liquidity or solvency is the principal matter of concern, the primary interest of creditors and owners is likely to center on their claims and their equity, respectively. Creditors, however, are likely to be interested also in owners' equity as one measure of the margin of security for their claims. Both groups are likely to be interested also in current assets as a primary source of funds to provide liquidity. Therefore, current assets and owners' equity are likely to be the more critical components when liquidity or solvency is the principal matter of concern to external users of financial statements.

My last comments on specific matters relate to the problem that may be described as one of nominal amounts or differences. The significance of earnings and of any related measure of materiality obviously diminishes as

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\* The projected effect on the next period (P) of a change in an item in the current period (C), based on the trend for a given number of periods (N) may be computed from the following formula:  $P = C(4/N)$ . Thus the projected effect of an item based on a trend computed from two or three periods would be 2 or 1.33, respectively, times the current effect.

earnings approach zero. In these circumstances, the matter of primary interest to investors is that the results of operations are substantially below normal expectations, rather than whether they are above or below the breakeven point by some nominal amount. I think the same rationale can reasonably be applied as the excess of working capital, or some other specified component of financial statements, over the minimum required under a loan agreement approaches zero. Although a nominal decline below such requirements technically would be a default, I doubt seriously that the practical consequences resulting solely from such a default ordinarily would differ materially from those where the requirements were exceeded by a nominal amount.

In addition to the above perceptions of the practical needs of users in such circumstances, two other considerations are relevant from the perspective of auditors. The first of these is that it is impracticable from a cost/benefit viewpoint to expand the scope of audit tests to the degree necessary to provide reasonable assurance of detecting errors that would be material if measured in relation to the foregoing amounts or differences as they approach zero. The second consideration is that the customary type of auditor's report relating to compliance with loan agreements is in the form negative assurance, and explicitly states that the examination was not directed primarily toward obtaining knowledge of noncompliance. I want to emphasize that both of these considerations are related solely to the scope of the auditor's examination, and are not intended to imply that special attention need not be given to known or reasonably estimated errors or to questions concerning disclosures in the circumstances described above.

I hope my comments on the matters mentioned in this paper will be helpful in stimulating consideration of materiality by the Auditing Standards Board and by academic researchers. The present situation which requires management and auditors to apply a clearly quantitative concept of materiality without the benefit of authoritative quantitative guidelines or methodology invites, and indeed requires the courts to fill this void on an after-the-fact, case-by-case basis when litigation arises. More important in the public interest however, is the need for professional guidance in the multitude of day-to-day decisions that are required but never involve litigation.

## **Appendix A**

### **Excerpts from Responses to FASB Discussion Memorandum on Criteria for Determining Materiality by Representatives of Preparers, Auditors and Users of Financial Statements**

*Committee on Corporate Reporting of the Financial Executives Institute (CCR Committee)*

The CCR Committee concurs that there is a need for materiality criteria, and we recommend that the FASB proceed with its deliberations and that the statement be issued with the explicit recognition that the statement of criteria will be subject to reexamination upon completion of the Board's project on the conceptual framework for accounting and reporting.

While we believe that a standard which establishes criteria for determining materiality cannot be finalized until the FASB adopts a statement on the objectives of financial reporting (a statement which we recognize must, of necessity, be subjected to lengthy FASB due process procedures), we are not suggesting postponement. On the contrary, we believe that the issuance of a statement on materiality at this time will enhance the credibility of financial reporting, even though the Board may announce its intention to reexamine and possibly amend the criteria after the "objectives" have been adopted.

We recommend that the Board establish a point of departure or threshold for the materiality decision process. We believe that a threshold of 5% of net income has support, since it seems to be the lower end of the issuer range and the upper end of the user range. While the need for a threshold for balance sheet items appears to be less urgent, we would anticipate that a threshold for the balance sheet would be higher than 5%, with the possible exception of situations relating to liquidity concerns and in the case of accounting changes. The adoption of quantitative criteria accompanied by logic and illustrative examples by the FASB would probably have an important influence on the courts in future litigation. The FASB statement should provide financial executives with a more authoritative basis for materiality decisions, as well as enhance the credibility of published financial reports.

*Accounting Standards Task Force on Materiality of the Accounting Standards Division of the American Institute of Certified Public Accountants (The Division)*

The Division believes that an FASB Statement establishing materiality criteria should be issued. Such a Statement would, perhaps, need to be reconsidered upon issuance of a Statement on the objectives of financial statements. Nevertheless, it is believed that a Statement at this time on materiality would provide guidance to the preparers of financial statements which would enhance the utility of financial statements and contribute to the understanding of users.

The Division was guided by practical considerations in recommending the criteria discussed below. The Division believes that quantitative criteria should be established and should be based on the assumption that an amount that is 5% or more of an appropriate denominator may reasonably be presumed to be material. The Division believes that this perception of the threshold of materiality could gain general acceptance and would be workable in practice. However, a minority within the Division believes the quantitative criteria should be a percentage greater than 5%. . . .

