AN EMPIRICAL EXAMINATION OF INCOME MANIPULATION

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
EUGENE A. IMHOFF, JR.
1973

This is to certify that the

thesis entitled

AN EMPIRICAL EXAMINATION OF INCOME MANIPULATION

presented by

Eugene A. Imhoff, Jr.

has been accepted towards fulfillment
of the requirements for

Ph.D degree in Business - Accounting

Major professor

Date August 9, 1973

O-7639

ABSTRACT

AN EMPIRICAL EXAMINATION OF INCOME MANIPULATION

By

Eugene A. Imhoff, Jr.

The purpose of this research was to test the ability of the proposed classification technique to discriminate between potential income manipulators and non-manipulators. The proposed classification technique was based on the strength of the association between reported net income and reported sales trends.

The first step of the research was to examine the association between sales and net income data for each of the 41 firms included in the study. The 41 firms included were selected primarily on the basis of the quantity of income statement data they provided. The association between the sales and net income data for the 41 firms, as measured by the coefficient of determination, indicated that major differences in the sales-net income relationships existed among the firms examined.

The classification of firms was based on the assumption that firms should naturally have a relatively strong relationship between reported sales data and reported net income data, and therefore the net income trend should be associated with the trend in sales. Hence, firms which had relatively strong (R^2 greater than .75) sales-net income relationships were classified as non-manipulators (NM firms), and those with relatively weak (R^2 less than .50) relationships were classified as potential manipulators (PM firms).

Two tests were made to determine the nature and cause of the differences in the sales-net income relationships. The first test was conducted to determine if either group had a significantly greater number of income statement variables which improved the basic sales-net income relationship. The test results indicated that the number of variables which improved the basic sales-net income relationships was not significantly different for the PM and NM firms. All but one of the 33 classified firms had at least one variable which was capable of improving the relationship between sales and net income at the .05 level of significance.

The second test examined the 277 variables of 33

classified firms in terms of four general behavior patterns. Using the same definitions of "weak" and "strong" that were indicated above, the variables were examined for the presence of one of the following behavior patterns: (1) strong correlations with both sales and income, (2) strong correlation with sales and weak correlation with income, (3) weak correlation with sales and strong correlation with income, and (4) weak correlations with both sales and income.

Variables which reflected the first two behavior patterns were not considered to be income manipulating variables due to the consistency of their behavior with respect to sales. Variables which reflected the third and fourth behavior patterns were considered to be capable of manipulating income due to the inconsistency of their behavior with respect to sales.

Chi-square tests of the frequency distribution of each behavior pattern among the PM and NM groups indicated that differences existed in each behavior pattern at the .05 level of significance. The PM group of firms had a significantly greater number of variables with the second, third and fourth behavioral characteristics. These results tended to support the PM-NM classifications.

The final stage of the research was to illustrate how variables were capable of manipulating reported net income. Four tax expense variables which were weakly correlated with both sales and net income were examined. The behavior of these variables was considered to be indicative of the type of behavior which would be capable of manipulating reported net income.

The first conclusion of the research was that major differences did exist in the strength of the sales-net income relationships of the firms examined in the study. These differences were found to exist even among firms in the same industry classification.

The second conclusion of the research was that PM firms had a significantly greater number of variables that were capable of manipulating income than NM firms.

Finally, based on the two conclusions above, the classification technique proposed and tested in the research was considered to be capable of discriminating between potential income manipulators and non-manipulators.

AN EMPIRICAL EXAMINATION OF INCOME MANIPULATION

By

Eugene A. Imhoff, Jr.

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Accounting and Financial Administration

1973

ACKNOWLEDGMENT

There are many who deserve recognition for their contributions and assistance which aided me in completing this thesis. To Dr. R. F. Salmonson, Chairman of my committee, I owe a great deal more than a simple thank you. His direct contributions to improve the organization and readability of the thesis were numerous and showed great patience. The direction and guidance which he continuously provided me with, always without delay, displayed both interest and consideration far greater than that called for by a Chairman, for which I am sincerely grateful.

To Dr. Richard Lewis, who served on my committee and provided me with the technical knowledge and assistance that aided me frequently and significantly in the research, and will continue to benefit me in the future, I extend my heartfelt appreciation and thanks.

To Dr. Melvin O'Connor, who served on my committee and whose comments and guidance particularly in the early stages helped me to focus my efforts and develop an appropriate mental attitude concerning the dissertation, goes

my sincere thanks.

I would also like to express my thanks to my fellow doctoral students whose comments both in class and in informal conversations contributed very meaningfully to the successful completion of the thesis. And in addition to my committee and fellow students, I would like to specifically thank Professors Jones, Olson, and Collins for their constructive criticisms and comments, and Dr. Ronald Marshall for the hours spent in discussions which proved fruitful to me. I am also, of course, indebted to Jo McKenzie whose efforts in physically completing the thesis provided this end result.

Finally, but far from last in importance, I wish to thank my wife, Barbara, for her unending support, confidence, patience, and affection throughout.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The first chapter of this dissertation presents the issues upon which the research was based, the resulting purpose of the research, and the approach and organization of the chapters to follow.

The Issues

The degree of confidence in the reliability of the published financial statement information was the central issue upon which the research was based. More specifically, the issue involved the fact that there is considerable controversy over the reliability of the process of income determination.

Charges have been levied by persons in various disciplines concerning the creditability of the income statement.[1] Although the charges have taken many different forms, a great deal of the criticism has been aimed at the flexibility of income measurement guidelines. It has been demonstrated that the flexibility of these measurement guidelines (or accounting methods) will permit many

different measures of income to be reported for the exact same set of events.[2] As a result, it is possible for a firm to exert some influence on its reported net income by its selection, or change in selection, of accounting methods to be employed in the measurement process. To be sure, different accounting methods do not exist for the purpose of allowing firms to exert influence on their income measurement. The different accounting methods reflect the fact that all items of a particular classification of items are not sufficiently uniform among firms to be accounted for in the same manner.

For example, all items classified as inventory are not so similar that a single accounting method, which served as a guideline for their measurement, has been found to be generally acceptable. Varying situations have necessitated the development of different methods of accounting for inventory which have been pragmatically, if not logically, derived. To require all inventory to be accounted for in the same manner would be far too restrictive and unrealistic to permit general agreement to be attainable. On the other hand, an expansion of the classification of items to permit the definition of all the various types of inventory and the most appropriate method of accounting measurement for each classification

could provide a solution to the flexibility problem. However, unless the "appropriate method" were somehow determined on a case by case basis, the result would simply be a more detailed and enumerative "use-this-method-for-this-general-situation" type of guideline system, a mere expansion of our present situation and the problems relating thereto.

While criticism of the flexibility permitted in accounting methods selection and the resulting lack of rigidity in income measurement continues, two facts should be stated in defense of such criticism. First, improvements in reporting requirements have been made in recent years which now require disclosure of the effects of changes in accounting methods on reported income.[3] This is in addition to the fact that frequent and significant changes in accounting methods had previously been guarded against to a considerable extent by auditing standards and procedures.

Second, while much is made of the permissiveness of accounting methods, little mention is made of other vehicles available to the management whose intention is to exert influence on its reported income. The management of a firm may choose to influence reported income by the way it handles the recording of non-transaction

based events, such as the determination of additions to "allowance", "reserve", and to contra accounts which affect revenues and expenses. Also, real events such as the amount to be expended on advertising or research and development may be specified or adjusted with the intention of influencing income. There are numerous ways in which a firm's management might act to influence reported income without changing accounting methods, if it so desired.

These two facts do not refute criticism of the income measurement process. They do imply that changes in accounting methods are not frequently occurring events which are flagrantly misused by management, and that other vehicles for influencing reported income do exist. By no means do they imply that a potentially serious problem does not exist.

It is clear that a firm's management, through various actions, is capable of exerting influence on the measurement of various revenue and expense accounts and is thereby able to manipulate its reported income. And if situations do exist, where management actions are taken with the intention of manipulating reported income, then the income statement becomes nothing more than a measure of the aspirations of the management that contrived it.

The mere fact that such a situation may exist, that the reported income figures might be influenced by a firm's management, presents the accounting profession with a critical weakness that may reduce the credibility and usefulness of the entire accounting function. To substantiate the existence of the problem and its importance, the degree of awareness of the problem of the reliability of the income statement and the significance of the income statement itself must be examined.

Awareness of the Problem

It is appropriate to say that unless there is an awareness of a problem situation, then no problem exists. The literature of accounting, finance, and business in general certainly reflects an awareness to the potential, if not real, problem of the reliability of the income measurement process and the resulting income statement.[4]

The presence of such terms as "Income Smoothing", "The Big Bath", "Quality of Earnings", and "Income Manipulation" can be frequently found in such literature. The general implication of such terms is that management deliberately adjusts reported income. The most general term for such activity is income manipulation, which is the central issue of this research.

The frequency with which the general concept of income manipulation has appeared in the literature is substantial enough to confirm that an income statement creditability problem does exist. A review of the literature which has been directed at the concept of income manipulation is examined in Chapter III.

The Import of the Income Statement

There is a generally accepted theory that the income statement is currently the most widely used, if not the most important, segment of accounting data. This theory is evident by the evaluation of the income statement and its role in relation to other accounting information provided by both the 1966 American Accounting Association committee to prepare A Statement of Basic Accounting Theory and the American Institute of Certified Public Accountants Accounting Principles Board Statement No. 4. Substantiation of the appropriateness of this theory is very clearly pointed out by Ball and Brown who, through their empirical research involving stock market reactions to various bits of information, arrived at the following conclusion:

> "Of all the information about an individual firm which becomes available during the year, one-half or more is captured in that year's income number."[5]

Such conclusions support the theoretical premise that users of financial data rely considerably on the information content of earnings.

There exists additional information which substantiates the importance of the income statement. For example, in the finance literature most models depicting investor behavior are based on the present value of the discounted future stream of dividends. The association between dividends, earnings per share, and reported income is substantial and was clearly established by McDonald as a foundation for his dissertation.[6]

Purpose

The importance of the income statement and the awareness of a problem concerning its reliability have been established. The purpose of the research reported here was to test the ability of a proposed classification technique to effectively discriminate between firms which had potentially manipulated reported net income and those firms which had not manipulated reported net income. The classification technique was based on a fundamental income statement relationship which is explained in detail in Chapter II.

The accounting profession is faced with numerous

problems today, and while the creditability of the income statement is only one of the problems, it should be viewed as a serious one.

The information in an income statement is a major part of the total output of accounting information. Many new and different types of information, some of it related to income reports (such as earnings forecasts), are being sought by those who use financial data, and the accounting profession is being called on to provide much of it. If the profession cannot substantiate the quality of its current output in the face of criticism concerning that output, it is doubtful that it can or will play a meaningful role in providing new and more desirable types of information. If the profession cannot clearly and meaningfully report on what has taken place in the past period, it is extremely doubtful that it can for example provide meaningful forecasts of what the future will hold.

Organization of the Study

Chapter II of this dissertation reports on the analysis of income manipulation concepts and definitions, and considers the role of income smoothing in the manipulation framework. The general problems which have been encountered in previous manipulation research are

considered. A method of classifying firms as potential manipulators and non-manipulators is then described, followed by an analysis of how the problems encountered in previous research are dealt with by the classification method.

As previously mentioned, Chapter III contains a review of the previous research in the area of income manipulation. The review is limited to the empirical research efforts which have been reported in the literature.

Chapter IV includes a statement of the research questions examined in the dissertation. The research methodology and the data collection techniques which were employed in the research are then described, followed by a brief description of how the research methods related to the research questions.

Chapter V of the dissertation reports the results of the research testing, an analysis of the results and how they provide the answers to the two research questions posed in Chapter IV.

And finally, Chapter VI provides a summary of the research findings and the conclusions drawn from the research.

Chapter I--Footnotes

1. For examples, see R. M. Copeland and M. L. Moore, "The Financial Bath: Is It Common?", MSU Business Topics, Vol. 20, No. 4 (Autumn, 1972), pp. 63-69; John H. Myers, "Depreciation Manipulation for Fun and Profits", The Financial Analysts Journal (Nov.-Dec., 1967), p. 119; "What Are Earnings? The Growing Credibility Gap", Forbes, May 15, 1967, p. 42; Leonard Spacek, What is Profit? (Cambridge, England: The Institute of Chartered Accountants in England and Wales, 1970), p. 26.

2. For examples, see M. C. O'Connor and J. C. Hamre, "Alternative Methods of Accounting for Long-Term Nonsubsidiary Intercorporate Investments in Common Stock", The Accounting Review, Vol. XLVII, No. 2 (April, 1972), pp. 308-319, and also R. J. Chambers, "A Matter of Principle", The Accounting Review, Vol. XLI, No. 3 (July, 1966), pp. 443-457.

3. Accounting Principles Board, "Opinion No. 20: Accounting Changes", and "Opinion No. 22: Accounting for Policy Changes", APB Accounting Principles, (American Institute of Certified Public Accountants, New York, New York).

4. See note 1 above.

5. Ray Ball and Philip Brown, "An Empirical Evaluation of Accounting Income Numbers", The Journal of Accounting Research, Vol. VI, No. 2 (Autumn, 1968), p. 176.

6. Charles Le Roy McDonald, An Empirical Examination of Published Predictions of Future Earnings. Unpublished Ph.D dissertation, Michigan State University, 1972.

CHAPTER II

AN ELABORATION OF INCOME MANIPULATION AND A PROPOSED GUIDELINE

Arriving at Some Definitions

The literature to date coming under the general heading of income manipulation can be divided into two general areas.

1. Literature dealing with the topic of income smoothing.
2. Literature dealing with other types of income manipulation such as taking a "bath."

The majority of references to the concept of income manipulation which appear in the literature are not based upon empirical research. Of the empirical research that has been conducted, a great deal of it has been in the income smoothing area. This point is suggested by Copeland who states, "One manipulating goal widely attributed to management is the desire to smooth reported income."[1] Further evidence of the prominence of research dealing with income smoothing as opposed to manipulation in general is provided in the review of empirical literature

in Chapter III.

An income smoother is usually defined as a firm which manipulates its reported income to obtain a smooth income trend. Stated another way, an income smoother is a firm whose "managers perceive their performance measure to be a decreasing function of earnings variability".[2] These definitions of income smoothing appear to be clear but are realistically somewhat difficult to apply in attempting to empirically determine if a particular firm is an income smoother. And while variations from these definitions are slight, it is significant that they are not the only definitions. Although the various definitions of income smoothing are not identical, and few definitions explicitly indicate that smoothing income is the result of an act of management, they all strongly imply that the smoothing phenomenon is the result of management actions to manipulate.

Given that income smoothing may be defined as the result of management actions to significantly decrease the variability of earnings through the manipulation of the income statement variables,[3] it is clear that income manipulation is a necessary but not sufficient condition for income smoothing to be present. In other words, income manipulation (defined to mean the result of

management actions of any type which are undertaken to significantly influence reported income) is necessary if income smoothing is to take place, but income manipulation itself does not necessarily result in a decreasing variability in reported income (or income smoothing). Income smoothing not only necessitates income manipulation, but it also requires that the manipulation be in the appropriate direction. Income smoothing may be viewed as a special case of income manipulation. Hence, an income smoother is an income manipulator whose objective is to manipulate income so that the income pattern through time presents a smooth trend line.

There is not complete agreement in the smoothing literature as to what the pattern of the trend line should be. While some feel that the pattern should be a constant income trend, others feel the pattern should present a strictly increasing income trend to reflect a constant or an exponential growth rate.[4]

The first concept is expressed by the formula:

$$E(I)_{t+1} = I_t \qquad (1)$$

where: $E(I)_{t+1}$ = expected value of reported income in period t+1

I_t = actual income reported in period t.

The variability of income using this model is reflected by the sum of the absolute changes in income from period to period, since the expected income number in the coming period is that income which was last reported.

The second concept of income smoothing is similar to the first except that the actual income in period t is operated on by a constant and/or an exponent such that:

$$E(I)_{t+1} = \alpha I_t^B + e \qquad (2)$$

where: e = residual error term,
α = constant,
B = exponent,
$E(I)_{t+1}$ = as above,
I_t = as above.

In this model, the expected income number for the coming period is some multiple of the income which was last reported.

The estimated rate of increase in income could be based on a time series regression estimate computed from previous reported income data, or some other basis. The variability is reflected in the sum of the residual error terms. The general concept of a constant growth model has been hypothesized by some to be the "ideal norm of behavior".[5]

There is no strong support for selecting one concept

of smoothing over the other. If the theory that firms have a life-cycle pattern where they experience periods of growth, stability, and decline is accepted, then the most appropriate smoothing concept in any given instance would depend on a case by case analysis to determine what stage of its life cycle a firm was in. The life-cycle theory rules out the possibility of a single acceptable concept of a pattern or trend which would reflect income smoothing. Both concepts have their drawbacks which are examined in more detail later in this chapter.

An Apparent Inconsistency

Given that the definitions of income smoothing and income manipulation are acceptable, it has been shown that income smoothing is a special and more restricted case of income manipulation. It can also be stated that the empirical research on income smoothing makes up nearly all of the research available in the area of income manipulation. This appears to be illogical since it would seem that the more restricted case of income manipulation would be more difficult to detect than income manipulation in general. While there is some agreement that income smoothing is a special case of manipulation, there is no

reason explicitly or implicitly stated in the literature to explain why most research has been directed at this special case of manipulation.[6]

The situation may be due to the fact that there exists a generally agreed upon and clearly defined standard by which income smoothing may be measured, which is the variability of reported income. The models presented earlier describe the techniques which have been used to measure such variability. In defining manipulation as management actions which are undertaken to significantly influence reported income, the effect of manipulation on the reported income numbers is unclear. Hence, income smoothing, by virtue of its having a predictable effect on reported income, has a degree of specificity which provides for its potential measurement while income manipulation does not.

Before income manipulation in general can be adequately researched, a guideline for detecting manipulation must be developed, since a commonly accepted guideline does not currently exist. A proposed guideline for detecting income manipulation is developed later in this chapter.

