VARIATION IN ACCOUNTING INFORMATION LOAD: THE IMPACT OF DISCLOSURE REQUIREMENTS OF FASB STATEMENT NO. 33 ON CASH FLOW PREDICTIONS OF FINANCIAL ANALYSTS

DISSERTATION

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By

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In Statement No. 33, "Financial Reporting and Changing Prices," the FASB requires that some large companies disclose their historical cost/constant dollar and current cost information in the published financial statements. One of the purposes of these disclosures is to help users of the financial statements in assessing future cash flows. This study was directed toward the examination of the effects of the different levels of disclosures on cash flow projections.

Financial analysts in the Dallas-Fort Worth and Houston areas were used as subjects in this study. Subjects were randomly divided into one control group and three experimental groups. Three distinct levels of disclosures from FASB Statement No. 33 were used to assess the effects of the disclosures on cash flow projections. These are (a) historical cost/constant dollar, (b) current cost, and (c) historical cost/constant dollar and current cost. The control group received financial statements without disclosures while the other three experimental groups received financial statements with three different levels of disclosures from an actual firm. Subjects were asked to make cash flow projections. The performance measure used was the absolute percentage error (APE).
The research results have led to four conclusions. First, different levels of disclosures have effects on the cash flow projections. Subjects who received the most disclosures had the most accurate cash flow projections, while subjects who received no disclosures had the least accuracy. Second, subjects who merely spent more time on either historical cost/constant dollar disclosures or current cost disclosures did not improve their performance. Third, subjects who received historical cost/constant dollar disclosures tended to underestimate cash flow. Fourth, the multiple regression analysis indicated that the model, based on the five analysts' characteristics, cannot be used to predict APE. These five characteristics were (a) Chartered Financial Analyst, (b) Educational level, (c) industry specialist, (d) years of experience, and (e) time spent completing the questionnaire.
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CHAPTER I

INTRODUCTION

Background and Significance of the Problem

In recent years accounting policy-makers have adopted a "user-oriented approach" to corporate financial reporting. Under this philosophy, the corporate entity is viewed as a supplier of information to serve the needs of many groups of users of financial data. Therefore, fuller disclosure is demanded in financial reporting. One such disclosure requirement is the inclusion of inflation data in corporate financial statements.

Inflation is not a new phenomenon nor have accountants just recently discovered its existence. They have debated for a long time the need for an accounting system that would disclose the effects of inflation on financial statements. Recent policy pronouncements made in the United States and some foreign countries require the disclosure of inflation data. In those foreign countries requiring disclosures, they may be either voluntary or mandatory. Items which must be disclosed include current cost of inventories, replacement cost of fixed assets, cost of goods sold based on replacement
cost at the time of sale, and depreciation based on current
cost. These disclosure requirements in foreign countries are
summarized in Appendix 1.

Proposals which would require accounting to respond to
change in inflation or deflation were made in the United
States as early as the 1920s. For example, Sweeney (19)
examined the hyperinflation in Germany and explored the
concepts and procedures for general purchasing power and
compared them to the American system. However, it was not
until the 1940's that professional accounting bodies formally
made recommendations for inflation disclosures. These
developments are summarized in Table I.

The most recent proposal was made by the Financial
Accounting Standard Board (FASB or Board) in its Statement
No. 33, "Financial Reporting and Changing Prices" issued in
September, 1979. This statement mandated inflation
accounting disclosures in annual reports to shareholders of
large companies. In Statement No. 33, the Board concluded
that because of persistent and significant inflation there
is a need for supplementing historical-cost financial
statements with information about the effects of (a) general
inflation and (b) specific price changes. These are referred
to as historical cost with constant dollar and current cost
disclosures respectively. General inflation refers to
changes in the general level of prices resulting in changes
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<td>1948</td>
<td>AAA: Accounting Concepts and Standards Underlying Corporate Financial Statements</td>
<td>Readers of financial statements may be aided in their interpretations by considering the effects of fluctuations in the purchasing power of money.</td>
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<td>1951</td>
<td>AAA: Supplementary Statement No. 2 Price Level Changes and Financial Statements</td>
<td>The committee recommended a thorough test of financial statements stated in units of general purchasing power rather than in units of money.</td>
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<td>1952</td>
<td>AIA: Study Group on Business Income Changing Concepts of Business Income</td>
<td>Publicly held corporations were encouraged to furnish information regarding the determination of income measured in units of purchasing power.</td>
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<td>1961</td>
<td>AICPA: Accounting Research Study No. 6 Reporting the Financial Effects of Price-Level Changes</td>
<td>Enterprise may publish supplementary financial statements with all items stated in units of general purchasing power.</td>
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<td>1969</td>
<td>APB: Statement No. 3, Financial Statements Restated for General Price-Level Changes</td>
<td>Enterprise may present supplementary financial statements with all items stated in units of general purchasing power and giving detailed principles and procedures to be followed in their preparation.</td>
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<td>1976</td>
<td>SEC: ASR No. 190, Replacement Cost Disclosures for Large Companies</td>
<td>Publicly held companies with inventories and gross property and equipment exceeding $100 million and constituting more than 10% of total assets are required to present current replacement cost in their form 10-K.</td>
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in the purchasing power of the monetary unit. However, individual specific price changes do not necessarily move in the same direction as the general index, which is a composite of many specific price changes.

Historical cost with constant dollar accounting is a method of reporting financial statement items in dollars having the same purchasing power. It attempts to portray how general inflation has affected the exchange value of the dollar. On the other hand, current cost accounting is a method of measuring assets and related expenses at their current cost on the date they are sold or used or presented on the balance sheet date. This method focuses on specific price changes for individual assets rather than on price changes caused by general inflation. Specific price changes of individual goods and services may be due in part to general inflation; they also can be caused by other factors such as supply and demand, and governmental regulations.

The disclosures required by Statement No. 33 are summarized as follows (9):

A. Historical cost with constant dollar accounting
   1. Income from continuing operations.
   2. Purchasing power gain or loss on net monetary assets.
   3. Five-year summary of selected data.
   4. Footnotes and narrative explanation.
B. Current cost accounting

1. Income from continuing operations.
2. Purchasing power gain or loss on net monetary assets.
3. Increases or decreases in current cost of investments and properties, net of inflation.
4. Inventories and properties at year-end.
5. Five-year summary of selected data.
6. Footnotes and narrative explanation.

The statement applies to publicly held corporations that have either (a) inventories and property, plant and equipment (before deducting accumulated depreciation) amounting to more than $125 million or (b) total assets amounting to more than $1 billion after deducting accumulated depreciation. The Board has chosen the Consumer Price Index for All Urban Consumers (CPI-U) to measure general inflation. However, the Board allows companies a considerable amount of flexibility in selecting methods of determining current cost. These range from indexing historical cost with specific price indexes to direct pricing techniques.

The demand for more disclosures is usually based on two assumptions. The first assumption is that the users of financial statements are sophisticated or knowledgeable.
For example, The Advisory Committee on Corporate Disclosure of the Securities and Exchange Commission (SEC) in its final report to the SEC indicated that target users have varying degrees of sophistication and access to information (11). The FASB also indicated that most users understand the business and economic environments, business activities, security markets, and related matters and are willing to invest the necessary effort to comprehend detailed accounting information (8). Further, the demand for more disclosures is a response to the needs of sophisticated users such as financial analysts (14, 16) and bankers (11), who make decisions heavily dependent upon financial accounting data (17). The second assumption is that the market is efficient in the semi-strong form, a hypothesis asserting that the current price of a security reflects all publicly available information. Studies based on the efficient market hypothesis indicated that disclosure of more accounting information than is currently required is needed to prevent abnormal monetary return accruing from inside information (13).

Though there is a strong argument in favor of more disclosures, the usefulness of more disclosures in financial statements is controversial. Some studies have suggested that by itself disclosure is insufficient and must be considered along with additional factors. For example, Davidson and Trueblood (6) focused their study on accounting
data's role in the decision making process and concluded that there is a greater benefit in pinpointing user needs than in producing abundant accounting data. Fertakis (7) also indicated that the user's information-processing capacity should be a primary consideration in designing accounting reports. Ashton (2) indicated that emphasis should be on more timely information, as opposed to simply more information.

Statement of the Problem

The processing and disclosing of information will undoubtedly impose additional expenditure on the part of business enterprises. However, whether the expanded disclosures will benefit the users of the financial statements is subject to debate. The marginal costs and marginal benefits should be considered in justifying the additional disclosures. The advocates of data expansion imply that marginal benefits exceed marginal costs. However, an alternative implications is that data expansion will induce information overload and marginal costs will exceed marginal benefits.

Lacking empirical support for either implication, neither should be accepted at face value. If the data expansion continues and marginal costs exceed marginal benefits, information production and processing resources
at the individual level and at aggregate levels will be misallocated. Conversely, if marginal benefits exceed marginal costs and data is withheld, opportunity losses may be incurred by statement users. An objective assessment of the merits of providing versus withholding additional accounting data will rest on an analysis of related empirical evidence. This dissertation examines the usefulness of the supplemental disclosures of FASB No. 33 by financial analysts in assessing future cash flows. The attempt is to ascertain the ability of the financial analysts to incorporate various levels of supplemental information on historical cost with constant dollar and current cost disclosures into their projection models to derive more accurate assessments of a firm's future cash flow.

Financial analysts in the Dallas-Fort Worth and Houston regions were used as subjects for the study. The purpose of this study is to see whether subjects with the supplemental disclosures required by FASB No. 33 can predict the future cash flow more accurately than those without supplemental disclosures or with fewer disclosures.

Though there are many groups of users of published financial statements, financial analysts have been chosen because they are probably the most avid consumers of such statements. In this study, a financial analyst is one who (a) analyzes companies and industries and makes recommendations thereon, or (b) as a principal or advisor selects
securities for purchase or sales in an investment portfolio to achieve the objectives of the fund, or (c) manages all or part of the organization responsible for those functions (15). Accountants have primary obligations to consider analyst's wants and needs (12). The analyst is frequently a reporter and interpreter of corporate financial information to a wider investing public (4, 15).