There should be a presumption that a matter is material if its current or potential effect is 5% or more of income or loss from continuing operations (i.e. income or loss before discontinued operations, extraordinary items and cumulative effect of an accounting change). Where necessary to prevent the use of an unreasonably low amount as a denominator, average income if greater than the current year's income (or loss) should generally be used. The Division recommends using an appropriate period (e.g., five years) to calculate average income, and loss years or "abnormal" years should be excluded from the calculation if the result would be to distort the average. The Division believes that income from continuing operations is a more useful base for decision making than net income, because this amount is more representative of the ongoing operations of the enterprise.

In certain unusual circumstances, even the use of average income would result in an overly stringent determination of materiality. For example, if a company's income from continuing operations for the past five years is near zero, 5% of this amount would not usually result in an amount which could reasonably be considered material. Where the quantitative criteria would clearly result in an overly stringent requirement, judgment is essential and a more appropriate base upon which to make the calculation should be selected. For example, in some circumstances 5% of net worth might serve as a substitute for income, and items which are 5% or more of this substitute would be presumed to be material. In other situations, published sources of average rates of return for particular industries might serve as a guide for selecting an income substitute.

The Division has concluded that it is not feasible to formulate quantitative materiality criteria based on earnings trends, since these trends vary so widely among companies. For example, a 5% increase in income over the prior year might be considered "normal" in one company, "significantly better than average" in another, and "significantly worse than average" in a third. In addition, if income increased 3% over the prior year and a "trend of earnings" factor was part of the criteria, the materiality level would be extremely low. Further, it is not known whether or not the treatment of an item which affected income by less than 5% but affected the "trend of earnings" by a higher percentage would have an effect on an investment or lending decision of a user in the majority of circumstances.

There should be a presumption that a matter is material if its current or potential effect is 5% or more of the appropriate balance sheet caption as follows: current assets—5% or more of total current assets; current liabilities—5% or more of total current liabilities; noncurrent assets or liabilities—5% or more of total assets. . . .

### *The Financial Analysts Federation*

With regard to the income statement, the financial effect of a matter should be viewed in the context of its relationship to the change in net income. For example, items might be deemed material if they exceeded 5 percent of net income or 20 percent of the change in net income from the prior-period. In no case shall an amount less than 2 percent of the average net income for the most recent three years be considered material. Thus, materiality criteria would not only be related to a level of net income, but also to the change in net income.

Balance sheet matters could be handled in a similar manner. For example, items could be deemed material if they account for more than 5 percent of net quick assets, net working capital, or shareholders' equity.



## Appendix B

### The Impact of Earnings on Stock Prices\*

#### Introduction

The research study described in this report was conducted at the request of the American Institute of Certified Public Accountants (AICPA) and is being submitted to the Financial Accounting Standards Board (FASB) in response to the FASB Discussion Memorandum dated March 21, 1975 relating to "Criteria for Determining Materiality." As contemplated in the AICPA's request, the research was conducted by the author and this report has not been reviewed or endorsed by any committee or representative of the AICPA.

Chapter II of the Discussion Memorandum discusses the concept of materiality in accounting and includes various definitions that have been promulgated or proposed for implementation of this concept. The central theme common to these definitions is that something is material if it would influence an investor's decision. In recognition of this decision-oriented formulation of the concept of materiality, Chapters V and VI set forth the results of interviews and other research concerning investors' decision processes. The interviews and other research underlying those chapters provided the basis for a comprehensive general description of investors' decision processes, but not for a definitive formulation of decision models with quantification of the variables comprehended in the models.

Such models are necessary if standards for materiality are to be related effectively to the impact of accounting information on investors' decisions. This may be illustrated by two oversimplified and extreme examples. Assume first, that the price of a particular stock was known to be exactly a given multiple of earnings; and second, that its price was known to be exactly a given multiple of the S & P average. In the first case, a change of 1% in earnings would cause a change of 1% in price, but in the second case the same change in earnings would not cause any change in price. If materiality is to be related to the effect on investors' decisions, the materiality of a given change in earnings clearly would be different under the two assumed models.

The purpose of the research described in this report was to determine whether a useful composite decision model might be derived from a study of the correlation between earnings and stock prices for reasonable sample of companies for a period of several years. The premise underlying this approach is that, given a general description of the principal factors considered in the decision process, the relative weight given to the respective factors may be inferred from the pattern of behavior suggested by such correlations.

This study was not conducted under any illusion that it would produce a precise or conclusive model, but only to determine whether it could provide information that would be useful in considering possible standards for materiality. To whatever extent the study may provide insight into investors'

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\* The author gratefully acknowledges the services of his partner, Dr. Maurice S. Newman, in providing mathematical consultation and computer programming; and of his research assistants, Mr. Steven Gillingham and Miss Swati Desai, in maintaining files, processing data, and assisting in other respects.

behavior, it may also be relevant to the FASB's consideration of the objectives of financial statements and the conceptual framework of accounting.