Smoothing Research Problems

The problems which have a bearing on income smoothing research and on general manipulation of income as well will be discussed under the following four categories:

1. Cycle Problems
2. Disclosure Problems
3. Economic Conditions
4. Bath Phenomenon

Cycle Problems

It has already been established that the life-cycle theory of the firm presents some problem, to the degree that the theory is realistic. If firms do have a life cycle portrayed by a period of growth followed by a period of stabilization and later decline, then it would have a definite bearing on the type of smoothing model used to measure the variability of reported income.

The constant model (1) would fail to detect smoothing in growth firms, and the exponential or growth model (2) would fail to detect smoothing in the stable firms, and both models would fail to detect smoothing for firms in a state of decline (unless the α coefficient and/or the B exponent in model 2 were allowed to be less than unity). In order to select the appropriate model in each case,

some scheme for classifying all firms into one of the three life cycle stages would be necessary. No recognition of the life cycle theory has been made in the research dealing with income smoothing and, to the extent that the theory is appropriate, the results of such research have been distorted.

It would be possible to apply both models (1 and 2) to each firm and select that model which provided the "best fit" to the reported income streams. Such a technique, aside from being biased toward obtaining a maximum number of inconsistently defined smooth income streams, has some obvious problems.

If a firm were in the process of changing from one stage in the life cycle pattern to another during the period which the reported income data were collected, it could be misclassified as a "non-smoother" while in fact it was a smoothing firm. Also, the assumption that such a technique truly classifies firms into their appropriate stage of the cycle would necessarily have to be made and supported in order to substantiate the inconsistency in the models used to measure variability. In addition to these problems, the appropriate classification of the random sample, or the sample of non-smoothing firms must be made to permit a meaningful "benchmark" for comparison

with both model and model 2 smoothers. In summary, to the extent that the life cycle theory is appropriate it presents income smoothing research with a considerable problem to overcome.

Another cycle problem affecting smoothing research is that of cyclical industries. Some industries are commonly felt to be cyclical in nature, such as the building materials industry.[7] The inclusion of firms in cyclical industries in the sample of firms used for income smoothing research represents a problem very similar to that of the life cycle problem discussed above. An additional question regarding firms in a cyclical industry is: Should the cycle be reflected in the reported income stream, and if so, to what degree?

While no reference has been made to the effect of the life-cycle theory, some indirect recognition has been given to the cyclical trends of reported income in general. Two studies discovered that a shorter time period over which the data are collected to fit the various smoothing models will result in a better fit of the income data to the trend line than in longer time periods.[8] The implications are that shorter time periods for test purposes will reduce cyclical effects in reported income and will decrease the standard error of estimate of

income trend lines. As a result, what little consideration has been given to the cycle effects in general has only served to restrict the usefulness of the "smoother, non-smoother" classification systems that do exist.

Disclosure Problems

Perhaps the most pressing problem facing manipulation research is the lack of disclosure of sufficient income statement data. Nearly all income smoothing research has relied on the examination of various income statement variables to either support a "smoother, non-smoother" classification system derived independently of the income statement variables, or use them as a basis for classifying firms as smoothers or non-smoothers.

The general purpose behind the examination of various income statement variables is to determine if they result in income smoothing or income manipulation. Unless income statement variables are disclosed, it is impossible to determine if they are being used to smooth or manipulate income. Therefore, a firm that actively manipulates income could conceal the means by which it conducted its income manipulation simply by not disclosing the income statement variables used to manipulate. This may be easily accomplished by consolidating manipulated variables

and other variables into some aggregated income statement classification such as "cost of goods sold" or "selling, general and administrative expenses". Such massive consolidation of income statement accounts will tend to obscure any efforts to manipulate, making the detection of manipulated variables virtually impossible.

While there are guidelines for disclosure in both published financial statements and financial statements presented to regulatory agencies, they generally do not provide sufficient disclosure for many research needs.

Public Requirements

The American Institute of Certified Public Accountants (AICPA) has stipulated its general disclosure requirements in its reporting standards which are a part of the ten Generally Accepted Auditing Standards to which all audited financial statements must conform.

The purpose of the standards as established in the Statements on Auditing Procedure (SAP) No. 33 follow:

> Auditing standards differ from auditing procedures in that "procedures" relate to acts to be performed, whereas "standards" deal with measures of the quality of the performance of those acts and the objectives to be attained by the use of the procedures undertaken. Auditing standards as thus distinct from auditing procedure concern themselves not only with the auditor's professional qualities

> but also with the judgment exercised by him in the performance of his examination and in his report.[9]

The four Reporting Standards deal with the report by the auditor on the audited financial statements, the Third Reporting Standard being:

> Informative disclosures in the financial statements are to be regarded as reasonably adequate unless otherwise stated in the report.[10]

As a result, unless the auditor's report indicates otherwise, it may be assumed that the disclosure presented in the published financial statements is "reasonably adequate", without clearly distinguishing adequacy from inadequacy. Any sample of published annual reports will help to point out how loosely this standard can be interpreted. The general income statement format that is typically presented consists of "cost of goods sold", "selling, general and administrative expenses", "tax expense", and perhaps a few other accounts. The amount of detailed account information to be found in published annual reports is generally minimal.

Regulatory Requirements

While the annual reports provide very little income account information to shareholders, there are other less accessable sources which do provide income statement data

in some detail. The Securities Act of 1933 and the Securities Exchange Act of 1934 were the initial measures taken by the government to regulate publicly traded companies. The Securities Exchange Commission (SEC), which was established as a result of the 1934 Act, has developed and made numerous revisions to Regulation S-X which represents the most rigorous financial reporting requirements imposed on today's publicly traded corporations. But while the financial statements and supporting schedules which are available as a result of regulation S-X provide much more information than is found in annual reports, the information is not readily available to the public. The documents filed by corporations as a result of regulation S-X are generally on file only at the offices of the SEC in Washington D.C.

Some services do obtain and reproduce some financial information from these documents (principally the annual form 10-K), making it more readily available to the public. Moody's has, for many years, derived certain financial facts from SEC reports to include in its annual reporting service information, and stipulates those cases where the financial information was obtained from SEC documents. More recently, some SEC derived financial information has become available on the Compustat Tapes.

These sources have been invaluable to researchers seeking detailed financial data not found in annual reports.

But the need for additional information continues. The public at large, as well as the financial community, continues to demand more and more information. The fact that there is a greater demand for more readily available information is reflected in the recent success of Leasco Information Products, Inc. The following statements from an article entitled, "Disclosure-Decision Making with an Edge" point out the demand for more financial data and Leasco's role in filling that demand.

> The ability of the financial community to make sound decisions about its money has always been largely a matter of how much information it could lay its hands on. That has been the principle underlying a series of federal acts dating back to 1933 that require publicly owned corporations to disclose increasing amounts of information about their business.
>
> For many years, the enormous volume of documents filed by public corporations (now approximately 10,000) have (sic) glutted the shelves of the SEC and of libraries of securities exchanges and other institutions that maintained copies. In early 1968 Leasco signed its first contract with the SEC and began putting the various corporate reports--now approaching 90,000 a year- on microfiche, 4- by 6-inch sheets of film that can hold up to 60 pages each.
>
> This method simplified the physical handling and storage of these documents,

> and made acquisition of all basic, unedited financial data a one-stop operation.[11]

While Leasco has thus far done little more than to increase the availability of existing information, the following point is well made:

> Undeniably, the public interest is best served when access to information is increased. The best capital market to fuel the American economic machine is an informed investment community. But until the advent of Leasco's "Disclosure" services, the objective of a universal, widely used information resource was always pushed a little further out because of the increasing number and complexity of documents filed. There was simply no way to keep apace with the information content of this vital resource.[12]

In addition to the "Disclosure" system, Leasco has developed two new disclosure services to begin publication in 1973, the Disclosure Index Journal and the Disclosure Resume Annual.

> The Disclosure Index Journal to be published monthly, will provide access to corporate reports released by the SEC for microfilming by subject and by company. In addition to the 150 to 200 pages of these indexes, the monthly service will begin with a "Current Awareness" section that will highlight developments of immediate importance to users. Twice a year, subscribers will receive a cumulative index covering all new documents filed during the period. And once a year, an annual cumulative index will appear classifying the

> approximately 90,000 documents filed during the previous twelve months.
>
> The Disclosure Index Journal eliminates the need to search the whole list of companies to find those that have reported a specific activity during the period. A quick look under the relevant heading in the index will provide the names of all those that have reported such activities. Brokers, security analysts, bankers, institutional and individual investors, lawyers, accountants, scholars, and all the other users of corporate information will now be able to save countless personnel hours formerly devoted to slogging through company files.[13]

The demand for more information is being heard and response to that demand is being made. Yet the availability of financial information remains as somewhat of a problem to past and current financial research efforts. While the SEC has improved its reporting requirements over the years, it is still seeking suggestions as to what additional financial information could and should be required. The practice of consolidating basic account data into an aggregated account persists even in SEC reporting.

Comparability

Another disclosure problem that has had a bearing on income smoothing research is the lack of uniformity in

reporte

ted to

smoothe

of a si

sale o

sarily

T

cial i

concer

plete

latio

firms

Consi

the

1957

earn

acco

"ear

in n

inco

prob

the

reported financial information. Some studies have attempted to accept or reject a hypothesized "smoother, non-smoother" classification scheme by examining the effects of a single income statement variable such as "gain on sale of marketable securities".[14] Such research is necessarily limited to those firms reporting such a variable.

The general inadequacy of uniformly disclosed financial information is reflected by the fact that no research concerning income manipulation has been based on a completely random sample of firms. Firms included in manipulation research are typically screened, and only those firms which have the necessary financial data are included.

Consistency

Still another disclosure problem is inconsistency in the composition of aggregated accounts. For example, from 1957 - 1962 Chrysler Corporation included its "equity in earnings of unconsolidated subsidiaries" in an aggregated account titled "other expenses". Since 1962 these "earnings" have been included in an account titled "equity in net earnings of unconsolidated subsidiaries". These inconsistencies make for difficult analysis and research problems, and tend to restrict the usefulness of some of the detailed financial data that are available.

The lack of the quantity and availability of financial statement data, and the inconsistency and lack of comparability in existing financial data have all combined to make disclosure a significant research problem.

Economic Conditions

Research aimed at detecting income smoothing has not been fruitful. A low degree of variability in reported income streams is felt to be the goal and characteristic of an income smoothing firm. Yet even if a firm did desire to manipulate its reported income to reflect a smooth income trend, there are certain events which might temporarily overrule such an objective. There are various economic situations that occur which might make it too difficult or less desirable to maintain the smooth income trend.

Situations such as the "credit crunch" experienced during 1969-70 and 1965-66 affect the entire economic community and make income smoothing more difficult and less necessary. The management of a firm that reports a decline in reported income in a year when most other firms are also reporting declines does not have to be overly defensive in explaining the declining figures providing they are reasonable under the circumstances. Economic

situations which create general decline (as well as others which may stimulate economic activity) will tend to increase the variability in reported income streams despite possible management objectives to the contrary, and thereby weaken the criteria for the determination of income smoothing.

Other economic situations may influence overall earnings variability of a smaller segment of the economic community. A change in tariff restrictions on imported steel may have a similar impact on the steel industry. A decline or increase in new resource discoveries may create comparable economic situations for oil, gas, copper, gypsum, and various other industries which are heavily dependent on natural resources. Here again, the variability of reported income should increase as a result of such situations and tend to distort smooth income trends.

Economic conditions such as were described above present potential problems for income smoothing research, and may help to explain why two smoothing studies found the variability of income streams increased as the number of years examined increased.[15]

The Big Bath

An event which will inevitably tend to increase the variability of reported income streams is the phenomenon often referred to as "bathing". The "big bath" theory generally implies a situation where a firm has a substantial loss or decline in profits to report, and will add to the loss or decline by charging off previously deferred expenses to the current period, and perhaps establishing excessive reserves for possible future losses. As one author states:

> Management will often seize on a period in which losses or comparatively adverse results are reported to create such reserves (reserves for future costs and losses). A new management team will often desire to make a "clean sweep".[16]

While the "bath" phenomenon implies manipulation of past and/or present and/or future reported income figures, it does not present a decreasing effect on the variability of reported income.

A Proposed Manipulation Guideline

It would be useful if a means of determining which firms manipulated or smoothed reported income could be developed. Yet manipulation or smoothing of reported income is virtually impossible to prove without an admission of such objectives on the part of a firm's management.

The most rigorous research methodology, no matter how logically the hypothesis is developed, or how statistically significant the results, cannot prove income smoothing or income manipulation.

The objective of the guideline developed here is not to prove income manipulation. But it is expected to yield some additional insight into the income manipulation controversy and serve as a useful means of separating potential income manipulators from non-manipulators.

The classification system proposed is based on a fundamental income statement relationship. The relationship is that which exists between sales and net income. The source of income is revenue, since without revenue there can be no income. And since revenue is typically recognized at the time of sale, the vast bulk of reported revenue consists of sales.

It seems logical to extend this concept further by stating that there should be some relationship between sales and net income, and therefore changes in the reported sales pattern should be associated with the pattern of reported net income. The relationship is fundamental. It deals with two of the most frequently reported pieces of financial data. To the extent that a relationship does naturally and logically exist between

sales and net income, a standard by which manipulation of reported income may be judged is provided.

The basic premise of this research is that there should be a strong functional relationship between sales and net income (defined throughout the remainder of this study to be net income after taxes but before extraordinary items and the taxes applicable thereto) over a relevant range of sales activity. That is, over some relevant range of sales that is pertinent to an individual firm, a particular sales level should be a general indication of what the resulting level of reported net income will be. Also, changes in a firm's level of net income should be related to the changes in the level of sales.

The *a priori* premise is that there are firms which have a strong functional relationship between sales and net income. Such firms are believed to be non-manipulators, since the changes that occur in reported income streams are highly associated with changes in reported sales. There is an additional belief (which is later explained in more detail and which was tested as part of the research) that such non-manipulating firms will possess income statement variables that are also highly associated with the changes in reported sales. Generally when the changes in income statement variables are all highly

associated with changes in the pattern of sales, the variables are construed to be behaving rationally and the non-manipulator classification is appropriate.

On the other hand, if a firm is manipulating its reported income, the functional relationship between reported sales and reported income will be weak. The firm that possesses a weak relationship between sales and income should also be characterized by the presence of income statement variables which are weakly associated with sales. A more detailed discussion of the association between sales, net income and other income statement variables is presented in Chapter V.

The basic guideline for determining firms which are potential income manipulators and firms which are non-manipulators is the association of the functional relationship between reported sales and net income data, as measured by regression analysis. A brief review of the terms and computational procedures of regression analysis as it applies to this research is provided in Appendix I.

The proposed guideline for classifying firms as potential manipulators and non-manipulators will overcome most of the problems previously discussed.

The guideline is quite simple to use. The classification system is realistic in that it does not imply, as

other researcher's classifications have, that the system can positively detect firms that are manipulators or smoothers. While the use of a "potential manipulator" classification may appear to be too weak to be meaningful at first, the real meaning of such a classification cannot appropriately be determined until the results are examined. The analysis of the research findings in Chapter V provided the basis for evaluating the strength of the inferences to be made from the classification system.

The fact that the proposed guideline system is based on the behavior of reported income streams relative to the behavior of sales overcomes the cycle problems previously cited. If a firm's reported income streams are not smooth due to cycle effects but are either inconsistent with sales that should reflect cycle effects, or relatively smooth compared to sales (which again should reflect the cycle effects), the system will classify the firm as a manipulator. To the extent that cycle effects are reflected in the reported sales streams, the cycle problem is eliminated.

The disclosure problem will remain a problem to the proposed guideline system, but to a lesser degree. The classification of a firm as a potential manipulator (PM) or a non-manipulator (NM) requires only the sales and

net income data. However, to determine the validity of this classification system, it is necessary to support the classifications by examining the behavior of other income statement variables.

The quantity of income statement variables that is disclosed does represent a constraint on the ability to support the proposed guideline. The income statement variables that are selected will also have to be consistently reported for a given firm over the period tested. However, the study did not examine the manipulative effect of any income statement variables in particular and therefore the income statement variables selected for examination need not be comparable among those firms included in the study. In eliminating the comparability requirement, it is assumed that manipulation of reported income can be achieved through any number of variables, and that different variables may be used to manipulate the reported income of different firms, or of different periods for a single firm.

To give appropriate recognition to the disclosure problem, it was considered as the basis for sample selection as explained in Chapter IV. If the classification technique which was tested is considered by the reader to be meaningful, its usefulness will be facilitated

by the fact that the data necessary for its implementation are readily available.

The potential problems presented by the impact of various economic events and the bathing phenomenon are circumvented by the proposed guideline system. To the extent that economic conditions having an impact on a particular firm are reflected in the sales stream of that firm, the effect of the conditions is taken into consideration.

If the economy were in a period of recession, the reported sales of a firm should change relative to the impact of the recession on the firm, and reported income should change according to the change in sales. A recession, or other types of economic conditions and events, should not distort the relationship between sales and net income of a given firm. If a firm's net income reacted more severely to a recession than sales, or if management decided to take a "bath" in a period of declining sales performance, the over-reactions reflected by the change in reported income would be found to be inconsistent with the change in reported sales. The result would be to decrease the strength of the sales-net income relationship.

The proposed guideline system might also help to explain why some smoothing research results were

inconclusive. Typical income smoothing research has classified firms with smooth trends in reported income as "income smoothers", implying that their income was somehow manipulated to decrease the variability of the income stream. Yet it is possible that a smooth income trend was the logical result of a smooth sales trend, and that no manipulation of income statement variables was made to achieve the smooth income trend.

The proposed system would eliminate such apparent misclassifications since a smooth income trend that is associated with a smooth sales trend would reflect a strong sales-net income relationship which characterizes NM firms. Income smoothing firms could be more precisely defined as firms with a poor sales-net income relationship (PM firms) and a relatively smooth income stream. It would be quite interesting to see how this additional criterion alone would effect the results of previous smoothing research.