Cash flow prediction was chosen as the experimental task because it is one of the stated purposes of disclosing historical cost with constant dollar and current cost amounts. The FASB reasons that when users wish to assess future cash flows, they will often examine the components of financial statements in detail rather than focusing on summary measures such as income from continuing operations. Cost of goods sold at current cost, depreciation expenses at current cost, and the current cost amounts of inventory, property, plant and equipment will incorporate more up-to-date information about the prices or resources used by an enterprise than the corresponding historical cost accounting (9). However, there is no empirical evidence to show the relationship between inflation disclosures and cash flow projection.
Predictive accuracy was chosen as the criterion variable because (a) it is precisely measurable and (b) it is prominent as a measure for evaluating the usefulness of accounting information. Of the twelve objectives of financial reporting specified in the *Objectives of Financial Statements* (1), seven are directed toward aiding the predictive accuracy of statement users.

The definition of cash flow used by financial analysts is not always the same as that used in accounting. To financial analysts cash flow is the net income after income taxes, adjusted for non-cash flow items such as depreciation, depletion and amortization (5, 10). Therefore, cash-flow used in this study, is operationally defined as the net income after taxes plus depreciation, depletion, amortization, and other similar non-cash outlay adjustments. This usually is referred to as cash flow from operations. This analysis is one of the most important items used by financial analysts to evaluate securities in making recommendations (13).

Organization of Thesis

Chapter II reviews the relevant literature of five areas: (a) predictive ability and accounting information, (b) association between cash flow and investor's and management's interest, (c) association between inflation disclosures and cash flow projection, (d) accounting studies
of the effects of information load, and (e) the theoretical
developments of the Brunswik Lens model and information
overload. The experimental design and statistical analysis
techniques are discussed in Chapter III. Chapter IV
analyzes the data collected from the research questionnaires.
Statistical analysis and interpretation are presented in
Chapter V. Chapter VI summarizes the study, reviews its
limitations and makes suggested extensions for future
research.
CHAPTER BIBLIOGRAPHY


Previous research in five interrelated areas is reviewed in this chapter: (a) predictive ability and accounting information, (b) association between cash flow and investor’s and management’s interest, (c) association between inflation disclosures and cash flow projection, (d) accounting studies of the effects of information load, and (e) the theoretical developments of the Brunswik Lens model, and information overload.

Predictive Ability and Accounting Information

The accounting profession's primary objective is to facilitate decision making. In A Statement of Basic Accounting Theory (ASOBAT), an American Accounting Association (AAA) committee defines accounting as (4,p.1)

... the process of identifying, measuring and communicating economic information to permit informed judgments and decisions by users of information.

Moonitz (38) postulated that financial statements are useful because quantitative data are helpful in making rational economic decisions, i.e., in making choices among alternatives actions must be correctly related to consequences.
Most decisions based on accounting information involve some kind of prediction (4). Users of accounting normally seek information which is beneficial in their decision making process. The heterogeneity of the decision process implies a diverse set of information needs.

Competing accounting methods can be evaluated in terms of their ability to predict events which concern the decision maker. The accounting method with the most accurate predictive power with respect to a specific event is deemed to be the best method for that purpose. Therefore, predictive achievement may be used as a criteria for selecting from among alternative accounting methods. Devine (20) urged the use of the predictive ability criterion in accounting research. Vatter (47) indicated that the outcome of accounting be examined and evaluated in terms of its relevance to the predictive and decision making processes.

Beaver, Kennelly, and Voss (14) studied the use of statistical methods in choosing among accounting alternatives, and examined the relationship between predictive ability and decision making. They pointed out the problems in using the decision making criterion. These problems are that (a) it is difficult to define the decision models of potential users of accounting data, and (b) it is not sufficient for determining which accounting measure produces the best decisions because many of the decision
variables are capable of being measured in more than one way. They concluded that the preference for an accounting measure may apply only within the context of a specific predictive purpose or predictive model and that the conclusions drawn from the predictive ability criterion studies must be considered tentative.

Libby (34, 35) indicated that the predictive ability criterion failed to consider the perceptions and information processing capacities of the decision maker actually making the prediction. Failure to include this behavior factor in the assessment of the relevance of an accounting data set may lead to the possibility that while a data set may be judged most relevant for decision making by a criterion, decision maker performance may be no different or it may deteriorate because it overtaxes his information processing capacity. Therefore, Libby suggested the incorporation of the decision maker in the prediction process. He also suggested that accounting researchers create mathematical models of human judgment and use these as surrogates in the predictive achievement studies.

Ashton (8) studied the predictive models in a managerial context. He indicated that the criterion values are difficult to specify because they are separate from the cues used to judge their values and may be affected by events not controlled or even known to the decision maker. He suggested that (a) studies should place emphasis on what
data are used in the predictive process before trying to
determine how data are used, and (b) predictive models
used should be reassessed periodically to allow for
change in the way human decision makers process data.
Ashton (9, 10) extended the idea of the mathematical model
mentioned by Libby (35). He suggested that the human
decision maker be replaced by his model in prediction
situations. He cited much literature from psychology and
management as evidence showing that individual linear
models outperform the human decision maker. This situation
exists because of (a) characteristics of typical prediction
tasks, (b) characteristics of human predictions, and
(c) characteristics of linear models themselves.

Many empirical studies which utilized the predictive
ability criterion have established significant statistical
association between accounting numbers and various
environmental events. For example, Beaver (13) analyzed
financial ratios in relation to the prediction of corporate
failures. Altman (3) advanced the predictive ratios by
applying discriminant analysis. Edmister (23) applied
stepwise multiple discriminant analysis of financial ratios
to predict small business failures during the period 1954
to 1960. However, some have challenged the efficacy and
methodology of predictive ability criterion studies.
Greenball (28) argued that predictive ability studies are
irrelevant for evaluating accounting alternatives in
non-predictive contexts. Further, he indicated that an accounting method was designed to measure not to explain. Gonedes and Dopuch (27) indicated that predictive abilities lacked theoretical and statistical support and viewed them as deficient as rules of thumb for choosing among alternative methods. Such criticism, however, did not discourage the use of the predictive ability type research methodology.

In this study different levels of disclosures were used to see how the subjects utilized them to improve their predictive performance. Disclosures have predictive content similar to that of accounting numbers because disclosures are integral parts of the financial statements and are generally viewed as potential sources of considerable information (7).

Association Between Cash Flow and Interests of Management and Investors

Cash flow information has received increased attention during the last decade by accounting researchers and by accounting professionals. The field studies of forty-two companies by the National Association of Accountants (NAA) in 1966 showed that top management is strongly interested in the amount of cash generated by business. Reasons for this interest in cash flow data, according to NAA are (39, p. 59-60),
1. Recent historical data together with forecasted cash flow data for future periods show whether or not the company is expected to generate enough cash to support the operating program planned. By comparing current cash flow figures with budgeted or prior period figures, changes of significance to the company may be detected. For example, a trend toward lower turnover of receivable or inventory may eventually lead to a future shortage of cash.

2. Cash flow measures the amount of cash available for investment in plant and equipment, additional inventories, or other operating fund assets. If these investments are to be financed with capital from outside sources, internal cash flow measures the company's ability to pay the resulting financial charges for interest and debt repayment, or dividends. For such purposes management needs to know cash flow as well as profits.

3. Cash flow measures the effect of certain financial management decisions such as decision to use or not to use accelerated depreciation for reporting taxable income, to lease or own assets, and to select alternative capital investment projects which have differing cash flow patterns.

4. The cash flow statement showing the principal sources and applications of cash is viewed as a valuable informational statement. For example, one company representative explained that the statement is "particularly interesting to management and stockholders because it is the chief source of information they receive about changes in the company's investment in the various categories of current and fixed assets."

Ijiri (29) indicated that cash flow is the most basic objective in business. A firm may hold various types of assets, but the reason that the firm holds such assets is always attributable to a cash flow objective.
Investors are also interested in cash flows. The Study Group on the Objectives of Financial Statements, established by American Institute of Certified Public Accountants (AICPA) indicates that the objective of financial statements is to provide information useful to investors and creditors for predicting, comparing and evaluating potential cash flow in terms of amount, timing and related uncertainty (6).

One of the objectives of financial accounting as stated by the FASB in Statement of Financial Accounting Concepts No. 1 is (25, par. 37)

To provide information that would help present and potential investors, creditors, and other users in assessing the amounts, timing, and the uncertainty of the prospective cash receipts from dividends or interest and proceeds from the sale, redemption or maturity of securities or loans.

Since investors' cash flow is related to enterprise cash flows, the FASB indicates that (25, par. 37)

... financial reporting should provide information to help investors, creditors, and others to assess the amounts, timing and uncertainty of prospective net cash inflows to the related enterprise.

Cash flow analysis is one of the most important items used by financial analysts to evaluate securities and make recommendations concerning them.
Manson states (36, p. 13),

The financial analysts are primarily concerned with two problems: (1) the earnings trend in relation to the security of a particular company and (2) the investment features of one company as compared with those of another. The cash flow concept appears to be widely if not universally used in both of these areas.

Manson concludes that analysts use cash flow as one of their most significant tools in evaluating the securities of a company for investment purposes (36). He further indicates that cash flow data are often presented by the analyst in comparative form for a period of time and as projections into the future (36).

Inflation Disclosures and Cash Flow

Financial statements should provide relevant information to the users. To be relevant to investors, creditors, and others who make investment decisions, accounting information must allow the user to make a prediction about the outcomes of present and future events or allow the users to confirm or correct expectations (26). The conventional accounting framework based on historical cost as typified by Paton and Littleton's monograph, *An Introduction to Corporate Accounting Standards* (43), has been criticized for not providing relevant information to the users of the financial statements for their decision making.
One of the weaknesses of historical cost accounting is its failure to reflect the impact of inflation. This failure stems from two of historical cost accounting's most important assumptions: (a) stable monetary unit and (b) stable specific price levels. These assumptions do not take into account inflation or deflation. Further, historical cost accounting assumes that the monetary unit in terms of purchasing power is stable. While historical cost accounting reports have an historical perspective, the value of the parts cannot be judged solely on their accuracy in reporting past conditions. Decision makers are interested in the past only to the extent that it reveals something about what can be expected in the future (42).

One of the purposes in making historical cost with constant dollar and current cost disclosures is to help users of financial statements in assessing the future cash flow of an enterprise. Therefore, it helps users of financial statements make better decisions. However, there is no empirical research to show the relationship between inflation disclosures and cash flow projection. This dissertation was directed toward the examination of the effects of inflation disclosures on cash flow projections of financial analysts.
Accounting Research on the Effects of Information Load

Accounting research on the effects of information load can be summarized into two types: (a) those emphasizing the ability of decision makers to use aggregated data versus disaggregated data, and (b) studies focusing on the impact of cognitive characteristics of decision makers in using information. This research is reviewed in this section.