If, however, this study or other information furnished to the FASB does not provide a basis for inferring a decision model that is considered sufficiently definitive to be useful in establishing criteria for accounting materiality, this would appear to leave two remaining alternatives. The first alternative would be to establish quantitative criteria with appropriate flexibility based on the subjective perceptions of users, preparers, and auditors as to reasonable levels of sensitivity and practicability. The first alternative was advocated in the response to the Discussion Memorandum which was submitted by the AICPA's Accounting Standards Task Force on Materiality. The second alternative would appear to be a conclusion by the FASB that quantitative criteria are not feasible.

## **Data and Methodology**

This study was described on page 44 of the Discussion Memorandum as follows:

The study focuses principally on earnings per share in relation to the market prices of securities. It seeks to establish the extent of the relationship of those factors and, in turn, to determine whether any general inferences can be drawn about the sensitivity of investment decisions to earnings per share.

The analysis comprehends 300 enterprises selected from the COMPUSTAT tapes of data for 1800 enterprises. Preliminary analysis has been confined to 100 enterprises, but will be extended to 300.

In the first phase of the study, various earnings per share amounts are being correlated through regression analysis with average stock prices for each enterprise over a period of fifteen years. The earnings per share amounts included in the study are the five-year moving average, the five-year trend line (both exponential and linear), and various current measurements, combined in some cases with growth rates. The results of these analyses are expected to give indications of the most significant earnings per share amounts, insofar as it may be inferred that such information influences investment decisions.

The second phase of the study introduces other factors to ascertain those that are significant in combination with earnings per share. These other factors include changes in earnings per share, dividends, changes in dividends, book value, the Standard & Poor's Industrial Stock Price Index, price stability, interest rates, enterprise sales, changes in sales, non-recurring income statement items, earnings variability, growth rates, turning points in growth rates, and changes in trends.

The final phase of the study will attempt to determine whether inferences can be drawn concerning the sensitivity of stock prices to earnings per share that would provide any useful basis for establishing a materiality standard.

## **Data**

The study was based primarily on annual data for the twenty years ended December 31, 1972. In order to permit the use of averages, trends, and other

data based on prior periods, the latest fifteen of the twenty years of annual data were used directly in the regression analyses.

The companies selected were from among those included in the Standard & Poor's Industrial Classification. The data files were screened using two criteria before making the final selection systematically with a random start. The screening criteria used were (1) a full set of data for the periods covered and (2) fiscal years ending December 31.

## Methodology

As mentioned earlier, the mathematical technique used for this research was regression analysis, which was applied through use of a stepwise multiple regression computer program. This methodology is generally accepted for use in studies having characteristics similar to those involved in this research. Any extensive explanation of regression analysis is beyond the scope of this report but may be found in standard textbooks on the subject or to a more limited extent in those on statistics or quantitative methods generally. The following brief explanation is considered sufficient for this report.

The purpose of regression analysis is to compute a mathematical function or equation that will best express the pattern or relationship existing between two or more sets of quantitative data (variables). The variable of primary interest is referred to as the "dependent" variable, and those whose relationship to the dependent variable is to be studied are referred to as the "independent" variables. In this study, average stock prices (the annual high-low average as carried on the COMPUSTAT tapes, adjusted for stock dividends and splits) were used as the dependent variable, and earnings and other data described in more detail later were used as the independent variables. "Simple" regression refers to the use of only one independent variable, while "multiple" regression refers to use of more than one independent variable.

The regression function derived from a regression analysis may be in the form of a linear or a non-linear equation. The form of a simple linear function is as follows:

$$Y'_i = a + bX_i$$

Where:

$Y'$  = estimated value of dependent variable.

$a$  = a constant value computed in the regression analysis.

$b$  = a coefficient (multiplier) computed in the regression analysis.

$X$  = the actual value of the independent variable.

$i$  = a subscript indicating a particular value included in the set of values of the respective variable; for example,  $i = 1, 2, \dots, 15$  if annual values of  $X$  and  $Y$  for 15 years are used in the regression analysis.

The form of a multiple linear function is the same as that described above for a simple function except for the addition of a separate coefficient ( $b$ ) for each additional independent variable ( $X$ ).

The actual value of each of the dependent variables ( $Y_i$ ) will differ from the corresponding estimated values ( $Y'_i$ ) by an amount referred to as the "residual" or "individual error of estimate" ( $e_i$ ) and the relation between the actual and estimated values of the dependent variable may be expressed as follows:

$$Y_i - Y'_i = e_i$$

The computations by which the regression function is determined are designed to provide the "best fit" by minimizing the sum of the squares of the individual errors of estimate. The quantity minimized for this purpose is the sum of the squares, rather than of the actual amounts of the individual errors, because the actual errors will be both positive and negative and their sum will always be zero. A statistic commonly used as a measure of the closeness of the relationship between the variables, or the "goodness of fit" of the regression function, is the "coefficient of correlation." The range of values for this coefficient is from 1 to 0, indicating perfect correlation or the lack of any correlation, respectively.

The details from one of the analyses made in the course of the study are presented to illustrate the matters discussed above in Table 1.