Summary

In this chapter, the meaning of the terms "income manipulation", and "income smoothing" was discussed and defined in the context which they are used throughout the remainder of this dissertation. Income smoothing is but

a special case of income manipulation with which most manipulation research has concerned itself. Some of the problems which have had a bearing on the outcome of previous smoothing research were examined. Finally a proposed guideline designed to classify firms as potential manipulators (PM's) or non-manipulators (NM's) which could overcome most of the research problems previously cited was presented. A closer look at previous manipulation research endeavors is provided in the next chapter.

Chapter II--Footnotes

1. R. M. Copeland, "Income Smoothing", Empirical Research in Accounting: Selected Studies, 1968, p. 101.

2. Eugene E. Comiskey and Russel M. Barefield, "The Smoothing Hypothesis: An Alternative Test", The Accounting Review, Vol. XLVII, No. 2 (April, 1972), p. 291.

3. Perhaps the most explicit support of such a definition is provided by R. M. Copeland, op. cit., p. 101.

4. For example, Dasher and Malcolm, and Gordon, Horwitz and Myers used the exponential growth model while Gagnon, Archibald, Copeland and Licastro, and Copeland all used the constant model (1) (See footnotes 1, 3, 10, 15, and 17 in Chapter III for complete citations).

5. Paul E. Dasher and Robert E. Malcolm, "A Note on Income Smoothing in the Chemical Industry", The Journal of Accounting Research, Vol. VIII, No. 2, (Autumn, 1970), p. 255.

6. R. M. Copeland, op. cit., pp. 101-102.

7. Gary E. White, "Discretionary Accounting Decisions and Income Normalization", The Journal of Accounting Research, Vol. VIII, No. 2 (Autumn, 1970), p. 261.

8. P. E. Dasher and R. E. Malcolm, op. cit., p. 257, and R. M. Copeland, op. cit., pp. 114-115.

9. Committee on Auditing Procedure, Auditing Standards and Procedure (AICPA, New York, New York, 1963), p. 15.

10. Ibid., p. 16.

11. "Disclosure-Decision Making With An Edge", The Leasco Magazine (An internal publication of the Leasco Corp.), Vol. 4, No. 4 (April, 1973), p. 15.

12. Ibid., p. 17.

13. Ibid., p. 15.

14. Nicholas Dopuch and David F. Drake, "The Effect of Alternative Accounting Rules for Nonsubsidiary Investments", Empirical Research in Accounting: Selected Studies, 1966, pp. 192-219.

15. P. E. Dasher and R. E. Malcolm, op. cit., p. 257, and R. M. Copeland, op. cit., pp. 114-115.

16. Leonard Bernstein, "Reserves for Future Costs and Losses; Threat to the Integrity of the Income Statement", The Financial Analysts Journal (Jan-Feb, 1967), p. 147.

of t

inco

prin

inco

the

revi

corr

Cor

sho

and

the

fir

use

cre

CHAPTER III

A REVIEW OF EMPIRICAL RESEARCH

Of the literature involving income manipulation, nine of the eleven research studies have been involved with income smoothing. While income smoothing is not the principal concern of this research, its relationship to income manipulation warrants consideration. A summary of the income smoothing research is provided, followed by a review of the two studies concerning manipulation of income. The studies are reviewed in chronological order.

Smoothing Research

Gordon, Horwitz, and Myers[1]

The earliest research efforts concerning income smoothing were conducted by M. J. Gordon, B. N. Horwitz, and P. T. Myers (GH&M). The GH&M study used 21 firms in the chemical industry as the sample to be tested. The firms did not represent a random sample. The variable used to test the smoothing hypothesis was the investment credit, as accounted for by the 21 selected firms during

1962 and 1963.

During the 1962-63 period, two different accounting measurement rules were commonly used: (1) taking the tax savings from the investment tax credit into income during the year of asset acquisition only; (2) distributing the tax savings over the life of the acquired asset. Income smoothing

> ...was tested by considering whether an accounting measurement rule (the investment credit) was selected which tended to: (1) adjust the firm's percentage change in earnings per share to the average percent change in the industry, or (2) smooth the firm's earnings per share toward a normal value, or (3) smooth the firm's rate of return on stockholders equity.[2]

In a review of the GH&M study, Copeland states:

> Normal income and smoothed earnings were defined with considerable rigor.....
> The results of their analysis were inconclusive. Introducing double exponential smoothing to measure the first two criteria (stated above) produced more error than it eliminated, thus leaving open to question the validity of their evidence.[3]

Conclusions based on the third criterion stated above were questioned in comments made on the GH&M study by Zeff, because:

> One, a rate of return on net assets is rarely found in corporation annual reports, suggesting that managers apparently do not intend to convey a notion

> of the success of operations in terms of that criterion. Two, financial analysts utilize a relationship between income and market value per share, not book value per share.[4]

In addition to criticism concerning the three criteria used to test smoothing, Copeland states:

> .....the long-run smoothing potential of the investment credit is questionable because the device, once adopted, commits a firm to report given amounts at determinable future dates, and this reporting may have antismoothing effects. Furthermore, the testing design used by GHM only examined manipulative adjustments for one year at a time so that conclusions about smoothing for individual firms could not be drawn, i.e., some maximizers, minimizers, or unsystematic manipulators may have been classified as smoothers.[5]

In addition to the above study, GH&M also examined the effects of five measurement rules on the time series trend of reported net income of United States Steel Corporation for a twelve year period. The measurement rules examined included: (1) the method of depreciation used, (2) the use of guideline lives for depreciable assets, (3) the estimates of past service pension costs, (4) the estimated current pension cost, and (5) the investment credit. While the management's use of these measurement rules roughly corresponded to the smoothing criteria established above, the lack of consistency in its

selection of alternative measurements resulted in inconclusive evidence.[6]

Dopuch and Drake[7]

In a 1966 study, Nicholas Dopuch and David F. Drake (D&D) examined the effects of dividend income and gains on the sale of marketable securities on the variability of the reported income trend. D&D began with 1000 firms that reported market values of securities to the SEC. They then determined those firms whose cash plus marketable securities represented more than 25 percent of the total assets for any year between 1954 and 1964, according to data listed on the Compustat Tapes. This reduced the sample from 1000 to 630. Of the 630 firms, only 200 reported cash plus nonsubsidiary investments that represented greater than 20 per cent of total assets for the entire 11 year period. Through examining information in Moody's and SEC 10-K reports, the sample was reduced to 12 firms which had substantial investments in marketable securities and which reported the market values of those securities for the years 1954-1964.

The examination of these twelve firms revealed that smoothing was not generally facilitated by the sale of marketable securities.

> Except for a few cases when the reported gains and losses were significant, the smoothing effects were due to dividend income rather than to the sale of securities.[8]

While the results of the D&D study indicated that, for the firms tested, dividend income represents a more prominent smoothing tool than the sale of marketable securities, their conclusions concerning the use of either method to smooth income were not overwhelming.

> There was some evidence of smoothing, but we did not observe any gross distortions of reported income.[9]

Gagnon[10]

As part of a study initially reported in 1967 by Jean-Marie Gagnon, the effects of the purchase versus pooling measurement choice on income smoothing was to be examined. While the principal purpose of the research proposed by Gagnon was to determine if there was some method of predicting how a merger would be treated (purchase or pooling of interest), one aspect of the study did intend to "find out whether there is any empirical basis for assuming that managers seek to smooth reported income".[11]

The sample used by Gagnon consisted of the examination of 500 New York Stock Exchange mergers occurring

during the period 1955-1958. Smooth income was defined to be a consistently reported income figure from year to year (model 1). The results of Gagnon's research, published four years later, indicated the selection of the purchase vs. pooling of interest measurement choice did not correspond to smoothing.[12] As suggested in a review of Gagnon's proposed research by Copeland[13] and confirmed by Gagnon in his concluding remarks from the completed study, "It is doubtful that income smoothing can explain accounting decisions having a long term effect on reported income."[14]

Archibald[15]

T. Ross Archibald, in a study reported in 1967, examined the effects of a change from accelerated depreciation methods to straight-line depreciation on the reported trend in income. The sample used consisted of 55 firms which (subsequent to the 1954 change in the Internal Revenue Code permitting accelerated depreciation) had adopted accelerated depreciation methods for both financial statement and tax purposes, and later reverted to the straight-line method for financial reporting while retaining the accelerated method for tax purposes. Since a change back to the straight line depreciation method would increase reported income in the year of change, an

income smoother would wait until a period of declining profits before making the change. As summarized by Copeland:

> Archibald found that 22 of the 55 switch back firms had lower profits in the year of change, but offered no conclusion on the smoothing hypothesis. However, any conclusions on smoothing would have been questionable on two methodological grounds. First, observation was made only once on one manipulative variable, so that a pattern of behavior could not be determined. Some of the 22 declining profit firms may have been maximizers or randomly acting nonmanipulators. Moreover, change in depreciation method calls for an auditor's qualification on the consistent application of accounting principles. If firms were really trying to artificially sweeten profits, it is unlikely that they would do so in a form that exposes their actions.[16]

Archibald, like Gagnon, defined a smooth income stream to be a constant reported income number from year to year. His study did not, at the time it was reported, actually measure the effect of the depreciation change on the variability of reported income. The Archibald study remains incomplete as of this writing.

Copeland and Licastro[17]

In a 1968 study, Ronald M. Copeland and R. L. Licastro (C&L) reported the effects of dividends received

from unconsolidated subsidiaries on the reported net income figures. C&L felt that such dividend income could be an effective smoothing technique for firms which carried unconsolidated subsidiaries on the cost basis while being able to effectively control the subsidiaries. In such cases, managers could wait until the end of a reporting period to determine the level of income before dividends, then request dividend payment from the controlled unconsolidated subsidiaries in the amount necessary to achieve the desired income level. The inability of a subsidiary to pay the dividends could be circumvented by the use of intercompany loans.

The C&L sample included 20 New York Stock Exchange firms which had seemingly controlled unconsolidated subsidiaries that were reported on the cost basis. The 11 year period examined was 1954 to 1965. As reported by Copeland:

> For each firm, the sign of the year-to-year change in earnings was compared to the sign of the change in dividends remitted to the parent. A chi-square contingency test was applied to the 169 sets of data. The evidence statistically supported the (null) hypothesis that the dividend-income technique was not used to smooth income.[18]

Aside from not yielding significant results, the C&L study suffers the same methodological problem as the GH&M

and the Archibald studies. Examining the effects of a variable on the year-to-year change in income does not give an indication of the trend in reported income streams, and since income smoothing implies a smooth trend in reported income such a test can not possibly indicate income smoothing.

A weakness that should be noted with all studies up to this point is that they attempted to detect income smoothing by examining a very limited number of income statement variables. In doing so, they made two strong a priori assumptions: (1) the income statement variables(s) examined is (are) the most likely means of achieving income smoothing, and (2) each variable will be consistently used to either smooth or not smooth income. While it may be possible to select variables a priori which most likely are able to facilitate a desire to smooth income, there is no apparent reason to assume that any one particular variable will consistently be used for income smoothing.

Copeland[19]

Later in 1968, Copeland reported the results of another income smoothing study. Copeland's objectives were to specify the attributes of accounting variables which could be used to smooth, to evaluate earlier

smoothing research, and to test several smoothing hypotheses.

In his analysis of accounting variables Copeland determined that smoothing devices should be restricted to accounting practices or measurement rules.

> A smoothing device ought to involve only accounting interpretation of an event, not the event itself. Accounting manipulation is a matter of form, not of substance.[20]

The sample used in the study was comprised of 19 firms whose published financial statements found in their annual reports reflected the presence of at least two potential smoothing variables, one of which was dividend income in each case. A smoothing firm was defined as "one which uses the variable to smooth in a majority of periods examined", and a variable was said to have smoothed income "if year-to-year changes in the variable are such as to decrease year-to-year variances in income".[21]

Using these definitions, a test was made to determine if the classification of firms (as smoothers and non-smoothers) based on the dividend-income variable (Variable 1) was significantly different than the classification of firms based on all other variables examined (Variable 2). If the two classification schemes lead to approximately the same results, the inference would be that a

classification based on one variable would not be significantly different than a classification based on a number of variables.

The results of the chi-square test, reproduced below, indicate that the two classifications do not yield comparable results at an $\alpha = .05$ level of significance ($X^2 = 4.27 >$ critical X^2 value of 3.84).[22]

TABLE 3-1

Two Variable Classification of Nineteen Firms as Smoothers or Nonsmoothers During Sixty-eight Consecutive Four-Year Periods

	Smoothers	Non-Smoothers	Totals
Variable 1 (Dividend-Income)	31	37	68
Variable 2 (All other variables)	43	25	68
Totals	74	62	136

The other major test conducted in the study was to determine the effect of the length of the time series examined. Two, four, six and eight year time series were tested. Using the definitions cited above, the number of firms classified as non-smoothers by both Variable 1 and Variable 2 increased from 27% to 43% as the length of the series increased from 2 to 6 years, and declined to 41% in the eight year series. The strongest inference to be

made from the time series results is that, using Copeland's definitions and classification scheme, the length of time studied will have a bearing on how a firm is classified.

While Copeland does not completely define the accounts included in Variable 2, he does state that it includes:

> .....extraordinary charges and credits, write-off of fixed assets or intangibles, cessation or unusual changes in pension charges, changes in accounting methods or procedures, fluctuations in contingencies or self-insurance reserves, changes in deferred charge or credit accounts, introduction of the 53rd week year, and others.[23]

The inclusion of many of these variables, as well as the dividend-income variable, appears to contradict the attributes of smoothing variables defined by Copeland at the outset of the study. In a footnote Copeland admits that: "While few of these variables meet all the criteria previously established, all possess some smoothing potential".[24] This contradiction points out the weaknesses of the far too restrictive criteria established for smoothing variables.

While Copeland does not precisely define his testing procedures, it appears that, since only 19 firms were included in the study and the test results cited above included 68 four year time series, a given firm could be classified as both a smoother and a non-smoother over the

test period. The number of cases where a given firm might change classifications cannot be determined since the number of years covered by the study varied between four and twenty years. The inclusion of a single firm as a number of observations is a questionable procedure, especially since the sample was so small and was not randomly selected.

While the results of the study are interesting, they are tentative at best. The problem of supporting the classification system employed was not considered. The analysis of a variable's effect on year-to-year variances in reported income was estimated by Copeland in cases where the dollar amounts of the change in a variable could not be determined, but the direction of the change and its effect on reported income was felt to be "obvious".[25] While Copeland did an excellent job of critically reviewing the smoothing research conducted to that time, he offered very little in the way of smoothing research improvements.

Dasher and Malcolm[26]

In a study reported in 1970, Paul E. Dasher and Robert E. Malcolm (D&M) differentiated between real and artificial smoothing as follows:

> Real smoothing refers to an actual transaction that is undertaken or not undertaken on the basis of its smoothing effect on income, whereas artificial smoothing refers to accounting procedures which are implemented to shift costs and/or revenues from one period to another.[27]

While D&M define real and artificial smoothing, they do not apply the definitions to their study since the two both are capable of smoothing and sometimes hard to distinguish from one another. The D&M sample consisted of 52 firms in the Chemical and Chemical Preparations Industries which enabled them to compare their results with the GH&M study. The sample was non-random.

The four variables examined for their smoothing effect were: (1) pension expense, (2) dividend revenues, (3) research and development expense, and (4) extraordinary items. The model used to measure variability was an exponential growth model similar to model 2 presented in Chapter II. D&M, from the least squares estimate of their growth model, calculated the standard deviation of the estimate (SDE) of reported income, and reported income less the effects of the four smoothing variables (net of tax), for both an eleven year (1956-66) and a six year (1961-66) period. The results are reproduced below:

TABLE 3-2

Comparative Smoothness of Income Streams

	6-year period	11-year period
Average ratio of reported-income SDE to geometric mean of reported income.....	.135	.212
Standard deviation of above.....	.146	.148
Average ratio of income-before-smoothing SDE to geometric mean of reported income.....	.148	.224
Standard deviation of above.....	.145	.148

The most obvious and perhaps the most meaningful result is that the income streams are less smooth for the 11-year period than for the 6-year period for both reported income and "income-before-smoothing". This result is consistent with Copeland's findings.

D&M test the presence of smoothing using the two SDE's to form a smoothing ratio (SR). As stated in the study:

> This (SR) consists of the SDE of income before smoothing variables to the SDE of reported income. An SR greater than 1.0 would indicate greater variability in the "income before smoothing" and a tendency toward deliberate smoothing of reported income. An SR less than 1.0 would tend to indicate a "nonsmoother".[29]

Their results revealed that 35 of the 52 firms had SR's greater than 1.0 for the 11-year data, and 40 firms

had SR's greater than 1.0 for the 6-year data. While the results appear to be very impressive, they do not provide any support for the classification system employed.

The use of ratios is also questionable since they do not provide any measure of the degree of smoothing as it is defined a priori, and they are completely unrelated to the goodness of fit of the exponential smoothing model employed. Also, since the geometric mean of reported income is not used to normalize the two SDE's used in the ratio, it seems logical to assume that the SDE of "income-before-smoothing" will be greater than the SDE of reported income (which results in a ratio greater than 1.0) since the value of the income-before-smoothing numbers will be greater than the reported income numbers. Carried to the extreme, the SDE of sales over the SDE of reported income will surely be greater than 1.0!

White[30]

In another 1970 study, Gary E. White attempted to determine "whether the motive of income smoothing or income normalization can explain managements' selection of accounting alternatives".[31] White's analysis considered two industries, the chemical industry (for comparison with the GH&M and D&M studies), and the building materials

industry. White used both linear and logarithmic least squares regression models to fit earnings per share (EPS) trends, and selected the model which yielded the best fit to the EPS data (the model which provided the highest R^2) for each firm over the 10 year period from 1957 to 1966. The 10 firms in each industry which had the highest R^2's for either model and a positive EPS trend over the entire test period were classified as income smoothers. The non-smoother groups were made up of 10 firms randomly selected from each industry. The effects of various management accounting policy decisions on income statement variables were then examined to determine if the variables were used to achieve the positive EPS trends of the smoothing companies. In the analysis of his research results, White states that:

> On the whole there is no evidence that companies in the smooth samples significantly achieved their positive least-squares trends by their choice of accounting alternatives. This suggests that smooth trends were achieved by chance and/or by controlling variables other than the accounting policy decisions included in the study.[32]

It was mentioned earlier that it would be interesting to see how the proposed guideline would effect previous smoothing research. One of the firms included in the

White study was also included in the current study. White classified the firm as a smoother due to the goodness of fit of the EPS trend to the regression model. This study classified the firm as a non-manipulator however, since the smooth upward trend in reported income was strongly associated with the smooth upward trend in sales. Depending on the acceptability of the proposed guideline, this case suggests that a potential problem may exist in the frequently used method of classifying firms as smoothers or non-smoothers, that is, based on their reported income trends alone.