Most researchers used aggregated accounting data versus disaggregated data to measure the information gain or loss due to the aggregation. For example, Lev (32, 33) suggested the use of the Entropy Law to measure the information loss due to aggregation in financial statements. Entropy is defined as (2)

\[ H(G_a) = -\sum_{k=1}^{n-1} P(G_a) \cdot \log p_k(G_a), \]

where \( H(G_a) \) = the entropy of any financial vector containing \( n \) items for a given level of aggregation \( G_a \)

\( p_k \) = the proportion of the \( k^{th} \) item in the financial vector,

\[ p_k \geq 0 \text{ and } \sum_{k=1}^{n} p_k = 1. \]

By aggregating two items, the level of aggregation becomes \( G_{a-1} \) and the entropy would be obtained as follows:
The information loss due to aggregation of these items is then given as

\[ d \ H (1) = H(G_a) - H(G_{a-1}). \]

By comparing the \textit{a priori} level of uncertainty with the \textit{a posteriori} level Lev attempted to (a) measure the amount of information loss from aggregation, (b) measure the materiality of an item, (c) discriminate between failing business firms and non-failures, (d) analyze budget variance, (e) predict bivariate budgets, and (f) make an \textit{ex post facto} analysis of budgets.

Abdel-Khalik (2) maintains that the entropy measure applied to accounting data is a decomposition index not a measure of information. Ijiri (3) discussed aggregation theory. He indicated that the aggregate structure consists of a microsystem (disaggregated data), a macrosystem (aggregated data), and an aggregation function which relates the elements in the microsystem to those in the macrosystem. The aggregation system is a transformation of the data only and no new data can be created from an original disaggregated system. Therefore, Ijiri concluded that aggregated results in information loss.
Feltham and Demski (24) examined the information evaluation process in terms of costs and benefits through the action of an "information evaluator" and decision maker. 

Barefield (11) used twenty-eight graduate students as subjects to study the impact of aggregated versus disaggregated cost variance on process control judgments. The hypothesis in his experiment was that the subjects with aggregated data would perform better than those with disaggregated data. However, Barefield found no overall significant effect on cost variances in the use of aggregated data or disaggregated data, but the subjects who received disaggregated data were less able to determine the optimal decision rule.

Abdel-Khalik (1) studied the impact of aggregated data and disaggregated data on bank loan officers in making decisions. Two hundred and seven bank loan officers were selected to respond to a questionnaire containing one of three levels of financial statement aggregation. These three levels of data aggregation were (a) data from 10-Ks, annual reports and Moody's, comprising the most disaggregated level, (b) information necessary to compute the key ratios, the most aggregated level, and (c) an intermediate level of aggregation. Each bank loan officer was given data about two pairs of actual firms. Each pair consisted of a firm which had defaulted on a loan obligation and a non-defaulted firm.
These firms were matched according to industry classification and total asset size. The bank loan officers were asked to make the following decisions: (a) to make a recommendation for or against a sixth-month loan, (b) to estimate the probability of the firm's remaining a good credit risk for the following three years, (d) to make a recommendation for or against a three-year term loan, and (e) to estimate the probability of default on that loan. Abdel-Khalik found that (a) users of financial ratios performed poorly in the decision task, (b) disaggregated-data users did not perform better in perceiving firm riskiness, and (c) the experience of loan officers had no significant effect on the decisions. In other words, the overall level of aggregation did not affect any of the quality criteria.

Dermer (19) studied how the level of an individual's intolerance of ambiguity affected his perception of what information is important to performing his job role. He used forty-four sales supervisors, district sales managers, and regional sales managers of a large, integrated oil company as subjects. Each job was classified by three schemes: (a) whether the job was under direct control of the company or whether it was indirectly controlled, (b) whether the item was measurable in financial terms, in behavioral terms, or operational terms, and (c) whether the time of the item pertained to the future or involved either
current or past events. Dermer found that those subjects who were most intolerant of ambiguity preferred more information; however, these subjects viewed future oriented and behavioral aspects of the job to be of less importance than did those subjects more tolerant of ambiguity.

Chervany and Dickson (18) studied the problem of information overload by assessing the relationship between aggregate production planning decisions and the form of information used to support the decisions. Subjects were divided into two groups. One group received detailed data and the other group received summarized data regarding (a) production costs, (b) finished goods production, (c) finished goods inventory, (d) raw material inventory, and (e) labor status and utilization. The subjects were asked to schedule the amount of production each day, the number of workers required each day, and the raw material required each day. Chervany and Dickson concluded that the group with the summarized data had lower total costs than those who received detailed data. However, the group who received the summarized data spent more time making decisions.

A decision style theory was developed by Driver and Mock (21) based on the Schroder, et. al. model (45). This theory recognized that some decision makers consistently used more information than others and differed in their perception of the end results of the information. Driver
and Mock (21) postulated two dimensions of information processing: amount of information used and the degree of focus. Amount of information used is divided into two types: minimal data users and maximal data users. A minimal data user is one who uses just enough data to make an adequate decision and then moves on, while a maximal data user examines all data perceived to be relevant. The degree of focus concerns the perception of the data. There are two extremes; one who sees all data leading to one conclusion and the other who sees information having a variety of meanings. Combining these two dimensions, Driver and Mock derived four decision styles: flexible, decisive, integrative, and hierarchic. The researchers used fifty-four students as subjects to examine the relationship between decision styles and the preference for and use of accounting feedback data. The experiments were based on a business game modeled on a manufacturing firm. The subjects were asked to make production and marketing decisions for five periods, based on demand and price information. The subjects received feedback in the form of financial statements, and they could purchase additional feedback if they so desired. Driver and Mock concluded that complex decision makers prefer and more effectively use complete feedback. However, the decisive decision makers become rapidly overloaded and hence cannot effectively use complex feedback.
Smith (46) worked with sixty financial analysts in the Cleveland, Ohio, Columbus, Ohio, and Pittsburgh, Pennsylvania, areas to project earnings by using different levels of segment reportings. Subjects were divided into three groups. Each analyst was asked to project the next year's operating earnings for each of two existing diversified firms whose identities had been disguised. They were also required to answer background questions. Each analyst received both past and projected economic data as well as the firm's aggregated financial statements. Analysts in Group I received no segmental firm data. Group II analysts received intermediate level of segmental data. Group III analysts received data at the maximum reported level of segmentation. Smith concluded that the increasing amount of segmental data provided to financial analysts did not necessarily improve earning's projection.

Smith did not randomly select the sample subjects in her study. She personally visited the financial analysts in the Cleveland, Columbus, and Pittsburgh areas and asked financial analysts to participate. Sixty financial analysts in these locations cooperated.

Casey (16, 17) used a different information load to study bank loan officers' ability to distinguish bankrupt firms from non-bankrupt firms. He sent questionnaires to 122 bank loan officers from twenty-six commercial banks in
fourteen states. Subjects were randomly assigned to three treatment groups: Group I received six financial ratios for each of thirty firms for three consecutive years. Groups II and III received data for only ten randomly selected firms, five from each of the bankrupt and non-bankrupt samples. Group II officers received ratios plus income statements and balance sheets without footnotes for the first ten firms analyzed by Group I, five of which were bankrupt. Group III received the notes to the financial statements in addition to the same data received by Group II. Casey concluded that Group II predicted significantly better than Group I even though Group II did not spend more time on the questionnaire. However, Group III spent more time on the task than Group II and did not predict any more accurately.

Casey used six financial ratios to predict bankruptcy: (a) net income/total assets, (b) cash/total assets, (c) current assets/total assets, (d) current assets/current liabilities, (e) net sales/current assets, and (f) total liabilities/owner's equity. The empirical research by Beaver (17) and Largay and Stickney (31) indicated that non-liquid asset ratios perform better than liquid asset ratios in the prediction of bankruptcy. For example, Beaver (12) found that three non-liquid asset ratios (a) cash flow/total debts, (b) net income/total assets and (c) total debts/total assets are the better predictors of business failure. Only one of
the non-liquid asset ratios mentioned by Beaver was used by Casey in his study. Had Casey used all non-liquid ratios, he might have reached different conclusions.

All of the studies reviewed above provide evidence that the cognitive ability of the decision maker is limited and the performance of the decision maker is affected by this limited ability. In designing an information system, the decision maker is an important factor to be considered.

This dissertation research on the ability of financial analysts to use various levels of inflation disclosures embodies many of the features of the previous studies, particularly, Casey (16, 17) and Smith (46). However, there are two important differences. First, this dissertation uses financial analysts in the Dallas-Fort Worth and Houston areas as subjects, and all subjects are randomly assigned to one control group and three experimental groups. Second, confidence intervals at ninety-five per cent are computed for each group to test whether the actual cash flow falls within the confidence intervals for each group.

Theoretical Development of the Brunswik Lens Model and Information Overload

Reviewed in this section are the Brunswik Lens Model and an information overload model. These are two of the most widely used models upon which predictive ability studies concerned with human decision making are based.
Brunswik Lens Model

The Brunswik (15) Lens Model was developed to study stochastic relationships between organismic and environmental elements in judgmental situations. The model considers both the predictive ability of the data and the ability of the decision maker to utilize the available data.

The model was introduced by the AAA Committee on Accounting Valuation Bases (5). This Committee was charged with identifying the admissible valuation bases and selecting the best alternative basis. The Committee suggested that the model can serve as a useful framework for evaluating alternative accounting numbers.

The model divides the world into two parts—the environment and the individual's judgmental system. The environmental or predictive system describes the relationship between the data set \((x)\) and the related environmental event \((Y_e)\). The judgmental system describes the behavioral or decision maker system. The judgmental system may be viewed as involving (a) collection of data, (b) organization of data, (c) interpretation of data, (d) inferences about future states of affairs, and (e) selection of a strategy that is perceived to be optimal given these inferences and subject to a set of constraints (5). Figure 1 shows one version of the Lens model. The components of the Lens model are (5, p. 549)
Figure 1: Modification of Brunswik's Lens Model

\( Y_e \): the state to be inferred by the judge. It may be called the distal state.

\( Y_s \): the judge's inference or response.

\( p_{is} \): the correlation between the judge's inference and the distal state.

\( X_{1,i} = 1, \ldots n \): the cues received by the judge.