**Table 1**

<i>Year</i>	<i>Actual Data*</i>		<i>Regression</i>	<i>Error of Estimate (e)</i>
	<i>EPS (X)</i>	<i>Price (Y)</i>	<i>Estimate of Price (Y')</i>	
1958	.474	8.185	9.380	- 1.195
1959	.326	9.169	7.977	1.192
1960	.698	9.469	11.502	- 2.033
1961	.615	11.888	10.715	1.173
1962	.831	10.641	12.762	- 2.121
1963	.906	13.660	13.473	.187
1964	1.414	18.391	18.287	.104
1965	1.800	23.285	21.945	1.340
1966	2.377	24.916	27.412	- 2.496
1967	1.935	24.878	23.224	1.654
1968	2.520	36.950	28.767	8.183
1969	3.420	38.150	37.296	.854
1970	3.160	28.650	34.832	- 6.182
1971	1.720	22.450	21.186	1.264
1972	1.840	20.400	22.324	- 1.924
Average	1.602	20.072	20.072	-0-

The regression function for this example is a constant of 4.888 and a coefficient of 9.476, and the coefficient of correlation is .95.

\* The actual data used in this example and throughout the study have been adjusted for stock dividends and splits.

The foregoing example is presented graphically in two forms. In Chart A each point represents the actual EPS and the actual average price for a

particular year as shown in Table 1 above. The solid line represents the regression estimates, and the distance between the line and the individual points plotted represents the errors of estimate. This form of graph illustrates the linearity of the regression estimates, but does not show the data by years and cannot be used where more than one independent variable is included in the regression function.

Chart B shows the same information in a form that obscures the linearity of the regression function but overcomes the two objections mentioned above. In this chart the points connected by the dotted line represent the actual prices and those connected by the solid line represent the estimated prices for the particular years, and the distances between the respective points represent the errors of estimate.

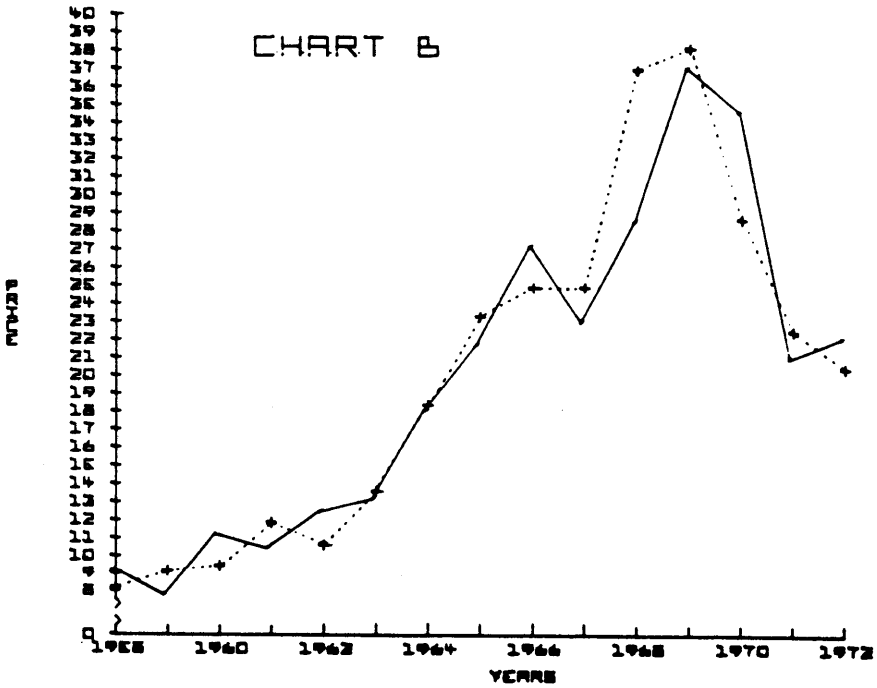
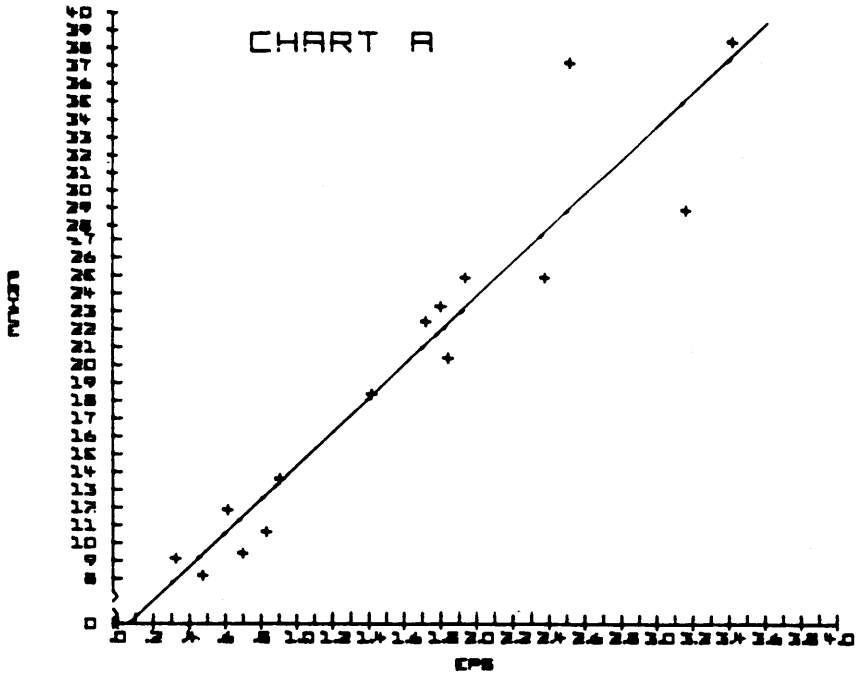
The foregoing example may also be used to illustrate the distinction between the regression coefficient for EPS, the price-earnings ratio, and the price-earnings sensitivity. The price-earnings ratio is discussed because of its common usage but it was not used in this study for the reasons given below.