Barefield and Comiskey[33]

A study reported in 1972 by Russel M. Barefield and Eugene E. Comiskey (B&C) attempted to determine if firms could achieve smooth income trends through their choice between the cost and equity method of accounting for subsidiaries. The study included a sample of 30 firms for the period 1959 to 1968. The firms were selected based on the availability of necessary information in published annual reports and included ten firms which used the cost basis, 14 firms which used the equity basis, and 6 firms which used both methods during the 10 year test period.

B&C employed a linear growth model to measure the

variability in reported earnings and the effects of the cost-equity choice on earnings variability. The conclusions of the B&C study were not inconsistent with previous research efforts in that they cited disclosure of information and sample size as limitations of the research effort. B&C reported that:

> Analysis of the data seem (sic) to indicate that conditions vary sufficiently to insure that neither accounting method applied across subsidiaries will consistently result in smoother earnings.[34]

This result is consistent with the notion suggested by Copeland that it is difficult to smooth income streams over many periods through the selection of a single accounting method during a single period which commits the firm to an accounting procedure for future periods. B&C did find "modest support for the hypothesis that firms select that method which produces smoother earnings".[35]

Manipulation Research

Simpson

Richard H. Simpson reported the results of his research findings in a 1969 article entitled "An Empirical Study of Possible Income Manipulation".[36] The study is the only empirical research effort known which deals specifically with income manipulation.

In the study, Simpson examined the effects of four "accounting practices" on reported income. The four practices of concern were: (1) the investment tax credit, (2) unusual gains and losses, (3) investment in the common stock of other firms, and (4) operating losses. These practices are said to have manipulative qualities since they all permit varying acceptable accounting treatments for situations that are not significantly different. Simpson determined a priori the single accounting treatment for each of the four "practices" which he felt was "acceptable". For example, he determined that the investment tax credit should reduce the cost of the qualifying assets with the benefit thus spread over the assets' useful life. The flow-through method which takes the entire credit in the year of a qualified asset acquisition was deemed "unacceptable".

A random sample of 85 New York Stock Exchange firms was selected and then reduced to 49 firms which met Simpson's sample selection criteria. The selection criteria were generally aimed at eliminating new firms, foreign firms, non-industrial firms, and firms which were subsidiaries of other firms.

Simpson adjusted the reported incomes for 1964 of the 49 sample firms to determine what the "corrected

income" would have been had the "acceptable" accounting practice been employed. The firms were then ranked according to the total absolute percentage of change resulting from the "unacceptable" practices (both increasing and decreasing effects combined) on "corrected incomes". The firm with the median rank was eliminated and the remaining 48 firms were divided into two groups of 24, one with the lowest ranked firms (whose "unacceptable" practices had little or no effect on corrected income) and the other with the highest ranked firms.

Simpson ran a number of tests to try to determine if the two groups had characteristics which were significantly different. The tests were aimed at determining whether or not there were differences in: (1) the overstatement or understatement of corrected net income, (2) uncorrected price-earnings ratios, (3) debt to equity ratios, and (4) firm sizes as measured by sales level.

Only the first item listed was found to be significantly different between the two groups. This result is certainly understandable since the overstatement or understatement of corrected net income was instrumental in ranking firms and separating them into two groups.

The strength of Simpson's study rests primarily on his a priori determination of which accounting practices

currently considered as being "generally acceptable" are "acceptable" from his point of view. To the extent that others agree with Simpson's point of view on which practices are acceptable or not acceptable, the study does provide a method of determining whether a firm is an income manipulator or not.

Copeland and Moore[37]

In a recent article, Ronald M. Copeland and Michael L. Moore (C&M) reported on their research of a specific type of manipulation, the corporate bath. The purpose of the C&M study was stated as follows:

> ...to determine (1) how frequently companies utilize discretionary accounting decisions to reduce income, that is, take a bath; (2) what are the economic conditions with respect to income or stock price movements that exist when discretionary accounting decisions are made; and (3) whether the size of discretionary accounting decisions is related to the magnitude of the adverse income or price movement.[38]

The discretionary accounting decisions referred to by C&M include write-offs, write-downs, and provisions for future charges which cannot be objectively determined at the time the provision is made.

The C&M sample was developed by randomly selecting 1,000 firms from the 1,800 companies listed on the Compustat

Tapes and requesting their annual reports for the years 1966 through 1970. The 907 companies which responded contributed a total of 3,761 annual reports, with the number varying between 545 and 871 for individual years from 1966 to 1970.

A company was characterized as a "bath company" if it reported extraordinary items which were based on discretionary accounting decisions and which decreased the income (or loss) before extraordinary items by ten percent or more. A summary of the frequency with which the "bath" characteristic was detected is reproduced below.[39]

TABLE 3-3

Number of Reports to Have the Bath Characteristics

Year	Total Reports	Bath Reports	Percentage ($\frac{\text{Column 3}}{\text{Column 2}}$)
1970	765	58	7.58
1969	871	53	6.08
1968	822	34	4.14
1967	758	33	4.35
1966	545	17	3.12
Total	3761	195	

Further testing revealed that there were statistically significant relationships between those firms which made discretionary accounting decisions and those which had income declines or management changes. No relationship was found between firms with the "bath"

characteristic and stock price declines.

Summary

While a good deal of time and effort has been exerted on research involving the manipulation of income, very few strong inferences or conclusions can be made as a result of these endeavors. Some common problems have been: the lack of detailed income statement information, the inconsistency and lack of comparability in information that is available, the inability to test a truly random sample (due in part to the previously cited information gathering problems), and the general inability to meaningfully characterize or otherwise confirm proposed smoother-nonsmoother or manipulator-nonmanipulator classification systems.

Chapter III--Footnotes

1. M. J. Gordon, B. N. Horwitz and P. T. Myers, "Accounting Measurements and Normal Growth of the Firm" in R. K. Jaedicke, Y. Ijiri, and O. Nielson (eds.), Research in Accounting Measurement, American Accounting Association (1966), pp. 221-31.

2. Ibid., p. 224.

3. Ronald M. Copeland, "Income Smoothing", Empirical Research in Accounting: Selected Studies, 1968, p. 106.

4. S. A. Zeff, "Discussion Comments", in R. K. Jaedicke, Y. Ijiri, and O. Nielson (eds.), op. cit., p. 250.

5. R. M. Copeland, op. cit., p. 106.

6. M. J. Gordon, B. N. Horwitz and P. T. Myers, op. cit., pp. 221-31.

7. Nicholas Dopuch and David F. Drake, "The Effect of Alternative Accounting Rules for Nonsubsidiary Investments", Empirical Research in Accounting: Selected Studies, 1966, pp. 192-219.

8. Ibid., p. 206.

9. Ibid., p. 207

10. Jean-Marie Gagnon, "Purchase Versus Pooling of Interests: The Search for a Predictor", Empirical Research in Accounting: Selected Studies, 1967, pp. 187-204.

11. Ibid., p. 188.

12. Jean-Marie Gagnon, "The Purchase-Pooling Choice: Some Empirical Evidence", The Journal of Accounting Research, Vol. IX, No. 1 (Spring, 1971), pp. 52-72.

13. R. M. Copeland, op. cit., p. 108.

14. J. M. Gagnon, op. cit., p. 63.

15. T. Ross Archibald, "The Return to Straight-Line Depreciation: An Analysis of a Change in Accounting Method", Empirical Research in Accounting: Selected Studies, 1967, pp. 164-80.

16. R. M. Copeland, op. cit., p. 107.

17. R. M. Copeland and R. L. Licastro, "A Note on Income Smoothing", The Accounting Review, Vol. XLIII, No. 3 (July, 1968), pp. 540-45.

18. R. M. Copeland, op. cit., p. 109.

19. Ibid., pp. 101-116.

20. Ibid., pp. 104-5.

21. Ibid., p. 111.

22. Ibid., p. 113.

23. Ibid., p. 111.

24. Ibid., p. 111 (footnote 28).

25. Ibid., p. 111.

26. Paul E. Dasher and Robert E. Malcolm, "A Note on Income Smoothing in the Chemical Industry", The Journal of Accounting Research, Vol. VIII, No. 2 (Autumn, 1970), pp. 253-259.

27. Ibid., p. 253.

28. Ibid., p. 257.

29. Ibid., p. 257.

30. Gary E. White, "Discretionary Accounting Decisions and Income Normalization", The Journal of Accounting Research, Vol. VIII, No. 2 (Autumn, 1970), pp. 260-273.

31. Ibid., p. 260.

32. Ibid., p. 270.

33. Eugene E. Comiskey and Russel M. Barefield, "The Smoothing Hypothesis: An Alternative Test", The Accounting Review, Vol. XLVII, No. 2 (April, 1972), pp. 291-298.

34. Ibid., p. 298.

35. Ibid., p. 298.

36. Richard H. Simpson, "An Empirical Study of Possible Income Manipulation", The Accounting Review, Vol. XLIV, No. 4 (October, 1969), pp. 806-817.

37. R. M. Copeland and Michael L. Moore, "The Financial Bath: Is It Common?", MSU Business Topics, Vol. 20, No. 4 (Autumn, 1972), pp. 63-69.

38. Ibid., p. 68.

CHAPTER IV

RESEARCH QUESTIONS, DESCRIPTION OF THE RESEARCH DESIGN AND APPLICATION

The purpose of the research underlying this dissertation was to determine if the proposed classification technique could distinguish between potential manipulators of reported net income and non-manipulators. This chapter indicates the research questions that were considered in attempting to support or refute the proposed classification technique. A description of the research design is then presented, followed by a general indication of how the research design was applied to the research questions.

The Research Questions

The purpose of the research testing was to determine if the analysis of income statement variables of the two groups of firms would provide evidence to either support or refute their proposed classification as potential manipulator (PM) and non-manipulator (NM) firms. In the regression sense, the differences in the sales-net income relationships of the two groups were not necessarily

associated with known differences in the nature of their respective income statement variables. The research questions examined and reported in this thesis were as follows:

1. Do income statement variables of the PM firms have a significantly different effect on their respective sales-net income relationships than the income statement variables of the NM firms?
2. Do the income statement variables of the PM firms and the NM firms have significantly different behavioral characteristics?

The first question was designed to indicate when the basic regression relationship between sales and net income was capable of being significantly improved through the addition of income statement variables, and if the frequency with which improvement occurred was significantly different for PM firms than for NM firms. Significant improvement may be interpreted as an instance where a variable was capable of reducing a meaningful portion of the residual error left by the basic sales-net income regression.

The second question was designed to indicate when major differences occurred in the types of behavior patterns reflected by the income statement variables of the two groups of firms. A more detailed explanation of

behavior patterns and the means of classifying a variable's behavior is provided later in this chapter.

If the answers to the two questions posed above had been negative, it would have implied that the differences in the sales-net income relationships were either attributable to factors other than the income statement variables (i.e. the effective or ineffective utilization of resources), or that the variables which did affect the sales-net income relationship were not examined in the study. In this case the conclusion would have been that the proposed classification system was not supportable by the research, implying the classification system could not discriminate between potential manipulators and non-manipulators.

If the answers to either of the two questions had been positive, the classification system would not have automatically been validated. If the variables of the two groups did have significantly different effects on the sales-net income relationships, and/or the variables of the two groups did have significantly different behavioral characteristics, it would have still been necessary to relate the differences to manipulative qualities.

Guideline Model Selection

While the proposed guideline was said to be based on the sales-net income relationship, the exact form of the relationship was not specified. In an attempt to determine an appropriate relationship, a sample of 15 firms was examined. Sales and income data for the firms were collected for a 12 to 15 year period. The data were analyzed by a statistical regression program which calculated the coefficient of determination (R^2) for a linear and three curvilinear relationships. The models of the relationships tested are provided below:

(1) $$Y_{ij} = B_{oj} + B_{1j} X_{ij} + e_{ij}$$

(2) $$\text{Log } Y_{ij} = B_{oj} + B_{1j} X_{ij} + e_{ij}$$

(3) $$Y_{ij} = B_{oj} + B_{1j} \text{ Log } X_{ij} + e_{ij}$$

(4) $$\text{Log } Y_{ij} = B_{oj} + B_{1j} \text{ Log } X_{ij} + e_{ij}$$

where; Y_{ij} = the expected income of firm j for year i (the dependent variable),

X_{ij} = the reported sales of firm j for year i (the independent variable),

B_{oj} = the computed regression constant of firm j,

B_{1j} = the computed sales coefficient of firm j,

e_{ij} = the residual error term of firm j for year i,

and where; i = 1,.....,12,...,15 years,

j = 1,.....,15 firms.

The analysis indicated that the linear relationship eliminated the greatest amount of squared error in the majority of the firms examined (9 firms), having resulted in the highest R^2 most frequently. In the other six firms the linear model eliminated nearly as much error as did any of the other three models. As a result, the linear model was selected as the regression form of the research.

The Time Period Examined

The study was designed to cover a sufficient number of years to permit the influence of various economic conditions and cyclical trends to be included in the test period. If the influences of such matters were reflected in the sales trend, as was suggested in Chapter II, there would be a substantial number of firms whose sales-net income relationships remained strongly associated. The data collected for the study were obtained from the years 1955 to 1971.

The Data Collection Sources

The ideal data collection source would have been the SEC 10-K reports which provide more detailed account information than any other publicly available source known to the researcher. While it was mentioned earlier that Leasco provides these reports on microfiche, it was

discovered that they are available only from 1968 to the present. Previous 10-K reports were not available locally.

Other available sources were Moody's and the Compustat Tapes, as mentioned earlier. After examining a number of 10-K reports and comparing them to the data which were available on the Compustat Tapes and in Moody's, it was determined that the amount of additional data which could have been obtained from examining the 10-K's directly as opposed to the other two sources was marginal at best. As a result, the Compustat Tapes and Moody's were the sources of data utilized in this research.

The Sample Selection

The firms included in the study were not randomly selected. The researcher could have randomly selected a large number of firms and then eliminated those which did not meet the sample selection criteria, as many smoothing studies have done. However, such a procedure would have been of little value since, in the end, such a sample would have been non-random.

Since this research tested the proposed classification of firms through the analysis of various income statement variables, the quantity of variables disclosed was considered to be the primary selection criterion.

Selection of firms based on the quantity of income statement data provided presented a potential problem which had to be considered.

It was suggested by Copeland and others that if information concerning a particular variable is provided to the public in annual reports, it is probably not being used to smooth or manipulate reported income. In other words, to effectively manipulate or smooth income would, according to some, require that the variable used to smooth or manipulate not be reported separately. If a disclosed variable were being used to smooth or manipulate the variable's manipulative effect would be readily ascertainable. There is probably some truth to this concept and its merit was considered in designing the study. The effect of extraordinary items, for example, that were reported in the financial statements which accompany the annual reports were not considered for their manipulative qualities. Also, the data for the variables selected were collected from sources other than the published annual reports of firms. However, some of the variables examined in the study were also provided in the annual reports of the sample firms to permit a test of the manipulative qualities of variables which are generally available to the public. The impact of one commonly disclosed variable is referred

to in the analysis in Chapter V.

Included in the Compustat Manual is a chart which lists all information items contained on the Tapes, and the frequency with which each item was recorded for each year covered. The two items which were least frequently reported in 1955 (Research and Development, and Selling and Advertising Expenses) were selected from this chart and a program was written to obtain the names of the companies which reported either of these items consistently from 1955 to 1971. It was hoped this selection would provide those companies which reported the greatest amount of information.

A printout of all the income statement information (for the period 1955 to 1971) of each of the 63 companies meeting the initial selection criterion was then obtained from the Compustat Tapes. These firms were reviewed and retained in the study if the following criteria were met:

1. The firm had no drastic changes in its compostion during at least 13 consecutive years of the test period (ie., no significant mergers or acquisitions, etc).
2. The firm's data contained at least five income statement variables consistently and consecutively reported each year for at least 13

years of the 17 year test period.

3. The data available in Moody's combined with the data from the Tapes resulted in at least 7 income statement variables consistently and consecutively reported each year for at least 13 years of the 17 years examined.

This review reduced the number of firms to 26.

To supplement this group of firms, a printout of all income statement information for the same period was obtained for all firms in a number of Compustat industry groups. These data were obtained from the Tapes in an attempt to include in the sample a number of firms in the same industry to allow some comparisons by industry. The industry classifications of the first 26 firms selected were considered in deciding which industries to examine, as was the number of firms in each particular industry classification (generally, only industries with less than ten firms were examined). The criteria cited above were then applied to the industry groups.

The resulting non-random sample consisted of 41 firms. The sample contained an information quantity bias, as well as a bias toward certain industries. These biases resulted strictly from a desire to examine firms with substantial account detail and to permit some comparisons

within industries. The sample firms and their Compustat Industry Classifications are listed on page 78, in Table 4-1.

The Variables

Since the research did not concern itself with any single variable's manipulative capacity, it was not necessary to have variables uniformly present among the firms included in the study.

The study also avoided discrimination among "real" and "artificial" variables. All variables are capable of being manipulated to the extent that they may be influenced by discretionary management actions. For example, discretionary actions would include management decisions to change accounting measurement methods (or accounting principles), to establish or alter the level of expenditures accounted for in various accounts, or to write-off or capitalize certain expenditures. While it would have been very interesting to discriminate among the various types of discretionary management decisions, it was frequently impossible to determine what type of action influenced a given variable in a given period.