\( p_{i,ce,i} = 1, \ldots n \): the correlation between the \( i \)th cue and the distal state.

\( p_{i,j} = 1, \ldots n \)

\( j = 1, \ldots n \): the intercorrelation of the cues.

\( p_{i,si} = 1, \ldots n \): the correlation between \( i \)th cue and the judge's inference.
The environmental side of the model may be summarized via a linear multiple regression equation as follows:

\[ \tilde{Y}_e = b_{e1} x_1 + b_{e2} x_2 + \ldots + b_{en} x_n, \]

where \( \tilde{Y}_e \) is the predicted value of the distal variable given cues 1 through n and each \( b_{ei} \) is a multiple regression beta weight determined by the validity of each cue. Identical relationships exist on the judgmental side. In multiple regression terms,

\[ \tilde{Y}_s = b_{s1} x_1 + b_{s2} + \ldots + b_{sn} x_n \]

indicates the extent to which the individual is using each cue when he predicts the distal variable. The multiple correlation coefficient (Rs) indicates the degree of linear relationship between the set of cues and the individual's predictions.

Relationships existing on each side of the lens model have been described via the linear multiple regression equation. Various types of nonlinear models have been used to describe the relationship between cues and predictions in studies of human judgment. However, the nonlinear relationships may be approximated quite well by a simple linear model. Ashton (9) suggested that accounting researchers seeking to identify users' prediction models might concentrate on the linear model.
The essential features of the Lens model based on Dudycha and Naylor (22) was applied in this research and is shown in Figure 2. This model divides the world into environmental system and behavioral system. The components of the lens model are

\[ Y_e = \] the environmental event about which the decision maker is concerned. It is known as distal variable.

\[ r_{ie} = \] a correlation coefficient called the ecological validity of the cue. It defines the relationship between each cue or piece of information \( X_i \) and the environmental event to be judged or predicted.

\[ X_i = \] the cues which may be used to judge the current state or to predict some future state of the distal variable.

\[ \hat{Y}_e = \] the predicted value of the distal variable derived by use of a linear multiple regression equation given cues 1 through k:

\[ \hat{Y}_e = b_{1e} X_1 + b_{2e} X_2 + \cdots + b_{ke} X_k \]

Where \( b_{ie} \) is a multiple regression beta weight determined by the validity of each cue.

\[ Y_s = \] the decision maker's judgment concerning the current or predicted state of the distal variable.

\[ r_{is} = \] the relationship between the cue and decision maker's prediction of the environment event. It is a correlation coefficient called utilization coefficient. It indicates the extent to which the individual utilizes the cue to predict the distal variable.

\[ \hat{Y}_s = \] the predicted value of the decision maker's judgment of the distal variable derived by use of a linear multiple regression equation given cues 1 through k:

\[ \hat{Y}_s = b_{1s} X_1 + b_{2s} X_2 + \cdots + b_{ks} X_k \]
Environment System
Criterion event:
Cash flow status

Environmental event $Y_e$

Predicted environmental event $\hat{Y}_e$

Environmental predictivity
$Re = r_{YeYe}$

$Ye = b_{1e}X_1 + ... + b_{ke}X_k$

Predicted user prediction $\hat{Y}_s$

User Prediction $Y_s$

Response Linearity
$Rs = r_{YsYs}$

Behavioral System
Financial analyst judgment:
cash flow projection

Matching Index
$C = r_{YeYs}$

$\hat{Y}_s = b_{1s}X_1 + ... + b_{ks}X_k$

Achievement Index
$Ra = Y_eY_s$

Utilization correlation coefficients

Ecological validities
Where $b_{is}$ indicates the extent to which the decision maker is using each cue to predict the distal variable.

$R_a = $ the relationship between the distal variable ($Y_e$) and the decision maker's judgment or prediction of the distal variable ($Y_s$). This is the achievement index which measures the prediction accuracy.

$R_s = $ the response linearity. It measures the relationship between the prediction of the decision maker ($Y_s$) and the statistical model's projection of the decision maker's prediction ($Y_s$).

$R_e = $ the measure of environmental predictive ability. It is the correlation between the environmental event ($Y_g$) and the statistical model's prediction of the environmental event ($Y_e$).

$G = $ the matching index measuring the correlation between $Y_e$, the prediction of the distal variable, and $Y_s$, the prediction of the decision maker's judgment concerning the distal variable.

$Y_e$ and $Y_s$ differ because there exists a less than perfect relationship between the environmental event and any set of information cues. Differences also occur because the decision maker does not use the cues in an optimal fashion due to his information processing capacity. The components of the lens model as used in this dissertation are described as follows:

The environmental system of the distal variable ($Y_e$) is the firm's actual cash flow for a given period. The behavioral system of the distal variable ($Y_s$) is the financial analyst's prediction of the firm's future cash flow for the same given period. In this dissertation there are four different sets of cues from which financial analysts attempt to gain information to predict cash flow. The four different
sets of cues are the financial statements with different levels of disclosures received by the financial analysts. The achievement index \( (R_a) \), which measures prediction accuracy in this dissertation, is the absolute value of the difference between the actual and predicted cash flow divided by the actual cash flow of the firm for the prediction period.

Statistical significance of the cue's ecological validities was assumed based on the findings of numerous studies examining the predictive ability of financial statement data and disclosures. No statistical models of the financial analyst's predictions process were constructed since this was not the objective of this dissertation. The Lens model emphasizes how the decision maker incorporates his ability to utilize cues with information content. This dissertation was directed toward assessing the ability of financial analysts to use varying amounts of disclosures. One phenomenon which could affect this ability is information overload.

**Information Overload**

In recent years, human information processing has drawn a lot of attention from accounting researchers. Human information processing (HIP) is research into perceptive and cognitive influences on accounting and communication
systems. This research recognizes that simply providing more and more data to an individual decision maker does not necessarily lead to a better performance if the decision maker does not value the information. In this regard, perception plays a very important role in communication. If the information is not perceived in the manner intended, then effective communication does not take place.

Schroder et al. (45) developed a model which provides one possible explanation for the much discussed limitations of human information processing capacity. The theory relates levels of environmental complexity as an independent variable, to information processing complexity, a dependent variable.

Information complexity is the composite degree of differentiation, discrimination and integration in an information load. These terms are defined as follows (45, p. 165):

- **Differentiation**: the number of elementary dimensions (stable, unique orderings of stimuli) in a complex cognitive structure (such as multidimensional perception).

- **Discrimination**: the fineness of organization among the stimuli that are ordered along a given dimension.

- **Integration**: the complexity of the schemata that determine the organization of several dimensions involved in a complex cognitive structure.

Differentiation and discrimination form the perception phase of the information processing structure while integration constitutes the organization phase.
Environmental complexity consists of the input complexity, the eucity, and noxity. The input complexity is the number of dimensions of information, the diversity of the information, and the rate of information change. Eucity is the amount of reward or promise given by an environment. Noxity is the severity of the adverse consequence of behavior in the specific situation. The degree of environmental complexity is the central and most general factor in information processing. Overly simple environments fail to stimulate the process of integration while overly complex environments reduce the generation of complex rules for processing information and also reduce the level of differentiation and integration involved.

Relatively low levels of processing complexity are termed "concrete" while relatively high levels are called "abstract." The most concrete subjects interpret stimuli dimensions in a fixed or hierarchial manner, each considered as isolated from each other. On the other hand, the most abstract subjects are characterized by emergent sets of integrated rules. The processing schemata of the abstract subjects are used simultaneously and in many different combinations to interpret dimensions. The most concrete and the most abstract are two extreme cases. Differences in information processing complexity between the most concrete and the most abstract subjects exist over all ranges of information load.
Figure 3 illustrates the information overload. The theory holds that information processing by people in general reaches a maximum level (point X in Figure 3) at some optimal level of environmental complexity (point A in Figure 3). As environmental complexity increases (point Y in Figure 3) past optimal level (X), the level of information processing (point B in Figure 3) decreases because the subject's cognitive structure becomes overtaxed. This condition is referred to as information overload.

The purpose of this research was not to determine whether the maximum disclosures received by subjects induce information overload; however, there was a possibility that the information overload phenomenon would affect the results of this study. Therefore, observations were made to make sure that the tasks and the subject's requirements for information overload were fulfilled. These requirements are that (a) the task be relatively complex and (b) subjects be capable of engaging in complex information processing. The financial reporting environment is viewed by accounting and financial analysis as a complex task (6, 25, 37, 44).

Financial statement data or a set of data items may contain information about a number of dimensions under which the firm operates such as governmental regulations, production and marketing activities, managerial effectiveness and future prospects of the firm. In order to engage in complex
Environmental Complexity

Figure 3: General relationship between environmental and behavior complexity

information processing, the information processors must be sufficiently skilled and knowledgeable and possess a high level of interest and motivation. Financial analysts have the required skills and knowledge and are considered sophisticated users of financial statements (40). They make decisions heavily dependent upon financial accounting data (41). Though a high level of interest and motivation is not guaranteed in experimental research, there is a reasonable assurance that a high level of interest and motivation exists, because the subjects have volunteered to participate knowing they will spend a considerable amount of time completing the task.
CHAPTER BIBLIOGRAPHY


CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the methodology used in this study. The validity and reliability of research findings depend on the appropriateness of the procedures used in conducting the research. Therefore, the choice of methodology, subject, task, performance measure, and statistical analysis for the data collected are discussed.

Types of Research

Research may be divided into four general categories: laboratory experiments, field experiments, field studies, and survey research (9). This study falls into the category called field experiments. This section briefly discusses the different categories of research and why this study uses field experiment research.

Laboratory Experiment

A laboratory experiment is a research study in which the variance of all or nearly all of the possible influential independent variables not pertinent to the problem under investigation is kept at a minimum (9). This is accomplished by isolating the research in a physical situation apart from
the routine of ordinary living and by manipulating one or more independent variables under rigorously specified, operationalized, and controlled conditions.