The price-earnings ratio is itself a variable, and may be used in either a historical or a prospective sense. Historically, it represents the ratio between actual or average price for a particular date or period and actual earnings for a particular period. Prospectively, it may refer to the ratio of current price to estimated earnings for a period ending in the future, or to an estimated ratio of future price to future earnings. Mathematically, the price-earnings ratio would be equivalent to the regression coefficient if and only if the constant term in the regression function is 0 and no independent variables other than EPS are used. Because of these exceptions, the use of an average price-earnings ratio to compute ratio estimates will not provide as good correlation with actual prices as that provided by regression estimates.

In the foregoing example, the average historical price-earning ratio would be 12.529 [20.072/1.602], in contrast to the regression coefficient of 9.476 shown in Table 1; and the correlation of ratio estimates would be .88, in contrast to .95 for the regression estimates.

In this report, "price-earnings sensitivity" (PES) refers to the estimated average percentage change in price associated with a 1% change in earnings based on the regression function. It is clear from the form of the simple and multiple regression functions discussed earlier that the PES factor would be 1 if and only if the constant and any terms other than the one for EPS are 0. If the net effect of such terms is positive the PES factor will be less than 1, and if the net effect is negative the factor will be greater than 1. It should be noted that the sensitivity depends on the relationship of the EPS term to the other terms in the regression function, rather than on the magnitude of the EPS coefficient. In the foregoing example the PES factor is .76  $[(9.476 \times 1.602)/20.072]$ .

A final point concerning the methodology deserves emphasis. This is that regression analysis identifies and measures a mathematical relationship, but does not necessarily establish a logical cause-and-effect relationship between the dependent and the independent variable(s). As one example, a close correlation might be established between rainfall and floods using either as the dependent variable; in this event it would be logical to infer that rainfall causes floods, but not that floods cause rainfall. Another classic example is that a high correlation was once found between increases in teachers' salaries and



increases in sales of liquor, but this does not establish that the latter is caused by the former; the more logical inference is that both of the increases are caused by one or more common factors not included as variables in the analysis. The simple examples are given to emphasize the need for logical analysis and judgment in interpreting the results of regression analysis. For this reason the variables used in this study have been restricted to those for which it is plausible to expect that a meaningful relationship may exist, based on the description of the investors' decision processes and the other research referred to in the Discussion Memorandum.

## **Earnings**

Since decision models may use earnings data from various periods and in various ways, the first phase of the study was designed to determine which of various assumed earnings models provided the best correlation with stock prices before considering any other variables. The Discussion Memorandum and accepted investment concepts indicate that the earnings with which investors are primarily concerned are those expected in the future. Consequently, the assumed models used in this study are considered surrogates for expected earnings.

The Discussion Memorandum and accepted investment concepts also indicate that the primary interest of investors is in ordinary or recurring earnings. For this reason, references to earnings or EPS in this report exclude, unless otherwise noted, amounts identified as extraordinary in the COMPUSTAT tapes from which the data were obtained for this study. It should be noted that the amounts so designated may not necessarily conform with accounting practices prevailing during the respective years or at the present time.

The various ordinary earnings models used in the study and the results obtained are discussed in the following section, and extraordinary items are considered separately in the next section of this report.

## **Ordinary Earnings**

Because of the requirements for five-year summaries of earnings in prospectuses and annual reports, several models based on five-year periods were used. These models were included because of the frequent references in accounting and investment literature to average earnings, trends, and growth rates. These models are described more specifically below.

**Five-Year Average**—This model assumes that the average annual EPS for the most recent five fiscal years is the surrogate for expected EPS for the current year.

**Five-Year Linear Trend**—This model assumes that the trend of EPS for the most recent five fiscal years, projected through the current year, is the surrogate for expected EPS for the current year.

**Five-Year Exponential Trend**—This model is similar to the previous one except that it is based on an exponential rather than a linear function.

**Five-Year Linear Growth Rate**—This model assumes that EPS for the preceding fiscal year, projected on the basis of the average annual

growth rate in EPS for the most recent five fiscal years, is the surrogate for expected EPS for the current year.