As previously indicated, the principal criterion which was considered in determining whether or not a firm

TABLE 4-1

Company Name	Industry Name	Company Name	Industry Name
American Smelt & Ref.	Metals-Misc.	Republic Steel	Steel-Major
St. Joe Minerals	Lead & Zinc	U.S. Steel	"
Allied Chemicals	Chemicals-Major	Keystone Cons. Inds	Steel Minor
American Cynamid	"	Owens-Corning Fbgl.	Bldg. Materials
Dow Chemical	"	Stewart Warner	Machinery-Gen.
E. I. Dupont	"		& Indus.
W. R. Grace	"	Addressograph	Office & Bus. Equip.
Hercules	"	Natl. Cash Register	"
Monsanto	"	Pitney Bowes	"
Olin	"	Chrysler	Motor Vehicles
Union Carbide	"	General Motors	"
Pfizer Inc.	Drugs-Ethical	Kelsey Hayes	Auto Parts & Acc.
Schering Plough	"	Lockheed	Aerospace
Baxter Labs.	Drugs-Med. & Hosp.	Elmer Perkin	Optical
Gillette	Cosmetics	American Airlines	Air Transport
Helene Curtis	"	Delta Airlines	"
Standard Oil, N.J.	Oil-Integr, Domest.	National Airlines	"
Armco Steel	Steel-Major	Northwest Orient Airlines	"
Inland Steel	"	Pan American Airlines	"
Jones and Laughlin	"	T.W.A.	"
National Steel	"	A.T. & T.	Telephone Co.

was included in the study was that it provided at least 7 variables. A summary of the 41 firms and the number of variables they reported is provided below.

TABLE 4-2

FREQUENCY OF NUMBER OF VARIABLES REPORTED

Number of Variables	11	10	9	8	7	Total -
Number of Firms	1	2	20	10	8	41

Since the data for the variables were collected from two different sources, it was necessary to confirm some information with both sources to insure that the data pertained to the same reported sales and net income figures in both cases. In cases where it was ambiguous as to when a variable might have been included as part of another variable (ie. "dividend income" from Compustat included in "other income" in Moody's), the variable in question was eliminated.

A summary of the 347 variables for which information was gathered, and the frequency with which each variable was included is presented in Table 4-3 on page 80.

The Classification System

Since the proposed classification system is based on the assumption that firms with a strong sales-net income

TABLE 4-3

VARIABLES USED IN STUDY

General Account Title	Frequency of Inclusion
Depreciation Expense	41
Interest Expense	33
Tax Expense	41
Pension Expense	38
Incentives Compensation Expense	12
Selling and Advertising Expense	11
Research and Development Expense	20
Rental Expense	21
Non-Recurring Expenses	7
Unconsolidated Subsidiaries-Remitted Earnings	6
Maintenance and Repairs Expense	33
Other Income	30
Other Expense	7
Dividend Income	7
Dividend and Interest Income	4
Rent and Royalty Expense	2
Royalty, Joint Venture, and Other Income	2
Selling, General and Administrative Expense	6
Interest Income	3
General and Administrative Expense	2
Amortization of Special Tools	2
Gain on Sale of Property	6
Others (with only 1 inclusion each)	13
Total	347

relations

tionships

define "v

basis fo

tion (R^2

of the a

It

cant di

examini

$R = \sqrt{R^2}$

test (t

in the

to char

from th

level c

ference

where

the dif

the fac

apply t

ber of

If

cally s

R, the n

relationship are non-manipulators and those with weak relationships are potential manipulators, it was necessary to define "weak" and "strong" relationships. The logical basis for the definitions was the coefficient of determination (R^2), which provides a relative measure of the strength of the association between sales and net income.

It is possible to determine if statistically significant differences exist between different R^2 statistics by examining the differences in the standard error of R (where $R = \sqrt{R^2}$ = the coefficient of correlation). The statistical test (the Student t test) to determine if the differences in the standard error of R were real differences, or due to chance, was applied to the regression data generated from the 15 firms in the pre-study sample, using a .05 level of significance. It was discovered that major differences in the R^2 statistics (ie. $R^2 = .90$ vs. $R^2 = .20$ where $.00 \leq R^2 \leq 1.00$) were necessary in order to infer that the differences were real. This result was largely due to the fact that the inference from the test, which would apply to all time periods, was based on such a small number of observations (12 to 15 years).

If the classification had been based on statistically significant differences in the standard error of R, the majority of the firms would have been eliminated

from the study due to their lack of sufficiently high or low R^2 statistics. If the classification was not based on statistically significant differences, then no statistical inference could be made about periods other than the period tested.

Since the number of years examined would have had to have been greatly increased to permit the majority of firms examined to yield statistically significant differences in R^2 for classification purposes, and since the amount of income statement data available in years prior to 1955 decreased rapidly, the statistical classification method was rejected. This was a regretable consequence since the resulting PM-NM classification of firms was necessarily based on the opinion of the researcher and therefore is subject to question. If statistical inferences were limited to the period examined only, then any difference in the R^2 values was, statistically a real difference.

Having been forced to an a priori definition of weak and strong relationships to permit the PM-NM classification of firms it was decided that firms with R^2 values above .75 would be considered to have sufficiently strong sales-net income relationships to be classified as NM firms. An R^2 of .75 meant that 75% of the squared error

of estimating net income was eliminated by basing the estimate of net income on the sales level associated with it (using the least squares regression estimate). In absolute terms, by interpreting the coefficient of association, this meant that 50% of the relative error (unsquared) was eliminated by using the regression estimate. Hence, firms whose sales-net income relationship was strong enough to permit the elimination of over 50% of the relative error in estimating net income were classified as NM firms.

In order to permit a clear distinction between PM firms and NM firms, a void R^2 range was used to eliminate borderline firms. Firms with R^2 values of less than .50 were classified as PM firms, and firms with R^2 values between .50 and .75 were unclassified and eliminated from the study.[1]

The Analysis Technique

The technique used to analyze the data was a stepwise linear regression routine. The basic equation analyzed can be expressed as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_n X_n + e$$

where: Y = estimated net income,

X_1 = reported sales,

$X_2 - X_n$ = income statement variables,

β_0 = constant,

β_1 = sales coefficient,

$\beta_2 - \beta_n$ = coefficients of income statement variables,

e = error term.

The regression program was used to calculate the strength of the association between sales and net income, and to measure the significance of the income statement variables on the sales-net income relationship. To determine the impact of the variables on the sales-net income relationship, three analytical methods were tested:

1. a deletion routine which initially included sales and all income statement variables examined in the original regression equation as independent variables, and deleted the income statement variables which did not significantly contribute (at an $\alpha = .05$ level of significance) toward explaining the dependent variable, net income;
2. an addition routine which began with net income as the dependent variable and sales as the only independent variable, then added any of the income statement variables which significantly contributed (at $\alpha = .05$) toward explaining the

dependent variable;

3. an addition routine which began with net income as the dependent variable and sales as the only independent variable, and which then examined each income statement variable individually to determine at what level of significance it would have been added to the regression equation.

All three methods considered sales as a fixed independent variable which was not allowed to be added or deleted from the regression equation. Also, all three analysis methods provided an intercorrelation matrix which permitted the examination of the association of any one variable with all other variables.

Due to the intercorrelation effects of the independent variables, the deletion routine permitted variables which were not significant, in and of themselves, to remain in the final regression equation. Also, it was possible that the deletion routine eliminated variables which, in and of themselves, were significant. For example, if the deletion routine was considering eight variables and the last variable examined was significant by itself, but its association with the dependent variable had already been "explained" by one or a group of other variables due to

the intercorrelation effects, the last variable examined would have been deleted from the equation.

The first addition routine (2) was also complicated due to the intercorrelation effects. The program added variables one at a time according to their level of significance in the regression equation. However, if the first variable added was highly correlated with other variables, the other variables would not have been added even though they may have been significant had they been considered individually.

The second addition routine (3) determined whether or not each individual variable was significant, without regard to the intercorrelation effects of other variables. Since the income statement variables were reported and collected as individual variables, it was considered most appropriate to analyze them individually. Hence, the last routine was selected as the most appropriate analysis technique.

It should be pointed out that the intercorrelation problems encountered with the regression routines described above were partially due to the fact that one of the assumptions of regression analysis was violated. When a number of independent variables are being used to explain the behavior of a dependent variable, it is

assumed that the independent variables are independent of one another. Since all of the independent variables in this study are used to help determine the dependent variable in the format of the income statement, they are not clearly independent of one another.

On the other hand, the fact that they are all used to arrive at the reported net income figure does not necessarily mean that they are dependent on one another in the regression sense. For example, there is no reason to believe that the amount expensed for research and development is dependent on the amount expensed for depreciation or for maintenance and repairs.

A certain amount of interdependence was implied by the fundamental relationship assumed in this thesis. In general terms, the income statement variables, to the extent that they were variable in nature, were expected to change relative to the changes in sales. To the extent that the variables were fixed in nature, they would be represented in the regression constant and would not affect the relationship. These general conditions were sufficient conditions for sales and net income to be strongly associated, but they were not necessary conditions. A firm could have had an artificially strong relationship between sales and net income. For example, two variables would

appear to be fixed, when considered together, if one increased by $10 and the other decreased by $10 for every $1,000 increase in sales. The first variable would have been positively correlated with sales, the second negatively correlated with sales, and if considered together they would have been completely uncorrelated with sales.

The above discussion tends to support the regression analysis technique which was selected. Examining the impact of each individual variable on the sales-net income relationship minimized the interdependence problems, since only two independent variables were considered at each step of the regression routine.

Application of the Research Design

Data were collected for sales, net income and at least seven income statement variables for each firm for 13 to 16 consecutive years. The data for each firm were entered into the linear stepwise regression routine. The regression's output provided the intercorrelation matrix, the strength (R^2) of the basic sales-net income relationship, and the level of significance of each income statement variable examined. If a variable was significant at the .05 level it was added to the regression and the revised coefficient of determination was calculated. If a

variable was not significant at the .05 level, the α level at which the variable would have become significant was calculated. Hence, the analysis technique yielded a relative measure of the degree of improvement provided by each variable.

In attempting to answer the first research question, the stepwise regression analysis was utilized. The frequency with which PM and NM firms possessed variables that significantly improved the sales-net income relationship was examined for statistically significant differences.

In examining the second research question, concerning the behavioral characteristics of the income statement variables, the intercorrelation matrix was utilized. If the PM-NM classification of firms was meaningful, the behavior of the variables examined would indicate differences between the two groups of firms.

Summary

The research questions which, when answered, would help determine the appropriateness of the proposed classification system have been presented. The research methodology which was employed in answering the questions was then described and related to the research questions. The research results and the analysis of those results are presented in the following chapter.

Chapter IV--Footnotes

1. A sensitivity analysis was performed in order to determine the validity of this elimination and may be found in Appendix II.

CHAPTER V

RESEARCH RESULTS AND ANALYSIS

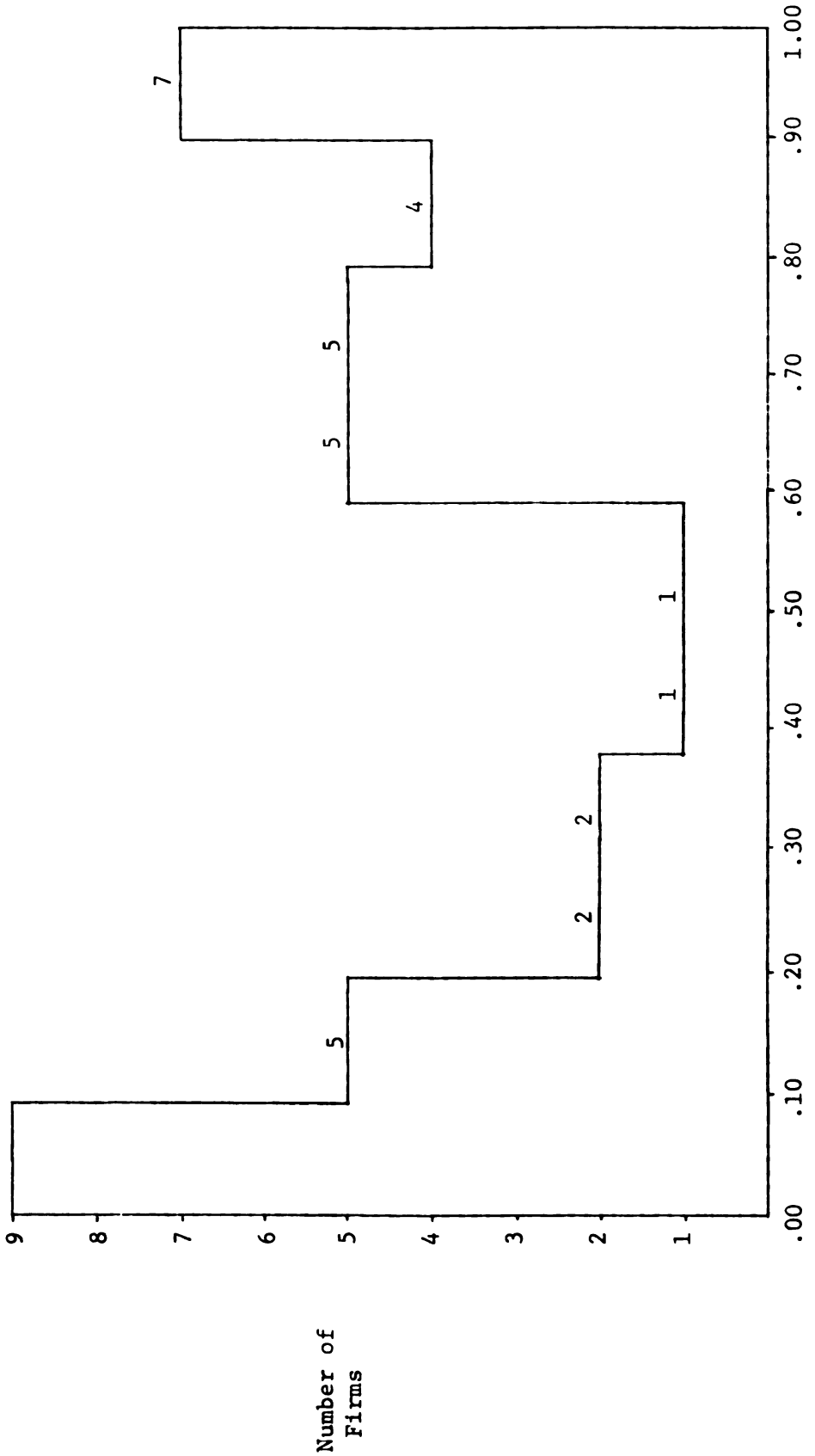
The Stepwise Regression Analysis Findings

The stepwise regression routine provided the calculation of the coefficient of determination (R^2) of the basic sales-net income relationship for each of the 41 firms. The distribution of R^2 values is summarized in Figure 1, on the following page.

The use of the R^2 statistic for analysis purposes was preferred to the use of R which is not meaningfully definable. The R statistic does, however, indicate whether the correlation is positive or negative which the R^2 statistic does not. Since a negative correlation of any magnitude (.00 to -1.00) was considered weaker than any positive correlation, it was necessary to discriminate between R^2 values based on positive coefficients of correlation (R values) and those which were based on negative coefficients of correlation. While the mathematical process of squaring the coefficients of correlation eliminates the possibility of negative R^2 values, the sign of the R statistic was

FIGURE 1

DISTRIBUTION OF COEFFICIENTS OF DETERMINATION (R^2 VALUES) FOR THE BASIC SALES-NET INCOME REGRESSION RESULTS



applied to R^2 throughout the remainder of the analysis.

Since the net income of some of the firms examined was actually negatively correlated with sales, Figure 1 is not completely accurate and is restated to reflect the negative correlations in Figure 2 on page 94.

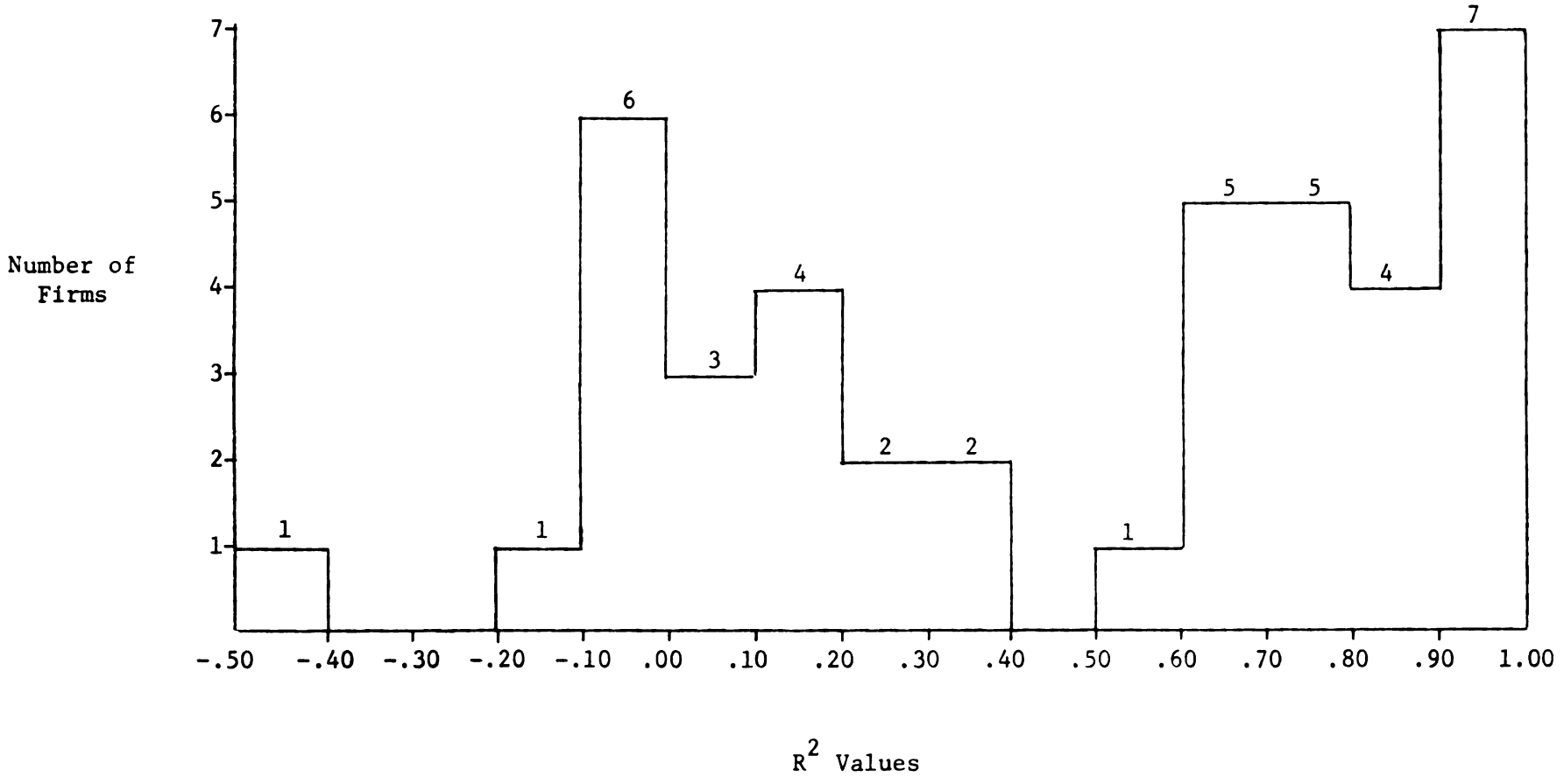
Based on the predetermined definitions of PM and NM firms, the results indicate that 19 of the 41 firms were in the PM classification, and 14 of the 41 firms were in the NM classification. Of the 8 firms which were not classified, two were in the .71-.80 range with R^2 values of less than .75.