This approach has several strengths. First, the experimenter has relatively complete control of the environmental situations of the subject. Second, the experimenter can achieve a high degree of specificity in the operational definitions of his variables. Third, the experimental procedure can be made more precise resulting in less error variance than in the field situation, and it can be duplicated. One of the greatest weakness however, of the experimental procedure is the lack of external validity which results from the artificiality of the laboratory experiment. When a research situation is deliberately contrived to exclude the many distractions of the environment, the research does not contain all of the factors affecting behavior. The lack of realism in this situation may cause subjects to exhibit behavior that would not be observed in an uncontrived environment. Another weakness is the lack of strength of independent variables. Since the experimental situation was created for a specific purpose, it cannot include the relatively large effects of independent variables in realistic situations.
Survey Research

Survey research studies large and small populations by selecting and studying samples chosen. The purpose of survey research is to discover the relative occurrence, distribution and interrelations of variables (9). This type of research focuses on people, and their beliefs, opinions, attitudes, motivations, and behavior. A major deficiency in this approach is that the survey technique assumes that the respondent knows about his actions and behavior. In the kind of study used for this dissertation, there is a reason to suspect that individuals do not know the limits of their information capacity, and therefore, would not be able to give accurate responses concerning the effect of different levels of disclosures in financial statements on predictive accuracy. Therefore, the survey method was not used in this study.

Field Study

Field studies are ex post facto inquiries aimed at discovering the relationships and interactions among variables. The researcher studies the relations among the attitudes, values, perceptions and the behaviors of individuals and groups (9). No independent variables are manipulated by the researcher. Field studies are strong in realism, significance, strength of variables, theory orientation, and heuristic quality. However, a weakness is that field studies
operate retroactively. As realism increases control over the study decreases because of the great increase in the number of variables and variances.

Field Experiment

A field experiment is a research study in a realistic situation. An experimenter attempts to manipulate one or more independent variables under as carefully controlled conditions as the situation will permit (9). The variables in a field experiment usually have a stronger effect on the experiment than those of laboratory experiments. The more realistic the situation the stronger the variable. The field experiment contributes to external validity since the more realistic the situation, the more valid are the generalizations to other situations likely to be. The field experiment utilizes less control over experimental variables than does the laboratory experiments. The more relaxed control means that it is more difficult to isolate and manipulate all variables affecting the results of the study. The field experiment also lacks precision. In a realistic situation, there is always systematic and random noise. In order to measure the effect of an independent variable on dependent variable in the field experiment, it is necessary to maximize the variance of the manipulated variable and to measure the dependent variable as precisely as possible. However, the measurements of the dependent variable are often so crude
that they cannot pick up all the variance that has been engendered by the independent variables.

The field experiment approach was judged to be the most appropriate method in this study. The purpose of the research was to present empirical evidence concerning the ability of the financial analysts to incorporate different levels of disclosures to project cash flows. The financial analysts had to view both the task and the data provided to complete the task realistically. This would increase the probability that the subjects would utilize their normal projection model in completing the task. For this reason, financial data from an actual existing firm were used and the projection period was a historical period. Control over all of the independent variables was impossible. In addition, cash flow projection was a complex task requiring a substantial amount of time. It would be impossible or extremely difficult to place the financial analysts in the laboratory setting to complete the task. The field study approach was not appropriate in this study because the different levels of disclosures were not present in the financial statements of the actual firm. Therefore, differences in predictive ability caused by the different levels of disclosures are not observed in a nonexperimental situation.
Instrument Design

This study uses the model developed by Schroder, et al. (15) and used by Smith (16) and Casey (4, 5) in their studies. The instruments used in this study consist of a letter, a questionnaire, and a set of financial statements.

A letter explaining the research project and inviting the financial analysts to participate was designed and used as a cover letter, (Appendix 2).

A questionnaire (Appendix 3) was developed, asking for responses to five questions of a demographic nature: (a) years of experience as a financial analyst, (b) whether or not the analyst is a member of Chartered Financial Analysts, (c) educational level, (d) whether or not the analyst is an industry specialist, and (e) time spent on the task.

A firm was selected from Standard & Poors Industry Records. The criteria for selection specified that all inflation disclosures must have been made according to the requirements of FASB No. 33 for the fiscal years 1979 and 1980. Since the inflation disclosures were not mandated in 1979, many firms were eliminated. The firm selected also needed to be very highly diversified so that no single economic factor would affect the firm under normal economic conditions.
Honeywell, Inc., was selected because it closely fit the stated criteria. Financial analysts did not know the identity of the company selected.

The financial analysts were asked to forecast the cash flow for fiscal year 1980. A set of financial statements, including an income statement, balance sheet, and statement of changes in financial position of Honeywell, Inc., was taken from Moody's Industry Manual for the fiscal years ended in 1979 and 1980. The financial statements for 1979 and 1980 disclosed all information as required by FASB No. 33. The 1980 financial statements were used to compute actual cash flow to compare with the cash flow forecasted by the financial analysts. The 1979 financial statements were reproduced with some of the firm's background data and cash flow data for the past five years. This material was sent to the financial analysts (Appendix 4).

Financial analysts were randomly divided into one control group and three experimental groups:

Group I members received 1979 financial statements, background data and five years of cash flow information.

Group II members received historical cost with constant dollar disclosures in addition to the information received by Group I.

Group III members received the current cost disclosures in addition to that information received by Group I.

Group IV members received both historical cost with constant dollar and current cost disclosures in addition to that information received by Group I.
Group I was the control group and Groups II, III, and IV were the experimental groups.

Selection of Financial Analysts

The list of financial analysts in the Dallas-Fort Worth and Houston areas was taken from the Financial Analysts Federation 1980 Membership Directory. There are approximately 430 financial analysts in these areas. Institutions providing subjects used in this research are listed in Appendix 5.

A pilot study was conducted before mailing the instruments to the financial analysts. The instruments with a letter explaining the project were sent to ten financial analysts to invite them to participate in the project. The analysts were asked to examine the disclosures and determine (a) whether they agreed that the information load in the four cases was significantly different and (b) whether the level of disclosure indicated an incremental information load difference in the four groups. These financial analysts were then contacted by telephone. All financial analysts agreed that the information load in the four cases was significantly different and that each level of disclosure provided an incremental information load. The financial analysts participating in this pilot study were excluded from the primary study.
The financial analysts were randomly divided into four groups: one control group and three experimental groups. Each group member received a letter, a questionnaire, and a set of financial statements. The researcher provided a self-addressed postage-paid envelope for returning the questionnaire.

In order to improve the rate of response, several techniques that have proved helpful on previous studies were utilized (8). The researcher provided a cover letter, a postage-paid envelope, and a follow-up letter. An offer to make the research results available to all the participants was made.

Questionnaires were mailed to 410 financial analysts. Thirty-seven questionnaires were returned by the post office as undeliverable because no forwarding address was available. A follow-up letter and a phone call to financial analysts were made one month after mailing the first questionnaires. At that time only ninety-seven of the 373 questionnaires had been returned. Within one month after follow-up, seventy-five more questionnaires were returned, making a total of 173 (46.38%). Sixty-four questionnaires were returned with negative responses declining to participate. Eleven questionnaires were returned without cash flow projections, and hence were excluded. Thus there were
ninety-eight (26.28%) questionnaires that were usable.

Table II summarizes the responses to the initial questionnaire and follow-up. No financial analyst indicated that he recognized the business entity Honeywell, Inc.

TABLE II

ANALYSIS OF THE RESPONSES OF THE SELECTED SAMPLE OF FINANCIAL ANALYSTS

<table>
<thead>
<tr>
<th>Number of questionnaires mailed</th>
<th>410</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undeliverable</td>
<td>37</td>
</tr>
<tr>
<td>Eligible financial analysts</td>
<td>373</td>
</tr>
<tr>
<td>Positive response</td>
<td>98</td>
</tr>
<tr>
<td>Positive response, but without cash flow projection</td>
<td>11</td>
</tr>
<tr>
<td>Negative response</td>
<td>64</td>
</tr>
<tr>
<td>No response</td>
<td>200</td>
</tr>
</tbody>
</table>

Percent of positive (usable) responses to eligible financial analysts 98/373 26.27%

Percent of total returned responses of total possible responses 173/373 46.38%
Statistical Analysis

In projecting cash flow, the analyst can make two types of errors. He can project cash flow that is greater than or less than the cash flow actually experienced by the firm. If the error is measured by

$$CFPE_{ij} = ACF - PCF_{ij}$$

where $CFPE_{ij}$ = cash flow projection error of subject $i$ in group $j$,

$ACF$ = actual cash flow of the firm, and

$PCF_{ij}$ = projected cash flow from subject $i$ in group $j$.

The sign of the cash flow projection error ($CFPE$) can be positive or negative. Both positive and negative represent deviation from accuracy and are of interest in this study. However, the variability of cash flow projection error ($CFPE$) could be very large and not in conformity with the underlying assumptions of the Analysis of Variance model (discussed in Chapter V). Therefore, the performance measure used in this study is the absolute percentage error of projection from actual cash flow. The absolute percentage error ($APE$) or error rate of the projection from subject $i$ in group $j$ is computed as

$$APE_{ij} = \frac{ACF - PCF_{ij}}{ACF}.$$
The absolute percentage error (APE) or error rate has been used as a performance measurement by Ruland (14), Basi, Carey and Twark, (2), Lorek, McDonald and Patz (11), and Smith (16) in their studies.

Data collected were tested to determine whether the variance was in conformity with the underlying assumptions of the Analysis of Variance model (ANOVA). Then, the one-way ANOVA model was used to test the predictive accuracy among the four treatment groups. The ANOVA technique allows simultaneous comparisons of means to determine if some statistical relationships exist between dependent and independent variables. The dependent variable is the absolute percentage error of the analyst's projection of cash flow from the actual cash flow of the firm. The independent variable is the level of disclosure in the financial statements received by the subjects.

Statistically significant results from ANOVA indicated that an effect is present, but the location and the detection of the causes of the effect requires further analysis.

Multiple comparisons were planned for the purpose of locating the source of anticipated significant differences. There are many different approaches to multiple comparison testing. Each comparison can be made with an individual probability of a Type I error of 0.05, using the T table to obtain the critical value. Levine (10) indicates that it is
not common practice to use the 0.05 level in multiple comparisons. The probability of one or more comparisons being significant with a true null hypothesis is not the simple Type I error used in testing each comparison. The probability of at least one Type I error increases with the number of comparisons.

Given C independent comparisons of differences between means, the probability of one or more instances of statistical significance was (10, p. 335):

$$\alpha_{ew} = 1 - (1 - \alpha_{pc})^C$$

where $\alpha_{pc}$: Type I error probability for each test of a difference between means,

$C$: The number of comparisons, and

$\alpha_{ew}$: The probability of having at least one instance of statistical significance among comparisons. The ew stands for experimentwise.