The following additional models involving earnings for the current and prior year were also used. In these, as well as in those discussed above, a clear identification of the respective periods referred to is important. Throughout this report the "current" period refers to the period for which the average stock prices are determined and in which the financial statements for the "prior" period are issued; at the present time, for example, 1976 is the current year and 1975 is the prior year. Discussion of the additional models follows:

**Prior Year**—This model assumes that the EPS for the prior year is the surrogate for expected EPS for the current year. It should be noted that this is the latest fiscal-year EPS on which materiality and investment decisions may be focused.

**Current Year**—This model assumes that the actual EPS for the current year is the surrogate for the expected EPS for that year. Since the actual EPS for the current year, of course, cannot be known during that year this model is tantamount to assuming perfect foresight. Although this assumption is unrealistic, it appears useful for analytical and comparative purposes.

**Average of Prior and Current Years**—This model assumes that the average of the EPS for the prior and current years (referred to hereinafter as the "average EPS") is the surrogate for the expected EPS for the current year. This model attempts to compensate in a simplistic way for the decreasing relevance of the prior information, and the increasing availability and relevance of the current information from quarterly reports and other sources, as the current year progresses.

For each of the models described above, time-series regression analyses were prepared for each of the 100 selected companies for the 15 years ended December 31, 1972, using data for those 15 years and for the preceding 5 years for those models that required such data. The results are summarized in Table 2.

**Table 2**

<i>Earnings Model</i>	<i>Average Correlation*</i>	<i>Number Significant*</i>
Five-year models:		
Average	.33	43
Trends:		
Exponential	.50	62
Linear	.55	68
Growth rates—linear	.62	77
Prior year	.63	78
Current year	.66	80
Average (prior and current)	.70	84

\* In this table and elsewhere in this report, unless otherwise noted, the statistical significance of correlations has been determined at the .05 level and average correlation has been computed for 100 companies, with those that were not significant being treated as zeros.



The pattern shown in Table 2 suggests clearly that the most recent earnings information available is the most closely related to stock prices. This suggests also that information about prior averages, trends, and growth rates may be overemphasized. Based on the results shown in Table 2, average EPS for the prior and current periods is used as the variable for ordinary earnings in the analyses discussed in the remainder of this report unless otherwise indicated.

An analysis was also prepared using average EPS to determine whether an exponential function would provide a better correlation than that obtained from the linear function as reported above. The form used for this purpose was:  $\log Y' = a + bX$ . This form was used to the exclusion of those that involve  $\log X$  because logarithms do not exist for negative values and average EPS ( $X$ ) was negative for various companies for various years. The average correlation from this exponential function was .65 with 78 significant correlations, as compared with .70 and 84 respectively from the linear function as shown in Table 2. This suggests that the latter is more relevant for the purpose of this study.

To complement the time-series analyses reported above, cross-sectional analyses were prepared for each of the 15 years using average stock prices and average EPS for each of the 100 companies in each of the 15 years. The average of the correlations obtained for each of the 15 years was .80.

Because of the widespread interest in forecasts of earnings, analyses were run to determine the correlation of forecasted earnings with stock prices and to compare such correlation with that of historical earnings. The source of the forecasts used for this purpose was the *Standard & Poor's Earnings Forecaster* from 1967, the earliest calendar year available, through 1972. This publication lists the most recently available forecasts of EPS for the current fiscal year by various analysts. The data used in this study were compiled generally as follows. For each calendar year, the issue used was the one dated nearest the mid-point of each calendar quarter. Where forecasts from several analysts were given, any which appeared to be extreme in relation to the others were eliminated and the average of the remainder was used for the particular quarter. The average of the forecasts so determined for each quarter was used for the year.

The results obtained from using forecasted earnings determined on this basis for each of the 100 companies for the six years indicated above, and from using the historical average EPS for the same six years are shown in Table 3.

**Table 3**

	<i>Average Correlation</i>	<i>Number Significant</i>
Forecasts	.41	45
Historical	.44	48

The results shown above are substantially lower than those shown in Table 2 for historical earnings. This appears to be caused primarily by the effect of the lower number of years used in the tests of significance. To eliminate this effect, analyses were run using the same data, but with the significance tests suppressed. These analyses showed average correlations of .60 for forecasts

and .69 for historical, with the latter being more comparable to the results in Table 2. Apart from the level of correlation, however, the more important result is that both sets of analyses show lower correlation for forecasts than for historical earnings.

This somewhat surprising comparison suggests that either (1) the relative weight given to forecasts versus historical earnings in investment decision may be less than the popular belief, or (2) the analysis is faulty in some respect. As to the latter possibility, several observations seem pertinent. Insofar as the author was able to determine, the publication used is the most comprehensive compilation publicly available. The average of quarterly forecasts for the current year should provide a more timely measure of expectations throughout the year than the average of the earnings of the current and prior years as used in the historical analysis; otherwise the time frames are the same in the respective analyses. Three possible sources of bias in the data used are as follows: (1) forecasts not included in the publication used, (2) differences between the relative number of investors who may have been influenced by the different forecasts included and the relative number implicit in the averages used, and (3) the extremes eliminated in computing the averages as discussed earlier. The author doubts that any of these possible sources of bias is significant.