It was expected that some of the firms would have sales-net income relationships which were weakly associated. However, it was totally unexpected that so many of the firms in the PM group (8 of the 19) would have sales and income trends which were negatively correlated. While the negative correlations are fairly weak, they do indicate instances where increasing (decreasing) sales trends may be accompanied by decreasing (increasing) net income trends.

The assumption that PM firms would possess variables that provided significant improvement to the basic sales-net income relationship more frequently than the NM firms proved to be incorrect. Of the 347 variables examined in

FIGURE 2

DISTRIBUTION OF COEFFICIENTS OF DETERMINATION (R^2 VALUES), WITH SIGN OF COEFFICIENT OF CORRELATION, FOR BASIC SALES-NET INCOME REGRESSION RESULTS



all 41 firms, 164 were found to provide significant improvement. Every firm except one (Baxter Labs) had at least one variable examined which was capable of significantly reducing the residual error left by the basic sales-net income regression. As a result, it was obviously not possible to discriminate between PM and NM firms based on the presence of a single significant variable.

The next test performed attempted to determine if there were differences in the number of significant variables found in the two groups. The 19 firms classified as PM firms had a total of 162 variables examined, of which 82 were significant. The 14 firms classified as NM firms had a total of 115 variables examined, of which 50 were significant. A two by two contingency table of these results is presented below.

TABLE 5-1

NUMBER OF VARIABLES FOUND TO PROVIDE SIGNIFICANT IMPROVEMENT TO THE BASIC SALES-NET INCOME RELATIONSHIP

Number of Variables at an α = .05 level which were	PM Firms (R^2<.50)	NM Firms (R^2>.75)	Totals
Significant	82	50	132
Non Significant	80	65	145
Totals	162	115	277

A chi-square test was used to examine the null hypothesis: The frequency with which variables are added is not significantly different for PM firms than for NM firms. The critical chi-square value was 3.84 for all two by two contingency tables at an $\alpha = .05$ level. If the calculated value of chi-square exceeded 3.84 in any case, the null hypothesis was rejected.

The calculated value of chi-square for the results tabulated above was 1.372, hence it was not possible to reject the null hypothesis. Table 5-2 provides a list of the 41 firms, their Compustat industry classifications, the R^2 generated from each firm's sales and net income data alone, the rank of the R^2 from the highest (41) to the lowest (1), the number of variables examined in each case, and the number of variables which significantly improved the basic R^2 at an $\alpha = .05$ level.

In answering the first research question, the results indicated that it was not possible to discriminate between PM and NM firms based on the existence, or the frequency of existence, of variables which significantly improve the basic sales-net income relationship. While the results were not expected, it was found, upon analysis of the mechanics of the regression routine, that the selected method of analysis (stepwise regression) did not provide

TABLE 5-2

Company Name	Industry Name	Sales-Net Income R^2	Rank of R^2	Number variables examined	Number of variables which were significant
American Smelt & Ref.	Metals-Misc.	.8646	31	9	4
St. Joe Minerals	Lead & Zinc	.7721	28	9	4
Allied Chemicals	Chemicals-Major	.1815	15	9	5
American Cynamid	"	.7829	29	9	4
Dow Chemical	"	.8888	34	9	4
E. I. Dupont	"	.1512	13	9	4
W. R. Grace	"	.6849	25	8	3
Hercules	"	.9093	35	8	6
Monsanto	"	.5780	20	9	4
Olin	"	.1672	14	8	2
Union Carbide	"	.1325	12	8	4
Pfizer Inc.	Drugs-Ethical	.9924	41	9	1
Schering Plough	"	.8871	33	9	5
Baxter Labs.	Drugs-Med. & Hosp.	.9718	39	8	0
Gillette	Cosmetics	.8738	32	7	5
Helene Curtis	"	(-).1238	2	7	2
Standard Oil, N.J.	Oil-Integr, Domest.	.9146	36	8	1
Armco Steel	Steel-Major	.6651	24	9	2
Inland Steel	"	.0845	11	7	3
Jones and Laughlin	"	(-).0006	8	8	7
National Steel	"	.6425	23	9	4
Republic Steel	"	.0307	9	9	3
U.S. Steel	"	(-).0075	4	7	4
Keystone Cons. Inds	Steel Minor	(-).4418	1	7	5
Owens-Corning Fbgl.	Bldg. Materials	.6309	22	8	2
Stewart Warner	Machinery-Gen. & Indus.	.9238	37	7	6

TABLE 5-2--Continued

Company Name	Industry Name	Sales-Net Income R^2	Rank of R^2	Number variables examined	Number of variables which were significant
Addressograph	Office & Bus. Equip.	.3103	18	9	6
National Cash Register	"	.0818	10	10	7
Pitney Bowes	"	.7963	30	7	4
Chrysler	Motor Vehicles	.2089	16	9	6
General Motors	"	.6142	21	10	6
Kelsey Hayes	Auto Parts & Acc.	.3280	19	9	5
Lockheed	Aerospace	(-).0064	5	8	4
Elmer Perkin	Optical	.9562	38	7	4
American Airlines	Air Transport	(-).0017	7	9	2
Delta Airlines	"	.7407	27	9	5
National Airlines	"	.2702	17	9	5
Northwest Orient Airlines	"	.7214	26	9	6
Pan American Airlines	"	(-).0373	3	11	4
T.W.A.	"	(-).0033	6	9	4
A.T. & T.	Telephone Co.	.9840	40	8	2
Totals				347	164

the expected results because it did not evaluate the variables in the manner anticipated. It was believed that the regression analysis would indicate a variable was significant only when the variable was poorly correlated with the independent variable (sales) and strongly correlated with the dependent variable (net income). If a variable were highly correlated with sales, it was assumed that it would not be added as a significant variable since the capacity of the variable to explain the trend of net income would have already been accounted for by the fixed sales variable. The assumption was incorrect.

Since the sales variables of the PM firms were poorly associated with net income (by definition of PM), the regression routine, in seeking variables which were associated with the trend in net income, did select variables which were weakly associated with sales as was anticipated.

On the other hand, when a NM firm had a variable which was strongly correlated with net income, it was always strongly correlated with sales as well. This event was not totally unexpected since it was assumed *a priori* that variables which were strongly correlated with net income and weakly correlated with sales would be variables which had the capacity to manipulate income. If the classification system were appropriate, NM firms

should have had a noticeable absence of such variables. The fact that they did have a complete absence of such variables tended to support the classification system. The regression characteristic which was unexpected, and which resulted in so many significant variables in the NM group, was the degree of significance found in variables which were highly correlated with both sales and net income. It was assumed that such variables would not significantly improve the sales-net income relationship due to their strong association with sales, as previously explained. However, this assumption proved to be incorrect.

To illustrate the problem a case will be explained. Elmer Perkin Co. had a very strong relationship between sales and net income for the test period as indicated by an R^2 of .9562. Yet the regression routine found four variables which provided statistically significant improvement! The squared correlations of the four variables with the sales variable were .94, .96, .98, and .98.

It was originally assumed that such variables would not provide significant improvement since their ability to explain the behavior of net income would have already been accounted for by the sales variable. The fault with the original assumption was that it did not consider the overriding influence of a variable's association with the

dependent variable, net income. All four variables in the above case had squared correlations with net income that exceeded the squared correlation of sales to net income (.96, .98, .98, and .99).

While the regression analysis did fail to discriminate between PM and NM firms in the manner anticipated, the analysis did provide some useful information for the behavioral characteristics study which is reported below. It should be noted that the failure of the regression analysis to discriminate between PM and NM firms based on either the number of cases or the frequency with which significant variables were indicated was the result of improper assumptions concerning the mechanics of the analysis technique. The behavioral analysis of the income statement variables which follows helped to properly qualify the results obtained from the regression analysis.

The Behavior of Income Statement Variables

The results of the regression analysis indicated that there were major differences in the strength of the sales-net income relationship among the firms examined, even within a particular industry classification. In attempting to determine what role the various income statement variables played in the sales-net income relationship

differences, an analysis of their behavior with respect to both sales and net income was considered to be appropriate.

The relationships which a variable may have with sales and net income can be generalized into four basic types of relationships. A variable can be (1) strongly correlated with both sales and net income, (2) weakly correlated with both sales and net income, (3) strongly correlated with sales and weakly correlated with net income, or (4) weakly correlated with sales and strongly correlated with net income. Each behavior pattern is now discussed with respect to its manipulative potential, and its presence in both the PM and NM groups.

The Strong-Strong Case

When a variable was strongly correlated with both sales and net income (an SS variable), it was felt that the variable was behaving predictably since the changes in the variable were consistent with the changes in sales and net income. There was some reason to believe that SS variables would not be present with equal frequency in both PM and NM firms. Due to the definition of NM firms, it was expected that such variables would exist more frequently in this group. Since sales and net income were poorly correlated in the PM group, it was less likely that

a PM firm would possess a variable which was strongly correlated with both sales and net income. A variable which was strongly correlated with both sales and net income in either PM or NM firms was not considered a variable which would be capable of manipulating income.

The Weak-Weak Case

Variables which were weakly correlated with both sales and net income (WW variables) were considered to be capable of reducing the strength of the sales-net income relationship. In this case, it was considered to be meaningful to distinguish between variables which were negatively correlated with sales or net income or both and variables which were positively correlated with both sales and net income.

Variables which had weak positive correlations with sales and net income were behaving in a manner which was unrelated to the trends in sales and net income. While they could have been variables which were being used to manipulate income, they also could have been relatively fixed revenue or expense variables which were insensitive to changes in sales and net income. (Note that all variables which were weakly correlated with sales and net income were not necessarily behaving in a relatively fixed

manner.)

Variables which were so weakly associated as to be negatively correlated with sales or net income or both were considered to be behaving in an unusual manner. An expense variable which was negatively correlated with net income (or sales) would tend to decrease as net income (sales) increased, and increase as net income (sales) decreased. Such behavior seems suspect, and becomes more so as the strength of the negative correlation increases. These negatively correlated variables were considered to be obvious candidates for distorting the assumed relationship between sales and net income, and were also considered to be capable of manipulating income. (It would seem that the variables which had a strong negative correlation with net income would be the variables which should be examined for income smoothing since they serve to reduce changes in income by acting against the direction of the change.)

Unlike the SS variables, there was no reason to assume the WW variables would not appear among the variables of both PM and NM firms with equal frequency. If the principal reason for variables being weakly associated with sales and net income was simply that they were relatively fixed in nature, both groups should possess WW

variables with approximately the same frequency.

The Strong-Weak Case

Variables which were strongly correlated with sales and weakly correlated with net income (SW variables) were also capable of reducing the strength of the sales-net income relationship. However, this behavior pattern was not considered to represent a capacity to manipulate income, since any variable which was behaving consistently with the sales trend was considered to be behaving rationally. Instances where a variable behaved consistently with respect to sales but inconsistently with respect to net income indicated that the sales-net income relationship had been weakened through some other variable, or group of variables, to the point where net income was no longer associated with sales. In other words, while SW variables were not considered to be potential manipulators of net income, they were considered to be indicative of instances where income might have been manipulated. If net income had not somehow become disassociated with sales the SW variables would have probably been strongly associated with both sales and net income.

If the classification system was not capable of discriminating between potential manipulators and

non-manipulators, there would be no reason to assume that SW variables would not be present among the variables of both PM and NM firms. However, if the PM firms contained SW variables with greater frequency than the NM firms, it would tend to confirm the ability of the PM-NM classification technique to discriminate between potential manipulators and non-manipulators.

The Weak-Strong Case

Variables which were weakly correlated with sales and strongly correlated with income (WS variables) had the capacity to reduce the strength of the association between sales and net income. These variables also had the potential to manipulate net income, since they helped to explain the income trend, and at the same time behaved inconsistently with respect to sales.

Here again, there was no reason to assume that WS variables would not be among the variables of both PM and NM firms. However, if the classification technique was capable of meaningfully classifying firms, the frequency with which WS variables were present among the NM firms should have been relatively low.

Behavioral Testing Results

In the analysis presented above, the four general behavior patterns of income statement variables were discussed. Tests were conducted to determine whether the behavior patterns of the variables examined in the PM firms were significantly different than those of the NM firms. A chi-square test was used in each instance, at the .05 level of significance.

The first generalized hypothesis was: The frequency with which PM firms contain a single variable with the specified behavior pattern is no different than that of the NM firms. Instances where at least one variable of a particular behavior was absent in every firm or present in every firm in either the PM or NM groups would be indicated testing this hypothesis.

The second generalized hypothesis was: The number of variables which reflect the specified behavior pattern is no different for PM firms than for NM firms. Testing this hypothesis provided the total frequency of occurrence for each behavior pattern in both PM and NM firms, and indicated significant differences.

Since the behavior patterns of variables were discussed in the context of weak and strong correlations, it was again necessary to define weak and strong. In order

to be consistent with the previous definitions, weak correlations were defined as instances where a variable's squared correlation (R^2 with the sign of R) with either sales or net income was less than .50. Strong correlations were defined as instances where the squared correlation of a variable with either sales or net income was greater than .75.

The Strong-Strong Test

The frequency with which the two groups of firms possessed at least one variable which was strongly associated with both sales and net income is presented in the following contingency table.

TABLE 5-3

Characteristic	PM Firms	NM Firms	Totals
at least one variable was strongly correlated with both sales and net income	0	14	14
no variables were strongly correlated with both sales and net income	19	0	19
Totals	19	14	33

The calculated value of chi-square from the above table was 32.99 which was greater than the critical value of 3.84, hence the null hypothesis was rejected. While this test does not lend strong support to the classification

system, it does indicate a complete absence of SS variables in the PM group of firms.

The number of variables which were strongly associated with both sales and net income is summarized in Table 5-4.

TABLE 5-4

Characteristic	PM Firms	NM Firms	Totals
variables strongly correlated with both sales and net income	0	62	62
variables not strongly correlated with both sales and net income	162	53	215
Totals	162	115	277

The calculated value of chi-square was 112.52, hence the null hypothesis was again rejected. Over one-half of all the variables (62 of the 115) of the NM firms were strongly associated with both sales and net income.

The Weak-Weak Test

The frequency with which the two groups of firms had at least one variable which was weakly correlated with both sales and net income is presented in the following table.

TABLE 5-5

Characteristic	PM Firms	NM Firms	Totals
at least one variable was weakly correlated with both sales and net income	19	8	27
no variables were weakly correlated with both sales and net income	0	6	6
Totals	19	14	33

The calculated value of chi-square from the results tabulated above was 7.79. As a result, the hypothesis that both groups had at least one variable which was weakly correlated with both sales and income with equal frequency was rejected. All of the PM firms had at least one variable which was weakly correlated with both sales and income, while six of the NM firms had no such variable.

The number of variables which had the weak-weak characteristic is indicated in the following table.

TABLE 5-6

Characteristic	PM Firms	NM Firms	Totals
variable weakly correlated with sales and net income	57	14	71
variable not weakly correlated with both sales and net income	105	101	206
Totals	162	115	277

The calculated value of chi-square from the data tabulated above was 18.69 which was considerably more significant than the first test above. While 8 of the 14 NM firms had at least one variable which was weakly correlated with both sales and income, only 14 of the 115 variables (12%) of NM firms possessed the weak-weak behavior. The 57 variables of the PM firms which possessed the weak-weak behavior represented 35% of the total 162 variables examined.

While the above distribution reflects highly significant differences in the frequency with which the weak-weak behavior characteristic appeared ($\alpha < .001$), it was concluded in the initial discussion of the weak-weak case that there was no reason to expect an unequal distribution of such variables. It was also suggested that such variables have the potential to manipulate income. As a result, if any inferences were to be made from the above tests, they would tend to support the PM - NM classification system. A closer examination of weakly correlated variables will be made later in this chapter.

The Strong-Weak Test

The frequency with which the two groups possessed at least one variable which was strongly associated with

sales and weakly associated with net income (SW variables) is presented in the following contingency table.

TABLE 5-7

Characteristic	PM Firms	NM Firms	Totals
at least one variable strongly associated with sales and weakly associated with income	18	2	20
no variables strongly associated with sales and weakly associated with income	1	12	13
Totals	19	14	33

The calculated value of chi-square was 21.80 which indicates a highly significant difference ($\alpha < .001$) in the distribution among the two groups. Only one of the PM firms did not have at least one SW variable. Upon closer examination of this firm it was found that none of the variables examined had a squared correlation of greater than .67 with either sales or income.