The values of $\alpha_{pc}$ is set so that for the given number of multiple comparisons the experimentwise probability of finding one or more instances of spurious will be held to $\alpha_{ew}$. Therefore, the values for $\alpha_{pc}$, given a desired value for $\alpha_{ew}$ are closely approximated by (10, p. 335)

$$\alpha_{pc} = \frac{\alpha_{ew}}{C} .$$

This equation suggests that the Type I error would be uniformly distributed to each comparison. However, the T tables do not normally list critical value for the odd, very small Type I error probabilities per comparison that are
often needed. For this reason, Dunn's procedure and table (10) were used.

Multiple regressions were planned to determine how well the absolute percentage error (APE) could be predicted, based on the knowledge of five characteristics of the analysts. These characteristics are (a) percentage who are Chartered Financial Analysts (CFA), (b) percentage who classified themselves as industry specialists, (c) years of experience as a financial analyst, (d) educational level, and (e) time spent on the task.

There is a possibility that the subject's performance is a function of time spent. The subject might perform better by spending more time on the experimental task, or the subject's performance might be adversely affected by possible fatigue from heavy data. The Pearson correlation coefficient between error rate and the amount of time spent was computed for each group and then tested for statistical significance. The hypothesis tested was

Ho: There is no significant correlation between error rates and time spent for each group.

Finally, confidence intervals at ninety-five per cent confidence level were computed for each group to see whether the actual cash flow falls within the confidence intervals for each group. The hypothesis tested was
Ho: The actual cash flow will fall within the confidence intervals at ninety-five per cent confidence level for each group.

In order to assure that the subjects were assigned to treatment groups randomly, a test using ANOVA (12) was administered to determine the significant effects of information load groups on five different variables. The variables are (a) years of experience as a financial analyst, (b) percentage who classified themselves as industry specialists, (c) percentage who are Chartered Financial Analysts (CFA), (d) educational level, and (e) time spent. The possibility of nonrespondent bias was assessed by using the wave (7). The responses received before follow-up letter and after follow-up letter were considered two waves. ANOVA and t test were performed to see whether there was a significant difference between two waves (3;5;13).

The results of the statistical analysis are presented in Chapter V.

Strengths and Limitations of the Methodology

This research has strengths in the experimental design. In this research all subjects are randomly assigned to a different treatment group and then treated differently in the different groups. Within a group all subjects are treated identically. The different groups were distinguished by different consistent treatments. The
independent variable is the different levels of disclosures received by financial analysts and the dependent variable is the accuracy of predictive performance measured by APE. Experimental manipulation of the independent variable allows the researcher to conclude, from significant results, that the independent variable is an effective agent, that is, statistical significance permits the conclusion that the independent variable is at least one of the factors causing the observed differences in the dependent variable.

The reliability and validity of research findings depend on the appropriateness of the methodology used in conducting the research. Reliability refers to the accuracy or precision of a measuring instrument while validity refers to the process of confirming that a test measures what it purports to measure (9).

Ebel (6) indicates that at least three factors contribute to the reliability or unreliability of a set of test scores: (a) appropriateness or definiteness of the task -- it should not be too easy or too difficult; (b) constancy or stability of the subject's ability to perform the tasks presented in the test; and (c) consistency and objectivity of the person who scores the test.

Literature review indicated that financial analysts are capable of using and interpreting financial statements with varying amount of disclosures. Cash flow projection is one of the important functions performed by them.
This dissertation used financial statements with different quantities of disclosures from an existing firm. Financial analysts were asked to make cash flow projection as they do every day. The experiment is a realistic one. The performance measurement used in this study was the APE which was computed from projected cash flow and actual cash flow. The APE was objectively determined and consistently applied to assess the accuracy of the performance. Therefore, two reliability factors as indicated by Ebel (6) were met.

Most experimental research in accounting suffers from instability, one necessary requirement for reliability. This is, as Ashton (1) pointed out, due to (a) changing hierarchical relationships of time, and (b) changing cue-utilization by the same individual over a period of time. Particular persons who occupy specific positions in superior-subordinate relationship at one point in time may not occupy those positions at a subsequent point in time. Therefore, the person to whom one alternative set of accounting information is communicated may change over a period of time. Perhaps the new position holder will desire different accounting information. On the other hand, even if the same person remains in a position for a long period of time, his perceptions of the usefulness of particular pieces of information may change over time.
Reliability is not a sufficient condition for validity. There are three types of validity: (a) content validity; (b) criterion-related validity; and (c) construct validity (9). Content validity is the representativeness or sample adequacy of the content—the substance, the matter, the topics—of a measuring instrument (9). The content validity is guided by the question whether the substance or content of this measure is representative of the content or the universe of content of the properties being measured.

Criteria related validity is studied by comparing test or scale scores with one or more external variables, or criteria, known or believed to measure the attribute under study. Construct validity is concerned with the factors or constructs that account for variance in test performance.

Though the field experiment research can achieve a better degree of validity than other types of research, as discussed earlier in this chapter, this study may be weak in content validity and construct validity.
CHAPTER BIBLIOGRAPHY


CHAPTER IV

DATA ANALYSIS

The questionnaires collected are tabulated and analyzed in this chapter. Statistical tests for hypotheses and interpretations of the results from the data generated by the research questionnaires will be presented in the next chapter.

Analysis of the Responses

The questionnaire was divided into two parts (see Appendix 3). The first part of the questionnaire asked financial analysts to respond to four questions. The purpose of this part was to determine how the subjects defined cash flow, how the subjects projected cash flow, how the subjects used financial data to project cash flow, and an amount of cash flow projected for the test company for the year.

Cash flow was operationally defined as net income after income taxes plus depreciation, amortization, and other similar non-cash outlay adjustments as discussed in Chapter II. Ninety (92%) of the ninety-eight financial analysts defined the cash flow in the same way as used in this study, while eight (8%) financial analysts defined cash flow differently. Table III summarizes the responses of the four groups, as well as the total responses. Some
financial analysts who disagreed with the definition indicated that cash flow is net income after taxes plus depreciation, or net income after income taxes plus deferred income tax, or income after income taxes plus foreign currency transaction adjustments, etc. These were implicitly included in the questionnaire as non-cash-outlay adjustments. Therefore, the difference in definition was negligible and was ignored.

TABLE III
SUMMARY OF THE RESULTS OF THE DEFINITION OF CASH FLOW

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>All Together</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>21</td>
<td>22</td>
<td>26</td>
<td>21</td>
<td>90</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>24</td>
<td>29</td>
<td>24</td>
<td>98</td>
</tr>
</tbody>
</table>

Financial analysts were asked to project cash flow by indicating both a number and range, based on financial statements and disclosures received. Some financial analysts responded with only a number and some responded with only a range. If only a number was given, the number was used for analysis. However, if only a range was given,
the average was computed and then used for analysis. For example, one financial analyst indicated that the projected cash flow would be between $475 million and $510 million; the average of $498 million was used for analysis.

One may expect that the amount of projected cash flow would vary from group to group and from individual to individual because of the different amount of disclosures received and different personal characteristics involved. The results confirmed this expectation. For example, the amount of projected cash flow ranged from $107 million to $800 million in Group I, from $354 million to $632 million in Group IV, and from $107 million for one individual to $938 for another individual. The results of the statistics of the projected cash flow in dollars are summarized in Table IV.

The variance measures the average of the squared differences between each observation and its mean, while standard deviation measures the square root of the average of squared differences around the mean. A high degree of variability or standard deviation would indicate a large fluctuation around the mean. As shown in Table IV, Group I, which received no disclosures, had the largest amount of variance and standard deviation, while Group IV, which received the most disclosures, had the smallest variance and standard deviation.
TABLE IV

SUMMARY OF STATISTICAL RESULTS OF PROJECTED CASH FLOW IN DOLLAR AMOUNT
(In Million of Dollars)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>All Together</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>21</td>
<td>24</td>
<td>29</td>
<td>24</td>
<td>98</td>
</tr>
<tr>
<td>Mean</td>
<td>515.62</td>
<td>491.79</td>
<td>552.52</td>
<td>533.75</td>
<td>525.42</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>138.50</td>
<td>64.01</td>
<td>89.11</td>
<td>53.91</td>
<td>91.96</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>107.00</td>
<td>343.00</td>
<td>340.00</td>
<td>354.00</td>
<td>107.00</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>800.00</td>
<td>600.00</td>
<td>938.00</td>
<td>632.00</td>
<td>938.00</td>
</tr>
<tr>
<td>Standard error or mean</td>
<td>30.22</td>
<td>13.07</td>
<td>16.55</td>
<td>11.00</td>
<td>9.29</td>
</tr>
<tr>
<td>Variance</td>
<td>19,182.25</td>
<td>4,097.28</td>
<td>7,940.59</td>
<td>2,906.29</td>
<td>8,456.64</td>
</tr>
</tbody>
</table>

The standard deviation of the distribution of sample means is called the standard error of the mean (1). The standard error of the mean measures the precision of the sample estimate; that is, how closely the sample value is likely to approach the true value. The smaller the standard error of the mean, the greater the precision. As shown in
Table IV, Group I had the largest standard error of the mean while Group IV had the smallest.

The frequency distribution of cash flow projections on dollar amount from Group I to Group IV were plotted and shown in Figure 4.

The performance measure used was the absolute percentage error (APE). The projected cash flows were converted into APE by taking the difference between projected cash flow (PCF) and actual cash flow (ACF) and then dividing by actual cash flow (ACF) as discussed in Chapter III:

$$APE = \frac{ACF - PCF}{ACF}.$$  

Table V shows the summary of the statistical results using the APE.