### **Extraordinary Earnings**

As indicated earlier, the foregoing analyses were based on the assumption that the earnings of primary interest to investors exclude extraordinary items. To test the validity of this assumption, an analysis was prepared for the 100 companies for 15 years using the average total EPS (including extraordinary items) as the independent variable. The average coefficient of correlation from this analysis was .65 as compared with that of .70 obtained by using average ordinary EPS. This result, combined with the evidence cited in the Discussion Memorandum and other sources, seems to confirm the validity of the assumption that ordinary earnings are of primary interest to investors.

### **Cash Flow**

There have been suggestions that investors may give more attention to cash flow than to earnings, either because they consider it more important, more objective, or more comparable between companies. For this reason, an analysis was prepared using average cash flow as the independent variable. This analysis showed an average correlation of .58 as compared with .70 for average earnings. This comparison suggests that investors do not consider cash flow more significant than earnings, and accordingly cash flow was not used further in this study.

### **Other Variables**

In the second phase of this study, the other variables mentioned earlier under "Data and Methodology" as quoted from the Discussion Memorandum were used in various combinations. Those for which the results were considered of interest are discussed in this section.

In addition to the level of ordinary earnings as discussed above, the five-year growth rate and variability of such earnings, and extraordinary earnings were used because of their possible relevance to earnings expectations. Dividends were used because of the general presumption that the distinction between distributed and undistributed earnings is significant to investors. The average of the dividends for the prior and current years was used for the reason explained earlier with respect to the use of average earnings. Book value was used primarily to test the prevalent presumption that it is not significant to investors. The market-related variables used were the Standard & Poor's average of stock prices for 425 industrial companies and an index of price stability (or variability). It was assumed that the S&P average would appropriately measure the combined effect of external factors affecting the market generally, and accordingly no effort was made to analyze any such factors individually. The use of average prices by industry classifications was considered impracticable because of the difficulty of establishing consistency in such classifications for the number of years covered, and was considered unnecessary because of the limited effect of such classifications indicated by earlier studies. The price stability index was computed for each company for each year by dividing the high-low price range by the corresponding price average.

Three of the variables mentioned in the preceding paragraph—dividends, book value, and the S&P average—appear to be of sufficient interest to consider individually. The average correlation obtained from the respective analyses in which these variables were used was as shown in Table 4.

**Table 4**

<i>Variables</i>	<i>Average Correlation</i>	<i>Number Significant</i>
Average dividends	.53	67
S & P average	.36	53
Book value	.39	48

A multiple set of variables, consisting of average EPS and all of those mentioned in the second preceding paragraph, was used in (1) time-series analyses covering 15 years for each of 100 companies and (2) cross-sectional analyses covering 100 companies for each of 15 years. The results obtained from these analyses and a comparison with those obtained from using average EPS only are presented in Table 5.

**Table 5**

	<i>Multiple Variables</i>	<i>Average EPS Only</i>
Time-series analyses:		
Number significant	95	84
Average correlation	.85	.70
Cross-section analyses:		
Number significant	15	15
Average correlation	.82	.80

As was expected, the use of multiple variables improved the overall results of the time-series analyses by companies but reduced the number of companies for which average EPS was a significant variable. This reduction was from 84 to 45.

The following summary shows the number of companies for which significant correlations were obtained and the number of such companies for which the respective variables were included in the significant set of variables, with an analysis indicating whether average EPS was included or excluded from the significant set:

**Table 6**

	<i>Total Significant</i>	<i>Average EPS</i>	
		<i>Included</i>	<i>Excluded</i>
Companies	95	45	50
Variables:*			
Average EPS	45	45	-
S&P average	24	7	17
Book value (beginning)	22	8	14
Average dividends	21	7	14
Five-year earnings:			
Growth rate	20	2	18
Variability (standard error)	14	10	4
Extraordinary earnings	11	2	9
Price stability index	9	3	6

\* The total of the variables listed exceeds the number of companies because of the cases in which more than one variable was significant for a particular company.

The number of years for which the respective variables were significant in the cross-sectional analyses is shown below:

**Table 7**

<i>Variables</i>	<i>Years</i>
Average EPS	15
S&P average	0
Book value (beginning)	1
Average dividends	9
Five-year earnings:	
Growth rate	0
Variability (standard error)	6
Extraordinary earnings	0
Price stability	8

### **Price-Earnings Sensitivity**

The average price-earnings sensitivity factors computed as stated previously from the principal analyses are shown in Table 8.

**Table 8**

	<i>Multiple Variables</i>	<i>Average EPS Only</i>
Time-series analyses—		
Average sensitivity based on:		
Total companies (100)	.46	.78
Number of companies for which average EPS was a significant variable (45 and 84, respectively)	1.02	.93
Cross-sectional analyses—		
Average sensitivity based on total companies	.83	.99

With the foregoing presentation of data concerning price-earnings sensitivity, we move to the more difficult problem of evaluation of the possible implications for establishing criteria for materiality in accounting. For this purpose, we consider first the time-series vs. cross-sectional analyses, and second the use of multiple variables vs. average EPS only.