The number of SW variables which were present in the two groups is summarized in the following table.

TABLE 5-8

Characteristic	PM Firms	NM Firms	Totals
variables strongly correlated with sales and weakly correlated with net income	65	3	68
variables not strongly correlated with sales and weakly correlated with net income	97	112	209
Totals	162	115	277

The calculated value of chi-square was 51.10 which was again significant at an α of less than .001. While 2 of the 14 NM firms had at least one of the SW variables, only 3 of the 115 variables of NM firms were so characterized. As was previously stated, the presence of SW variables, while not considered to be manipulated variables themselves, should be an indication of instances where income has been potentially manipulated. Had the frequency distribution of such variables not been significantly different for the two groups, the PM-NM classification system would have been discredited. The results tabulated above once again tend to confirm the ability of the classification to discriminate between PM and NM firms.

The Weak-Strong Test

The variables which were weakly correlated with sales and strongly correlated with income (WS variables) were the variables which the regression routine was expected to add as providing significant improvement to the basic income statement relationship. The frequency with which a firm possessed at least one WS variable is tabulated below.

TABLE 5-9

Characteristic	PM Firms	NM Firms	Totals
at least one variable that was weakly correlated with sales and strongly correlated with net income	11	0	11
no variables weakly correlated with sales and strongly correlated with net income	8	14	22
Totals	19	14	33

The calculated chi-square value of 11.22 indicated the difference between the PM and NM groups was significant at an α level of less than .001. None of the NM firms had a single WS variable.

The frequency with which WS variables occurred is reported in the following table.

TABLE 5-10

Characteristic	PM Firms	NM Firms	Totals
variables weakly correlated with sales and strongly correlated with net income	12	0	12
variables not weakly correlated with sales and strongly correlated with net income	150	115	265
Totals	162	115	277

The calculated chi-square value of 7.95, while being the lowest calculated value, indicated a difference between the two groups which was significant at an α level of less than .005.

The WS variables were expected to be variables most likely to represent manipulation. In examining the 12 WS variables of the 19 firms it was discovered that each variable was added to the stepwise regression routine as was originally anticipated. However, of these 12 WS variables, 11 represented the "tax expense" variable and the other represented a "bonuses" account. There was no reason to believe that either type of account would not normally be strongly associated with reported net income. As a result, none of the 12 WS variables was construed to have manipulated income. The fact that they were weakly correlated with sales while being highly correlated with

income simply indicated that if manipulation occurred, it took place before the two expense items were calculated.

Summary of the Behavioral Test Results and Some Further Testing

Each of the eight tests reported indicated that the differences in the behavior patterns of the income statement variables examined for PM and NM firms were statistically significant. These results tend to confirm the assumption that the differences in the strength of the basic sales-net income relationships, which was the basis for classifying firms, were at least partially attributable to the differences in the behavior of the income statement variables. The answer to the second research question is clearly affirmative. Yet, it remains unclear as to how these behavioral differences result in potential manipulation for PM firms.

Recall from the previous behavioral analysis discussion that SS variables and SW variables were ruled out as being representative of income manipulating behavior due to their strong associations with the trend in sales. The WS variables and the WW variables were considered to be candidates for manipulating income due to the inconsistency of their behavior with respect to the sales trend.

Since the 12 WS variables were found to be

non-manipulative in nature, the existence of potential income manipulation can not be exemplified by the analysis of these variables. This fact should not be construed to mean that WS variables do not have the potential ability to manipulate income, or that WS variables which may have served to manipulate income did not exist in the sample of firms examined. The disclosure of such variables could have easily been avoided by combining their amounts with other variables and reporting them under some aggregated account classification.

Aggregating accounts which have dissimilar behavior patterns will distort the behavior patterns of the individual accounts. The analysis of aggregated accounts in such cases is of limited benefit. Exactly how accounts should be aggregated and/or reported has, of itself, been a controversial issue. The 1966 American Accounting Association Committee to Prepare a Statement of Basic Accounting Theory suggested an aggregation format based on whether the amounts in income statement accounts were either fixed or variable in nature. Such an aggregation technique would have been extremely helpful for this research effort, since it would have provided a benchmark for comparing actual behavior patterns to stipulated behavior patterns.

The only disclosed variables examined in the study

which might have exemplified manipulative capabilities were the WW variables. Some of the WW variables could have represented accounts which were relatively fixed in nature, which would account for their lack of sensitivity to changes in sales and net income. However, when the WW variables were negatively correlated with sales or income or both, their changes with respect to trended sales or net income or both were in the opposite direction. Such behavior was considered to be indicative of a capacity to manipulate net income.

To determine if the PM and NM firms had significant differences with respect to the presence of negatively correlated variables, a more restrictive version of the weak-weak test was examined. The results of the first test are presented below.

TABLE 5-11

Characteristic	PM Firms	NM Firms	Totals
at least one variable was negatively correlated with either sales or net income	19	4	23
no variables were negatively correlated with either sales or net income	0	10	10
Totals	19	14	33

Since it was assumed that no inherent differences in the presence of negatively correlated variables should result from the PM-NM classifications, the null hypothesis was: The presence of at least one negatively correlated variable is no different for PM firms than for NM firms. From the data tabulated above the calculated value of chi-square was 19.49 which was significantly greater than the critical value of chi-square (at α = .005 the critical value of chi-square is 7.879), hence the null hypothesis was rejected.

As in all of the behavioral pattern tests previously reported, it was of interest to note when any differences were found based on the presence of a single variable of a specified characteristic. In this case, it was discovered that none of the PM firms in the sample had a complete absence of negatively correlated variables.

An additional test was made to determine the number of negatively correlated variables each group was observed to have had, and if the frequency distribution of such variables was significantly different between groups. The results of this test are tabulated below.

TABLE 5-12

Characteristic	PM Firms	NM Firms	Totals
number of variables negatively correlated with either sales or net income	91	4	95
number of variables positively correlated with both sales and net income	71	111	182
Totals	162	115	277

The calculated value of chi-square (82.87) indicated that there were highly significant differences.

The 4 NM firms which had negatively correlated variables each had only one such variable. Of these 4 variables, 3 were negatively correlated with both sales and net income and one was negatively correlated with sales only. The average of the 3 squared correlations with net income was (-).096, and the average of the 4 squared correlations with sales was (-).075.

Of the 91 variables which were negatively correlated with either sales or net income for PM firms, 67 were negatively correlated with net income, 33 were negatively correlated with sales, and 9 were negatively correlated with both. The average squared correlation of the 67 variables which were negatively correlated with net income was (-).1795, and the average squared correlation of the 33 variables negatively correlated with sales was (-).1632.

Figures 3 and 4 indicate the frequency distribution of the negatively correlated variables of the PM firms for net income and sales respectively.

Since negatively correlated variables have the capacity to manipulate income, it was possible to examine these variables and find an example which represented potential income manipulation. As mentioned in the analysis of the 12 WS variables, it was not considered unusual that the 11 tax expense variables were strongly correlated with net income. This relationship was, in fact, the expected behavior of all tax expense variables. However 4 of the 19 PM firms had tax expense variables which were weakly correlated with net income, and one of the 4 was negatively correlated with net income ($R^2 = -.33$). Figure 5 indicates the behavior of the tax expense variable which was negatively correlated with net income.

It was not the intention of this researcher to imply that the tax expense variable illustrated in Figure 5, or any other variable, represented an actual case where income was manipulated. However, it is evident that the tax expense variable illustrated, in and of itself, has the capacity to manipulate income. The tax expense as a percent of reported net income (column 4) ranged from 58% to 103%, with year-to-year variations in the percent as large

FIGURE 3

FREQUENCY DISTRIBUTION OF VARIABLES OF PM FIRMS WHICH WERE NEGATIVELY CORRELATED WITH NET INCOME, R^2 WITH SIGN OF R

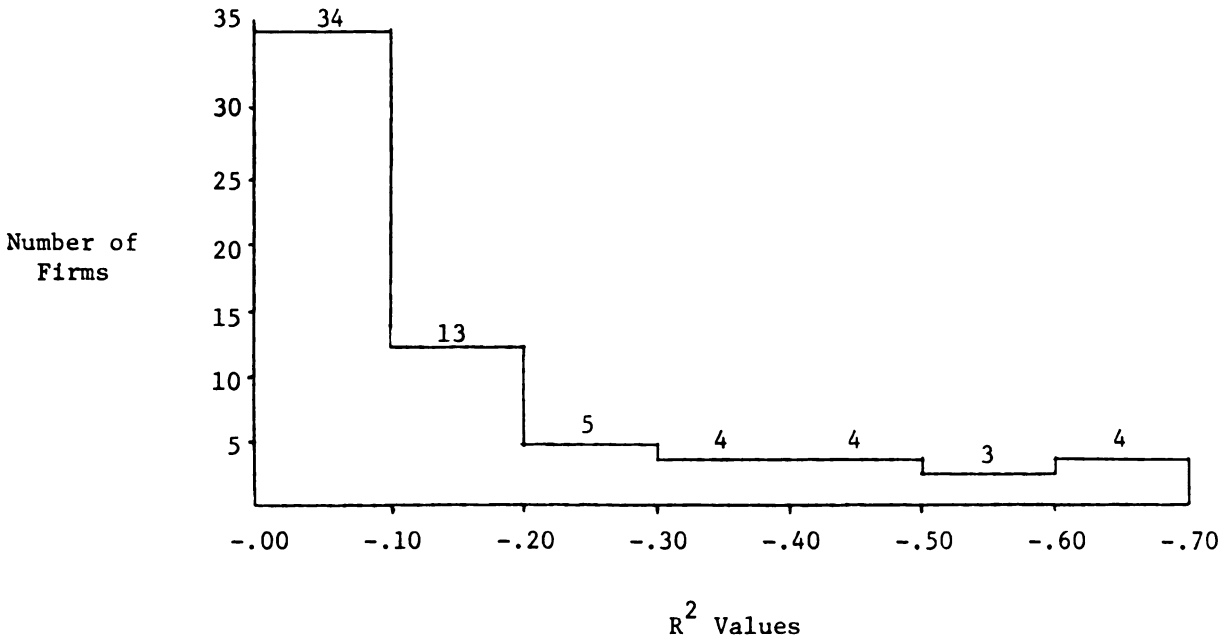


FIGURE 4

FREQUENCY DISTRIBUTION OF VARIABLES OF PM FIRMS WHICH WERE NEGATIVELY CORRELATED WITH SALES, R^2 WITH SIGN OF R

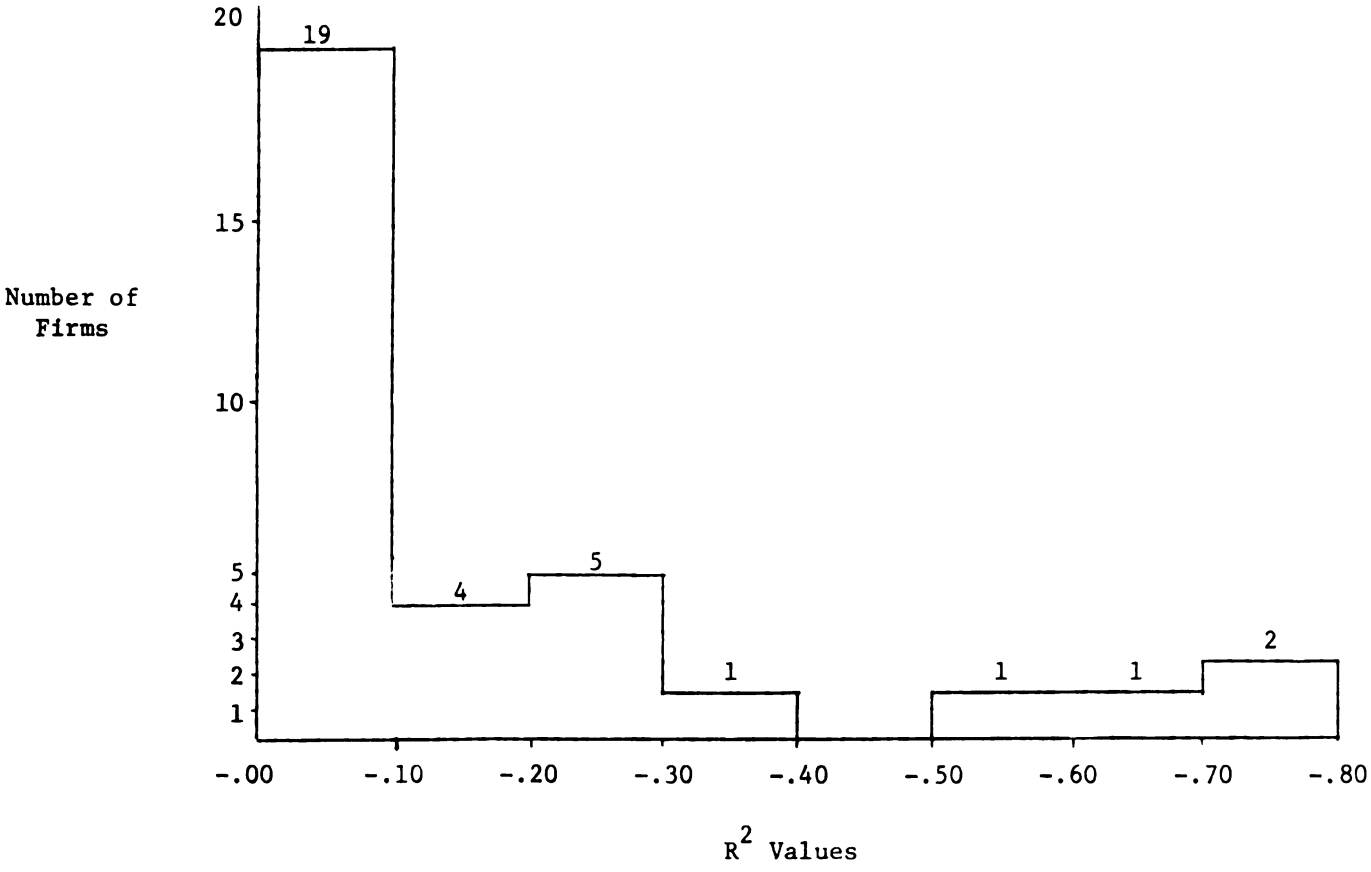


FIGURE 5

(1) Year	(2) Reported Net Income (millions)	(3) Reported Tax Expense (million)	(4) Column 3 as a % of Column 2	(5) % change in reported net income from previous year	(6) % change in reported tax expense from previous year
1957	$396.61	$280.33	71%		
1958	341.25	197.77	58	- 13.96%	- 29.45%
1959	418.70	308.87	74	+ 22.70	+ 56.18
1960	381.40	250.32	66	- 8.91	- 18.96
1961	418.16	264.93	63	+ 9.64	+ 5.84
1962	451.60	333.46	74	+ 8.00	+ 25.87
1963	472.26	349.55	74	+ 4.57	+ 4.83
1964	471.43	359.35	76	- .18	+ 2.80
1965	407.23	357.66	88	- 13.62	- .47
1966	389.12	334.25	86	- 4.45	- 6.55
1967	313.86	253.42	81	- 19.34	- 24.18
1968	371.87	382.16	103	+ 18.48	+ 50.80
1969	356.20	343.30	96	- 4.21	- 10.17
1970	328.70	250.40	76	- 7.72	- 27.06
1971	356.50	265.00	74	+ 8.46	+ 5.83

as 22% (1967 to 1968).

Although the tax expense variable was selected because its behavior was different than that which was normally expected of such a variable (the average squared correlation with net income of all 41 tax expense variables examined was +.735), it also provided an illustration of how an income statement variable which would normally be disclosed in the published financial reports could have had a manipulative effect on net income.

An abbreviated analysis, similar to that which was illustrated in Figure 5, was conducted on the three remaining WW tax expense variables of the PM firms to provide further evidence of the appropriateness of the interpretation of WW variables in general. The results of the analysis are illustrated in Figure 6.

The analysis of negatively correlated variables provided further evidence of the ability of the classification system to discriminate between PM and NM firms. The behavior of a negatively correlated variable and three other WW variables provided illustrations of how these variables may have a manipulative effect on reported net income.

FIGURE 6

TAX EXPENSE AS A PERCENT OF REPORTED NET INCOME

Year*	Case 1	Case 2	Case 3
1	80.64%	37.00%	81.47%
2	51.91	32.47	81.45
3	72.08	31.07	78.12
4	70.96	36.85	62.34
5	63.92	50.11	52.35
6	74.13	55.97	66.51
7	78.68	55.43	64.43
8	85.04	64.35	70.77
9	89.74	77.34	80.32
10	83.39	84.60	86.59
11	87.16	104.58	85.46
12	94.77	101.77	82.65
13	88.02	99.60	95.28
14	89.28	82.41	93.64
15	103.58	80.23	95.27

* year 1 is most recent year for which data was collected in each case.

NOTE: Case 2 and 3 above, and the case illustrated in Figure 5 are all from the Chemicals-Major Industry classification.

Summary

This chapter reported the results of the research and an analysis of the results. The stepwise regression routine was used to test the first research question. The results of the regression testing indicated that the variables examined in both PM and NM firms were capable of improving the basic income statement relationship.

An analysis of the behavior of income statement variables with respect to sales and net income trends utilized the intercorrelation matrix to test the second research question. The behavior analysis indicated which behavioral patterns were capable of manipulating income and which were not considered to have income manipulating capabilities. The tests concerning the frequency with which PM and NM firms contained variables of each general behavior pattern indicated that the frequency distributions for each behavior pattern were significantly different for PM and NM firms. These results indicated that the answer to the second research question, which asked if PM and NM firms had variables which had significantly different behavioral characteristics, was affirmative.

Further analysis considered the nature of the differences in the behavior of variables, and indicated that the PM firms possessed a significantly greater number

of variables which were considered to be capable of manipulating income.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The first section of Chapter VI contains a summary of the results presented and discussed in the previous chapters. A brief review of the conditions which led to the research topic is presented, followed by the two research questions considered and a summary of the results which were obtained in answering the two questions. The conclusions drawn from the research results reported are then presented, followed by some recommendations.