The variance, standard deviation, and standard error of the mean are shown in Table V for each group and all groups together. Group I had the largest amount of variance, standard deviation and standard error of the mean, while Group IV had the smallest amount. The range of the APE was from 0.19% to 80.04%, taking all groups together. The range of dollar amounts was from $107 million to $938 million. The variability was substantially reduced by using the APE as the performance measurement. The frequency distribution of the APE for each group is plotted in Figure 5.
Figure 4: Frequency distribution on dollar amount
Figure 5: Frequency distribution on absolute percentage error
TABLE V

SUMMARY OF STATISTICS OF RESULTS OF CASH FLOW PROJECTION USING APE

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>All Together</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>21</td>
<td>24</td>
<td>29</td>
<td>24</td>
<td>98</td>
</tr>
<tr>
<td>Mean</td>
<td>16.91</td>
<td>10.28</td>
<td>8.58</td>
<td>6.45</td>
<td>10.22</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0.75</td>
<td>0.75</td>
<td>0.19</td>
<td>0.37</td>
<td>0.19</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>79.29</td>
<td>35.26</td>
<td>74.81</td>
<td>33.59</td>
<td>80.04</td>
</tr>
<tr>
<td>Standard error of mean</td>
<td>4.27</td>
<td>2.08</td>
<td>2.71</td>
<td>1.55</td>
<td>1.40</td>
</tr>
<tr>
<td>Variance</td>
<td>382.59</td>
<td>103.43</td>
<td>212.87</td>
<td>57.91</td>
<td>192.93</td>
</tr>
</tbody>
</table>

Financial analysts were asked briefly to indicate formulas, computations, or descriptions of what they did in projecting cash flow. All financial analysts explained how they derived the amount of cash flow in their responses. This was strong evidence that the financial analysts regarded the experimental task as realistic and actually spent a considerable amount of time completing the task.
In response to the question regarding the most important information in projecting cash flow, the researcher supplied four items of information and left one to be added by the financial analysts if they considered another item more important. Subjects were asked to rank each item from most important to the least important. These items were (a) cash flow trend based on historical cost data, (b) historical cost with constant dollar disclosure, (c) current cost disclosure, (d) segment data disclosure, and (e) other.

Table VI shows the summary of the results of the most important information considered by financial analysts in projecting cash flow from each group and all groups together.

As indicated in Table VI, the majority of the financial analysts considered the cash flow trend based on the historical cost data as the most important information in projecting cash flow. The other items of information mentioned by financial analysts as important information were net income, projection plan and strategy plan, earning per share, projection trends and ratios, company analysis with current capital investment, projection of sales in units and dollars, factors affecting profit margin, statement of changes in financial positions, earnings and working capital projections, industry projections, and ten-year income summary.
### TABLE VI

**SUMMARY OF THE MOST IMPORTANT INFORMATION USED IN PROJECTING CASH FLOW**

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. %</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Cash flow trend</td>
<td>9 43</td>
<td>12 50</td>
<td>11 38</td>
<td>13 54</td>
<td>45 46</td>
</tr>
<tr>
<td>based on historical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Historical cost</td>
<td>3 13</td>
<td>4 17</td>
<td>5 17</td>
<td>4 16</td>
<td>16 17</td>
</tr>
<tr>
<td>with constant dollar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Current cost</td>
<td>2 10</td>
<td>4 17</td>
<td>6 21</td>
<td>3 13</td>
<td>15 15</td>
</tr>
<tr>
<td>d. Segment data</td>
<td>2 10</td>
<td>2 8</td>
<td>2 7</td>
<td>3 13</td>
<td>9 9</td>
</tr>
<tr>
<td>e. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31 100</td>
<td>24 100</td>
<td>29 100</td>
<td>24 100</td>
<td>98 100</td>
</tr>
</tbody>
</table>

**Financial Analyst's Characteristics**

The second part of the questionnaire was concerned with the characteristics of the financial analysts. There were five variables the financial analysts were asked to respond. Three questions contained dichotomous variables, and two questions contained continuous variables. Therefore, they were analyzed separately. Questions containing dichotomous variables were (a) whether the financial analyst was a
Chartered Financial Analyst (CFA), (b) whether the financial analyst had a bachelor’s or master’s degree, and (c) whether the financial analyst was classified as an industry specialist. Group II had fifteen (63%) financial analysts who were Chartered Financial Analysts, while Group I had seven (33%). Eighteen (76%) of the financial analysts in Group IV had master’s degrees, while only thirteen (60%) had master’s degrees in Group I. Seven (24%) financial analysts in Group III were classified as industry specialists, while only three (13%) were industry specialists in Group IV. Table VII summarizes the results of the statistics.

The other two questions containing continuous variables to which financial analysts were asked to respond were (a) how many years of experience they had as financial analysts, and (b) how much time they spent completing the questionnaire. The years of experience as financial analyst ranged from one year to forty-three years. The time spent to complete the questionnaire ranged from five minutes to seventy minutes.

Table VIII summarizes the results of these questions.

As shown in Table VIII, the average years of experience ranged from 9.762 years in Group I to 12.667 years in Group IV. The average time spent completing the questionnaire ranged from 16.447 minutes in Group II to 27.619
TABLE VII
SUMMARY OF THE FINANCIAL ANALYSTS' CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>CFA: S:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 33</td>
<td>15 63</td>
<td>14 48</td>
<td>12 50</td>
</tr>
<tr>
<td>No</td>
<td>14 67</td>
<td>9 37</td>
<td>15 52</td>
<td>12 50</td>
</tr>
<tr>
<td></td>
<td>21 100</td>
<td>24 100</td>
<td>29 100</td>
<td>24 100</td>
</tr>
<tr>
<td>Education: B:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>8 40</td>
<td>9 38</td>
<td>10 34</td>
<td>6 24</td>
</tr>
<tr>
<td>Master</td>
<td>13 60</td>
<td>15 62</td>
<td>19 66</td>
<td>18 76</td>
</tr>
<tr>
<td></td>
<td>21 100</td>
<td>24 100</td>
<td>29 100</td>
<td>24 100</td>
</tr>
<tr>
<td>Specialist: Y:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 19</td>
<td>4 17</td>
<td>7 24</td>
<td>3 13</td>
</tr>
<tr>
<td>No</td>
<td>17 81</td>
<td>20 83</td>
<td>22 76</td>
<td>21 87</td>
</tr>
<tr>
<td></td>
<td>21 100</td>
<td>24 100</td>
<td>29 100</td>
<td>24 100</td>
</tr>
</tbody>
</table>

minutes in Group I, indicating that financial analysts spent a considerable amount of time completing the questionnaire.

The purposes of the second part of the questionnaire were to correlate the subjects' characteristics to the accuracy of cash flow projection. The characteristics of the subjects were used as variables in the multiple linear regression analysis to determine whether the accuracy of the performance could be predicted based on the knowledge.
<table>
<thead>
<tr>
<th></th>
<th>GROUP I</th>
<th>GROUP II</th>
<th>GROUP III</th>
<th>GROUP IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average years of Experience</td>
<td>9.762</td>
<td>11.792</td>
<td>12.103</td>
<td>12.667</td>
</tr>
<tr>
<td>Average time Spent (Minutes)</td>
<td>27.619</td>
<td>16.447</td>
<td>22.862</td>
<td>25.958</td>
</tr>
</tbody>
</table>

of the subject's characteristics. The results of this analysis will be presented in the multiple linear regression analysis section in Chapter V.
CHAPTER BIBLIOGRAPHY

CHAPTER V

STATISTICAL ANALYSIS AND INTERPRETATION

The statistical tests of hypotheses and their results are analyzed and interpreted in this chapter. The McGill University System for Interactive Computer (MUSIC) (5) was used to generate the various statistical tests presented in this chapter, except the $t$ test. The $t$ tests were performed by using STAT/BASIC (6).

Statistical Tests

In order to test a null hypothesis statistically, the data collected to test the hypothesis must confirm to certain underlying assumptions. The $F$-test of the Analysis of Variance (ANOVA) and the pairwise comparisons of means are based on the following assumptions (1, 8):

1. The error variance should be normally distributed.
2. The error variance should be made up of independent components.
3. The error variance should be homogeneous.

The normality assumption states that the values in each group are normally distributed. The validity of the normality assumption depends on the measurement method used. However, mathematical proofs and empirical studies have shown the ratio of means squares to be little affected
by departures from normality (8). Violation of the normality assumption would not bias the results significantly.

The assumption of independence cannot be tested directly. Therefore, conformance to the independence assumption cannot be guaranteed in this study. However, randomization provides a means to achieve the independence objective. Myers (8) indicated that when there is only one observation obtained from each subject, and subjects are randomly assigned to control groups and experimental groups, the assumption of independence of scores will generally be met. The financial analysts chosen in this study were randomly assigned to one control group and three experimental groups and completed their task without assistance. There is no reason to suspect that a serious violation of the independence assumption occurred.

Homogeneity of variance is indicated by denominators in the computation of the F-ratio made of cell values, columns or rows for which the variances are relatively alike. This assumption is needed in order to combine or pool the variances within the groups into a single "within groups" source of variation. Non-conformity with the assumption of homogeneity of variance usually results in an inflated \( \alpha \)-level in the test of the null hypothesis (8). Mathematical derivations and numerous empirical
psychological studies indicated that $\alpha$-level is inflated by heterogeneity of variance. Myers (65) indicates that the degree of inflation will vary with the set of distribution functions as well as with the variances; it is consequently difficult to provide a definite description of the effects of these violations.

Homogeneity of variance among treatment groups was tested using Hartley's "$F_{\text{max}}" statistic (11):

$$F_{\text{max}} = \frac{\text{Largest of } k \text{ treatment variances}}{\text{Smallest of } k \text{ treatment variances}}$$

The variance in cash flow as projected by the four groups, in millions of dollars, ranged from 19,182.25 to 2,906.07 as shown in Table IV, page 74. The variance in the absolute percentage error ranged from 382.59 to 57.91 as shown in Table V, on page 78. The $F_{\text{max}}$ values were computed as follows:

For dollar amount: \[ F_{\text{max}} = \frac{19,182.25}{2,906.07} = 6.6008 \]

For APE \[ F_{\text{max}} = \frac{382.59}{57.91} = 6.6066 \]

From the tables of the $F_{\text{max}}$ distribution, the critical value for $F_{\text{max}}$ with four and twenty-one degrees of freedom at ninety-five per cent of confidence level is approximately 3.29. The computed value was greater than the critical value. Therefore, the null hypothesis of homogeneity of variance was rejected.
Homogeneity of variance may be obtained by an appropriate transformation of data. Myers (8) suggested a logarithmic transformation of data to be used:

\[ Y_{ij} = \log Y_{ij}, \]

where \( Y_{ij} \) is the \( i \)th original observation of the \( j \)th disclosure treatment group. The summarized transformed data statistic is presented in Table IX.