In considering the relative merits of time-series and cross-sectional analyses for the purposes of this study, it appears that the advantages of one are the disadvantages of the other and vice versa. The time-series analyses for individual companies eliminate the effect of differences between companies, while the individual cross-sectional analyses eliminate the effect of differences between years. Consequently, the results of the respective analyses are somewhat complementary. On balance, however, it appears that the time-series analyses may be more meaningful for this study because the variability between companies is greater than that between years. This is indicated by the fact that the average of the relative standard errors of estimate for the multiple-variable cross-sectional analyses was .48 as compared with .14 for the corresponding time-series analyses.

Conceptually, the results from using multiple variables are preferable to those from using only average EPS for two reasons. First, the plausibility of significant variables other than EPS is established in the Discussion Memorandum and investment literature. Second, the correlation obtained from the use of multiple variables is higher. However, it is difficult to discern significant patterns or in some cases a rationale for the regression functions developed from the multiple variables for individual companies.

The multiple-variable analyses present a dilemma in that they show average EPS as being significant for only 45 of the 100 companies. For this reason, any use of the average from such a skewed distribution of the 100 companies would be questionable. Conversely, any use of the average for the 45 significant cases could result in unduly restrictive criteria for companies as to which EPS may not be significant. However, the latter appears to be the more acceptable of the two unattractive alternatives offered by the multiple-variable analyses.

Another possibility is to discount the conceptual preferability of the multiple-variable analyses and assume that EPS data were the only significant variable. Pragmatically, the difference between this approach and the alterna-

tive suggested in the preceding paragraph would not be very great (1.02 vs. .93) as shown in Table 8.

### **Materiality Decision Model**

Given any level of price-earnings sensitivity, further consideration is required to translate such information into logical criteria for accounting materiality. The considerations required for this purpose are referred to herein as a materiality decision model.

Any change in earnings could be considered material at any level of sensitivity if changes in investment portfolios could be made without incurring costs. This is not the case, however, and consequently such costs should be included in the decision model. Further, since changes in investments involve two transactions, the model should include the costs of both.

The principal costs to be considered are commissions and the price effects of blockage (size of blocks traded). A recent report by the SEC (Second Report to Congress on The Effect of the Absence of Fixed Rates of Commission, dated March 29, 1976.) indicates that the average commission as a percentage of the principal value of all trades is approximately 1.6% for individuals and .6% for institutions. Discussions with investment personnel familiar with "best execution" trading strategy, which is designed to minimize the total of commission and blockage costs, indicate that the latter ordinarily are significantly greater than the differential between the average commission costs of individuals and of institutions. Consequently, it seems reasonable for the purpose of this study to consider that the average cost of changing from one investment to another is at least 3.2% (1.6 x 2).

An important consideration in the decision model is that incurrence of transaction costs is certain, while realization of the expected benefits is uncertain. Consequently, the cost-benefit inequality inherent in the model requires that the expected benefits be expressed in terms of a high degree of assurance. This can be accomplished by using the standard error associated with the sensitivity factor to compute a "lower sensitivity limit" for comparison with the transaction costs. Since a range of three standard errors around a statistical estimate provides virtual certainty where a normal distribution of such estimates may reasonably be assumed, a lower sensitivity limit computed on this basis seems appropriate for use in the model being discussed here. Such a limit represents the maximum change in price that could be considered virtually certain from a 1% change in earnings—in contrast to the estimated change based on the sensitivity level, as to which there is an equal risk of variation in either direction. Based on the average standard error applicable to the sensitivity factor of 1.02 shown in Table 8 the lower sensitivity limit computed as suggested above is .50.

The materiality decision model described above can be summarized as follows:

$$M = C/S$$

Where:

M = Materiality limit—the maximum effect on ordinary earnings that would be immaterial.

C = Cost of change in investments.

S = Lower limit of price-earnings sensitivity.

Based on this model and the data presented earlier, a reasonable materiality limit in relation to effect on ordinary earnings for a year would be 6.4% (3.2/.5).

The data and rationale culminating in the foregoing computation should be evaluated in the context of the caveat expressed earlier: "This study was not conducted under any illusion that it would produce a precise or conclusive model, but only to determine whether it could provide information that would be useful in considering possible standards for materiality." Two considerations seem particularly relevant in evaluating the usefulness of this study. First, insofar as known to the author, it is the only approach that has been developed for considering materiality criteria analytically rather than subjectively. Second, the results of the study tend to corroborate the general range of subjective judgments expressed by many practicing accountants. For example, the response by the AICPA's Accounting Standards Task Force on Materiality recommended a level of 5% of ordinary earnings, with appropriate flexibility for unusual circumstances, which compares with 6.4% developed in this study. (The author of this study was a member of the AICPA Task Force but the study had not been completed, no preliminary conclusions had been formed, and no consideration was given to the study at the time the recommendations of the Task Force were formulated.)