Summary of Results

In the literature of accounting and finance it has been suggested that some firms manipulate their reported net incomes. The notion that income is sometimes manipulated represents a substantial criticism of the usefulness to external users of the income statement which is generally considered to be the most widely used segment of published accounting information. A good many critics have sighted the flexibility and permissiveness of

generally accepted accounting principles as the major vehicle for facilitating a firm's ability to manipulate its reported net income. Others have expressed the belief that manipulative tools are not necessarily confined to accounting principles. In either case, the bulk of the criticism has been aimed at the accounting profession.

There have been a number of researchers who have attempted to develop techniques whereby instances of manipulation might be determined. If general agreement could be reached on exactly what recognizable conditions constitute income manipulation, the implied desire of some firms to manipulate their reported net income might be substantially deterred. However, none of the research endeavors thus far has been capable of providing a generally agreed upon definition of manipulation or a technique for determining when income has been manipulated.

The purpose of this research was to test the ability of the classification technique herein proposed to differentiate between potential manipulators of reported net income and non-manipulators. The classification of firms was based on their linear relationships between reported sales and reported net income over a 13 to 16 year period.

Firms whose reported net income data were strongly

associated with their respective net sales data were considered to be non-manipulator firms. The NM classification was based on the assumption that there should be a strong functional relationship between net income data and sales data for those firms which have not manipulated reported net income.

Conversly, firms whose reported net income data were weakly associated with their respective net sales data were considered to be potential income manipulators. The assumed relationship between sales and net income in these instances had somehow become distorted, and firms which had manipulated net income would, therefore, be among those firms with weakly associated sales-net income data.

To determine if the proposed classification technique was appropriate it was necessary to examine the strength of the sales-net income relationships of a number of firms for differences. Once differences in the sales-net income relationships had been established, the behavior of each firm's individual income statement variables was examined to determine if it was responsible for the differences. In determining the effect of the various income statement variables, two research questions were considered.

The first research question asked if the income statement variables of the PM and NM firms had

significantly different effects on their respective sales-net income relationships. In answering this question, a stepwise regression analysis was used to evaluate the impact of each individual variable on the residuals from the sales-net income relationship of the firm to which it pertained.

An evaluation of the relative improvement to the basic sales-net income relationships of the 33 classified firms provided by their respective income statement variables was made using the stepwise regression analysis. All but one of the 33 classified firms had at least one variable which was capable of significantly improving the strength of their basic sales-net income relationships. Of the 162 variables belonging to the 19 firms in the PM group, 82 were found to provide significant improvement (at the .05 level of significance). Of the 115 variables belonging to the 15 firms in the NM group, 50 were found to provide significant improvement.

Based on these regression results, it was not possible to discriminate between PM and NM firms on the basis of either the number of instances or the number of variables which indicated that improvement in the basic relationship had taken place. Both groups of firms had variables which improved their relationships, and the frequency with which

such variables were present did not indicate that a significant difference existed between the two groups.

The answer to the first research question was that the income statement variables of the PM and NM firms did not have significantly different effects on their respective sales-net income relationships.

The second research question asked if the income statement variables of the PM and NM firms had significantly different behavioral characteristics. In answering this question the data from an intercorrelation matrix were used. The behavior pattern of each variable was characterized by its correlation with sales as well as its correlation with net income.

Income statement variables were considered, defined and classified into four general behavior patterns and evaluated with respect to their income manipulating capabilities. Variables whose behavior patterns represented either strong correlations with both sales and net income, or strong correlations with sales and weak correlations with net income were considered to be incapable of manipulating income. Variables whose behavior patterns represented either weak correlations with both sales and net income, or weak correlations with sales and strong correlations with net income were considered to be capable of

manipulating income.

The frequencies with which PM and NM firms possessed variables with the four general behavior patterns were tested to determine if there were significant differences. The tests revealed that statistically significant differences (at an α of less than .005) occurred in each of the four behavior patterns. PM firms were found to have a complete absence of income statement variables which were strongly correlated with both sales and net income. Also, PM firms were characterized as having a significantly greater number of variables which were: (1) weakly correlated with both sales and net income; (2) weakly correlated with sales and strongly correlated with net income; (3) strongly correlated with sales and weakly correlated with net income.

The answer to the second research question was that the variables of the PM and NM firms did have significantly different behavioral characteristics. The differences in the behavior of the variables of the two groups tended to lend support to the notion that firms classified as PM's were potential income manipulators and those classified as NM's were non-manipulators.

An additional test was conducted to determine if there were differences in the frequency with which negatively

correlated variables occurred among the two groups of firms. Negatively correlated variables were considered to be strong candidates for manipulating income. The results indicated that PM firms had a significantly greater number of variables which were negatively correlated with sales or net income or both than NM firms, providing additional support for the PM-NM classifications.

Finally, some illustrations of variables which were said to be capable of manipulating income were presented to reveal how they might have been used to influence the determination of reported net income.

Conclusions

The implications of the research results are largely a function of how they are interpreted by the reader. Two direct conclusions may, however, be drawn.

First, it was revealed that major differences do exist in the strength of firms sales-net income relationships, even among firms in the same industry classification. The differences were so great in some instances that they could have been considered real (statistically significant) differences for all periods rather than for the years tested alone. This was again true for some firms in the same industry classification.

Second, it was concluded that the income statement variables examined in the research did play an important part in generating the existing differences in the sales-net income relationships of the sample firms for the period tested. Furthermore, firms classified as potential income manipulators were found to have a significantly greater number of variables which behaved unpredictably and inconsistently with regard to their respective sales and net income data. Such behavior was considered to be typical of the behavior which would characterize manipulated income statement variables.

Based on the aforementioned conclusions, the proposed classification technique was generally considered to be capable of discriminating between potential income manipulators and non-manipulators. The classification technique, being dichotomous in nature, is not as refined as it might be, and the definitions of "weak" and "strong" are not beyond reproach. However, the research results seem to strongly infer that the basic concept underlying the classification technique is not unfounded, and might well provide a sound foundation for future income manipulation research.

Recommendations

Based on the results reported in this dissertation, it is strongly recommended that the information generated by the classification technique used in this research be considered as a part of the information set for investment decision making. Firms with weakly associated sales-net income data should generally be considered less desirable investments than firms with strongly associated data, all else being equal. Whether or not the inconsistent behavior of income statement variables, which characterizes PM firms, is by design should not be of major import to the investor. It is sufficient to realize that the income statement variables and resulting net income generally behave in a less predictable manner for PM firms than for NM firms.

Knowledge of a firm's sales-net income relationship based on past data may be extremely useful when used in conjunction with other information. If a firm is expected to have an increase in sales activity in the coming period it is often assumed that net income will also increase. The research results clearly indicate that for PM firms this would not have always been an appropriate assumption. Yet, based on past experience, there is a high probability that the assumption would be appropriate for NM firms. If

the past relationship between a firm's sales and income data can be expected to continue in the future, then, given an expected sales value, it would be possible to make a better estimate of expected net income for NM firms than for PM firms.

Another recommendation, based primarily on the opinion of the author, is that the Securities Exchange Commission (SEC) or the American Institute of Certified Public Accountants or both should take some positive action to improve the existing income statement disclosure requirements and reporting format. The solutions to many of the questions and problems which burden the accounting profession today will require extensive empirical research by its members. This research endeavor, as well as many others, has been constrained by both the quantity and quality of the existing income statement data. To relieve these constraints it will be necessary to develop a more meaningful disclosure format.

One possible format might provide for the aggregation of accounts on the basis of their association with sales. For example, variables which had a correlation with sales over the past 5 or 10 years (including the current year) of between .75 and 1.00 could be combined and reported together, those having a correlation with sales of between

.50 to .74 could be combined and reported together, and so on. It would also be possible to further sub-divide these aggregated accounts according to their particular functions, such as cost of goods, selling, administrative, and so on. The resulting aggregations would amplify the behavior of groups of accounts with respect to sales and all other groups of accounts, and would prohibit aggregations of accounts whose behavior patterns tend to offset one another.

While this suggestion may be too drastically different to be considered feasible, there are other possibilities which might provide meaningful improvements to the present reporting format. The income statement format recommended by the American Accounting Association's Committee to Prepare A Statement of Basic Accounting Theory (ASOBAT), by differentiating between variable and fixed income statement components, would provide new and useful information, particularly for research concerned with the behavior of income statement variables. As a case in point, if the accounting profession expects to have a meaningful role in meeting the demand for forecasted earnings statements, it will be necessary to gain a better understanding of the behavior of the elements which are used to determine earnings. The ASOBAT format would also

be of considerable benefit to research which considers the analysis of past results and trends in income statement data, as this research has.

While the format of the income statement is thought to be in need of improvement, it is also believed that it should generally disclose more information. At a minimum, the maximum amount of actual income statement data (exclusive of exhibits, etc.) which is reported by a firm to any source (ie. the SEC, the CAB, etc.), should be the same amount of information reported to all other sources. This requirement would make the information that is presently available equally accessable to all users and potential users of those data, with no additional cost or effort required on the users part.

To improve the uniformity of income statement disclosure, it could be required that all firms in any given industry report essentially the same information. For example, if research and development is considered to be a significant expense in the chemical industry or the aerospace industry, all firms in those industries should be required to disclose the amount expended. In other industries where research and development expenditures are not material in amount, disclosure would not be necessary. Some significance limits could be stipulated,

possibly based on a variable's percent of net sales, to help determine which accounts should be disclosed and which could be aggregated.

The possible improvements which could be made to existing income statement format and disclosure requirements are too numerous to be considered here. It is sufficient to say that improved requirements in these areas would facilitate more meaningful accounting research, and that the research is a necessary element for effectively solving many of the controversial issues in accounting.

APPENDIX I

Regression Association

The fundamentals of the regression analysis used in this research are explained in this appendix. The behavior of reported net income and its association with various reported elements of the income statement were of principal interest. Reported net income (Y) was, therefore, the dependent variable used throughout. To explain the behavior of reported net income, its association with various income statement variables (the independent X_j variables) was examined. The reported sales variable was considered to be the principal independent variable (X_1), and was a fixed element in the regression analysis in that it was always considered as an independent variable in the regression equation. The regression analysis evaluated the ability of the individual independent variables of each firm to explain the trend in the dependent variable (reported net income) for the period examined. The mechanics of the regression association and the definitions of the statistics generated are provided below.

Let X_{ij} = the j independent variables,

$\bar{Y}$ = the mean value of the dependent variable,

Y_{c_i} = the estimated values of the dependent variable computed by the regression equation based on the actual values of the independent variables (in simple linear regression Y_c would be the least squares line),

Y_i = the actual values of the dependent variable,

$i = 1,\ldots,n$ = the number of observations (years) for both X_i and Y_i.

Then

$$\sum_{i=1}^{n} \frac{(Y_i - \bar{Y})^2}{n} = \sigma_Y^2 = \text{the variance of the } Y_i \text{ from } \bar{Y}$$
$$= \text{the total variance,}$$

$$\sum_{i=1}^{n} \frac{(Y_i - Y_{c_i})^2}{n} = \sigma_{Y_c}^2 = \text{the variance of } Y_i \text{ from the } Y_{c_i} \text{ estimates,}$$
$$= \text{the unexplained variance,}$$

$$\sum_{i=1}^{n} \frac{(Y_{c_i} - \bar{Y})^2}{n} = \sigma_{Y \cdot X^2}^2 = \text{the variance of } Y_{c_i} \text{ from } \bar{Y}, \text{ given the } X_i\text{'s}$$
$$= \text{the explained variance.}$$

Since $\sigma_Y^2 = \sigma_{Y_c}^2 + \sigma_{Y \cdot X^2}^2$

we can say $\dfrac{\sigma_Y^2}{\sigma_Y^2} = \dfrac{\sigma_{Y_c}^2}{\sigma_Y^2} + \dfrac{\sigma_{Y \cdot X^2}^2}{\sigma_Y^2}$

$$\equiv \quad 1 = \frac{\sigma_{Y_c}^2}{\sigma_Y^2} + \frac{\sigma_{Y \cdot X^2}^2}{\sigma_Y^2}$$

$$\equiv \quad 1 = K^2 + R^2$$

where $K^2 = \frac{\sigma^2_{Y_c}}{\sigma^2_Y} = \frac{\text{the unexplained variances}}{\text{the total variances}}$

= the amount (ratio) of squared error unable to be reduced.

$R^2 = \frac{\sigma^2_{Y \cdot X^2}}{\sigma^2_Y} = \frac{\text{the explained error}}{\text{the total error}}$

= the amount (ratio) of squared error reduced by using Y_{c_i} to estimate Y_i given the values of X_{ij}.

As most commonly defined:

R^2 = the "coefficient of determination", which provides a relative measure of the strength of the association between the X_j's and Y,

K^2 = the "coefficient of non-determination",

R = the "coefficient of correlation" (undefined)

K = the "coefficient of alienation" which indicates the relative percent of unsquared error unable to be reduced by the regression equation,

1-K=A = the "coefficient of association" the relative percent of unsquared error able to be reduced by the regression equation.

SOURCE: Materials prepared and provided by Dr. Richard Lewis, Professor of Marketing, Michigan State University.

APPENDIX II

Sensitivity Analysis

To test the effect of the eight firms eliminated from the study on the research results, a form of a sensitivity test was performed on the definitions of PM and NM firms. Without changing the definitions of weak and strong behavior patterns, the eight firms were added first to the PM group and then to the NM group to determine their impact on the results of the chi-square tests reported in the research. The following table summarizes the results of the sensitivity tests.

Case (Sales-Net Income)	X^2 Values Presence Test	Frequency Test
W - W Case		
(1) as reported	7.79	18.69
(2) if PM < .75	6.41	16.19
(3) if NM > .50	6.81	14.77
S - W Case		
(1) as reported	21.80	51.10
(2) if PM < .75	27.34	42.60
(3) if NM > .50	11.32	44.33
W - S Case		
(1) as reported	11.22	7.95
(2) if PM < .75	10.14	7.84
(3) if NM > .50	7.12	6.99
S - S Case		
(1) as reported	32.99	112.52
(2) if PM < .75	32.90	136.59
(3) if NM > .50	22.58	70.83

Generally speaking, the results of the chi-square tests are less significant when the eight firms are added to either the PM or the NM group. This would imply mixed behavior patterns on the part of the variables of the eight firms, indicating no strong tendency to act like either the PM or the NM groups as originally specified. The chi-square values calculated from the sensitivity tests were, however, all significant at the .05 level.

SELECTED BIBLIOGRAPHY

Accounting Principles Board, APB Accounting Principles, New York, New York: American Institute of Certified Public Accountants.

Archibald, T. Ross, "The Return to Straight-Line Depreciation: An Analysis of a Change in Accounting Method , Empirical Research in Accounting: Selected Studies, 1967, 164-80.

Ball, Ray and Brown, Philip, "An Empirical Evaluation of Accounting Income Numbers", The Journal of Accounting Research, Vol. VI, No. 2 (Autumn, 1968), 169-78.

Chambers, R. J., "Matter of Principle", The Accounting Review, Vol. XLI, No. 3 (July, 1966), 443-57.

Comiskey, Eugene E. and Barefield, Russel M., "The Smoothing Hypothesis: An Alternative Test", The Accounting Review, Vol. XLVII, No. 2 (April, 1972), 291-98.

Committee on Auditing Procedure, Auditing Standards and Procedure, New York, New York: American Institute of Certified Public Accountants, 1963.

Committee to Prepare a Statement of Basic Accounting Theory, A Statement of Basic Accounting Theory, Evanston, Illinois: American Accounting Association, 1966.

Copeland, R. M., "Income Smoothing", Empirical Research in Accounting: Selected Studies, 1968, 101-116.

_____. and Licastro, R. L., "A Note on Income Smoothing", The Accounting Review, Vol. XLIII, No. 3 (July, 1968), 540-5.

_____. and Moore, Michael L., "The Financial Bath: Is It Common?", MSU Business Topics, Vol. 20, No. 4

(Autumn, 1972), 63-7.

Dasher, Paul E. and Malcolm, Robert E., "A Note on Income Smoothing in the Chemical Industry", The Journal of Accounting Research, Vol. VIII, No 2 (Autumn, 1970), 253-9.

Dopuch, Nicholas and Drake, David F., "The Effect of Alternative Accounting Rules for Nonsubsidiary Investments", Empirical Research in Accounting: Selected Studies, 1966, 192-219.

Gagnon, Jean-Marie, "Purchase Versus Pooling of Interests: The Search for a Predictor", Empirical Research in Accounting: Selected Studies, 1967, 187-204.

_____. "The Purchase-Pooling Choice: Some Empirical Evidence", The Journal of Accounting Research, Vol. IX, No. 1 (Spring, 1971), 52-72.

Jaedicke, Robert K., Ijiri, Yuji, and Nielson, Oswald, Research in Accounting Measurement, Menasha, Wisconsin: American Accounting Association, 1966.

McDonald, Charles LeRoy, An Empirical Examination of Published Predictions of Future Earnings. Unpublished Ph.D. dissertation, Michigan State University, 1972.

Mendenhall, William, The Design and Analysis of Experiments, Belmont, California: Wadsworth Publishing Company, Inc., 1968.

O'Connor, M. C. and Hamre, J. E., "Alternative Methods of Accounting for Long-Term Nonsubsidiary Intercorporate Investments in Common Stock", The Accounting Review, Vol. XLVII, No. 2 (April, 1972), 308-19.

Salmonson, R. F., Basic Financial Accounting Theory, Belmont, California: Wadsworth Publishing Company, Inc., 1969.

Simpson, Richard H., "An Empirical Study of Possible Income Manipulation", The Accounting Review, Vol. XLIV, No. 4 (October, 1969), 806-17.

Spacek, Leonard, What is Profit? Cambridge, England: The Institute of Chartered Accountants in England and Wales, 1970.

White, Gary E., "Discretionary Accounting Decisions and Income Normalization", The Journal of Accounting Research (Autumn, 1970), 260-73.