**TABLE IX**

**SUMMARY OF THE VARIANCE USING TRANSFORMED DATA**

<table>
<thead>
<tr>
<th>Group</th>
<th>Dollar Amount ( Y_{ij} )</th>
<th>Dollar Amount ( \log Y_{ij} )</th>
<th>APE ( Y_{ij} )</th>
<th>APE ( \log Y_{ij} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>19,182.25</td>
<td>0.0299</td>
<td>382.59</td>
<td>0.2894</td>
</tr>
<tr>
<td>II</td>
<td>4,097.28</td>
<td>0.0037</td>
<td>103.43</td>
<td>0.2116</td>
</tr>
<tr>
<td>III</td>
<td>7,940.59</td>
<td>0.0228</td>
<td>212.87</td>
<td>0.2301</td>
</tr>
<tr>
<td>IV</td>
<td>2,906.29</td>
<td>0.0023</td>
<td>57.91</td>
<td>0.2632</td>
</tr>
</tbody>
</table>

It can be seen that the variances were substantially reduced by using the transformed data as shown in Table IX. The computed \( F_{\text{max}} \) values of the transformed scores were

For dollar amount: \( F_{\text{max}} = \frac{0.0299}{0.0023} = 13 \)

For APE: \( F_{\text{max}} = \frac{0.2894}{0.2116} = 1.368 \)

This is also distributed with four and twenty-one degrees of freedom at ninety-five per cent confidence level. The null hypothesis of homogeneity of variance for the APE could not be rejected at 0.05 \( \alpha \)-level. However, the hypothesis of
homogeneity of variance of dollar amount was rejected. Therefore, the ANOVA and multiple comparison procedures were performed using the transformed data from APE. The dollar amount of projected cash flow was dropped from the analysis.

**Analysis of Variance**

Analysis of Variance (ANOVA) furnishes a technique for testing simultaneously the significance of the difference among several means. In this study, financial analysts were randomly divided into four groups and each group received financial statements with different levels of disclosures. The test was to determine whether the means of the four groups had a significant difference. The null hypothesis to be tested, stated symbolically, was

$$H_0: \ U_1 = U_2 = U_3 = U_4.$$  

The alternative hypothesis was that all means were not equal.

The significance of the difference among the four means can be tested by analyzing the variance among the means. The total variations in the data can be broken into two components: the variation between groups and the variation within groups. The ratio of the variance between groups to the variance within the groups is called the $F$-ratio and is computed as follows (7):
\[
F = \frac{S_1^2}{S_2^2},
\]

where \( S_1^2 \) = mean square variance between groups, and

\( S_2^2 \) = mean square variance within groups.

To determine if the F-ratio computed represents a significant difference, the values from the table for the given degrees of freedom for the numerator and the denominator are compared to the computed F-ratio. If the computed F-ratio exceeds the value from the table, at a given significance level, the difference among the means is deemed significant. If the computed F-ratio is less than the value shown in the table of F distribution, the difference among the means is deemed not significant. The F-ratio was computed as follows:

\[
F = \frac{0.86051}{0.27635} = 3.11378.
\]

From the F distribution table for three and ninety-four degrees of freedom for the numerator and denominator, respectively, at 0.05 significance level, the F value (critical value) was 2.70. The computed F value was greater than the critical value at 0.05 \( \alpha \)-level. The null hypothesis was rejected. Table X summarizes the computations and the results of the test.
TABLE X

ANALYSIS OF VARIANCE ON ABSOLUTE PERCENTAGE ERROR USING TRANSFORMED DATA

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degree of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>Computed F-value</th>
<th>Critical F-value (α = 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between the Groups</td>
<td>3</td>
<td>2.58152</td>
<td>0.86051</td>
<td>3.11378</td>
<td>2.70</td>
</tr>
<tr>
<td>Within the Groups</td>
<td>94</td>
<td>25.97723</td>
<td>0.27635</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>28.55876</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The rejection of the null hypothesis indicates that the mean estimates of cash flow by the four groups differed significantly, and thus the level of disclosure had a significant effect on the prediction by the financial analysts. One may conclude that the subjects have attempted to analyze and incorporate historical cost with constant dollar disclosures and current cost disclosures into their cash flow projection models.

**Multiple Comparison Procedures**

The results from ANOVA indicated that different levels of disclosures had significant effects on the mean values of the predictive performance for the four groups. It did not locate the specific differences which contributed to the overall significant effect. For this reason, Dunn's multiple comparison procedure was performed to test pairwise equality of the groups' means. The null and alternative hypothesis to be tested were

\[ H_0: U_1 = U_2, U_1 = U_3, U_1 = U_4 \ y_2 = U_3 \ y_2 = U_3 \ y_2 = U_4 \ y_3 = U_4 \]

In order to reject the null hypothesis, the critical difference (CD) must be greater than the experimental difference (ED). The critical difference (CD) was computed by (7)
\[ CD = d(c, df_{\text{error}}) \sqrt{MS_{\text{error}} \left( \frac{(C_j)^2}{N_j} + \ldots + \frac{(C_j')^2}{N_j'} \right)} , \]

where \( c \) = the number of comparisons,
\( df_{\text{error}} \) = degree of freedom for experimental error,
\( d(c, df_{\text{error}}) \) = table value associated with a particular value of \( c \) and error degree of freedom,
\( N_j \) = the \( j^{th} \) group's sample size,
\( C_j \) = coefficient associated with \( j^{th} \) mean in a statement of the comparison, and
\( MS_{\text{error}} \) = an estimate of the common population error variance.

Each set of six null hypotheses was tested at the 0.05 \( \alpha \)-level. The 0.05 \( \alpha \)-level was distributed uniformly over the six comparisons according to Dunn's procedures. Therefore, each comparison was made at approximately the 0.0083 \( \alpha \)-level.

The critical differences (CD) used to test each of the null hypotheses were computed as follows:

\[ CD_{1.2} = 2.68 \sqrt{0.27635 \times (1/21 + 1/24)} = 1.3313 \]
\[ CD_{1.3} = 2.68 \sqrt{0.27635 \times (1/21 + 1/29)} = 1.2765 \]
\[ CD_{1.4} = 2.68 \sqrt{0.27635 \times (1/21 + 1/24)} = 1.3313 \]
\[ CD_{2.3} = 2.68 \sqrt{0.27635 \times (1/24 + 1/29)} = 0.3889 \]
\[ CD_{2.4} = 2.68 \sqrt{0.27635 \times (1/24 + 1/24)} = 0.4069 \]
\[ CD_{3.4} = 2.68 \sqrt{0.27635 \times (1/29 + 1/24)} = 0.3889. \]
The experimental differences (ED) were

\[
\begin{align*}
ED_{1.2} &= 0.951 - 0.802 = 0.149 \\
ED_{1.3} &= 0.951 - 0.576 = 0.375 \\
ED_{1.4} &= 0.951 - 0.547 = 0.404 \\
ED_{2.3} &= 0.802 - 0.576 = 0.226 \\
ED_{2.3} &= 0.802 - 0.547 = 0.255 \\
ED_{3.4} &= 0.576 - 0.547 = 0.029.
\end{align*}
\]

Since the computed CD was greater than the ED in all cases, the null hypotheses were rejected. It implies that the performance by financial analyst was different. Therefore, it is support for the contention that disclosures made a difference.

**Pearson's Correlation Analysis**

The findings that the different levels of disclosures had a significant effect on the accuracy of the particular subject's performance could be due to that subject's spending more time on the experimental task. There is a possibility that the subject's performance is a function of time spent. The subject might perform better by spending more time on the experimental task. On the other hand, the subject's performance might be adversely affected by the possible fatigue of completing a questionnaire with detailed disclosures. Therefore, Pearson's correlation
analysis was planned to determine the association between time spent and error rates and then tested for significant variation from zero.

Correlation measures the degree of association between two variables. The three types of association between two variables are perfect negative correlation, perfect positive correlation and no correlation. The strength of a relationship between two variables is usually measured by the coefficient of correlation (r), whose value ranges from -1 for perfect negative correlation up to +1 for perfect positive correlation.

The Pearson's correlation coefficient between error rates and time spent for each group was computed and the correlation coefficients (r) for four groups were as follows:

\[ r_1 = -0.069 \]
\[ r_2 = 0.561 \]
\[ r_3 = 0.424 \]
\[ r_4 = -0.174 \]

It can be seen that Groups I and IV had negative correlation coefficients, while Groups II and III had positive correlation coefficients. The square of the correlation coefficient is called the coefficient of determination.
The coefficient of determination is defined as the proportion of the total variance in the dependent variable which is explained by the independent variable. For example, 31.47\% of the variance in the APE was attributed to the time spent in Group II.

Caution should be taken in interpreting these results. A correlation between time spent and absolute percentage error would indicate that spending more time will result in higher error rates. The high correlation coefficients for Group II and Group III indicated that financial analysts in Group II and Group III made no improvement in accuracy by spending more time on their cash flow projection.

Levine (7) suggests that given sufficiently large samples, it is possible to use sampled correlation as approximately accurate estimates of the population correlation. He indicates that when two variables are continuous variables, the sample correlation can be computed and then the sample correlation can be tested for a
significant variation from zero (7). The computed correlation can be compared with a critical value derived from the table to determine the statistical significance. If the sampled correlation equals or surpasses the table value, the two variables that yield the sample correlation are considered related.

The time spent and the absolute percentage error were both continuous variables. Therefore, the Pearson's correlation coefficient between the time spent and the absolute percentage error was tested for statistical significance by applying Levine's procedures described above. The null hypothesis to be tested is the zero population correlation coefficient:

\[ H_0: \rho = 0 \]

The alternative hypothesis is that the population correlation coefficient is not zero. The results of the test are presented in Table XI.

### TABLE XI

<table>
<thead>
<tr>
<th>Group</th>
<th>( r )</th>
<th>Critical value at 0.05 (-)-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-0.069</td>
<td>0.433</td>
</tr>
<tr>
<td>II</td>
<td>0.561</td>
<td>0.404</td>
</tr>
<tr>
<td>III</td>
<td>0.424</td>
<td>0.367</td>
</tr>
<tr>
<td>IV</td>
<td>-0.174</td>
<td>0.404</td>
</tr>
</tbody>
</table>
The critical value in Table XI was derived by referring to the table at n-2 degrees of freedom. By comparing the r values and critical values, the null hypothesis of the zero population correlation coefficient was rejected in tests for Group II and Group III but could not be rejected in tests for Group I and Group IV.

The rejection of the null hypothesis for Group II and Group III indicates that the time spent and absolute percentage error were correlated. In other words, subjects in Group II and Group III merely spending more time made no improvement on cash flow projection.

Confidence Intervals

Statistical inference is the process of using sample results to estimate or draw conclusions about characteristics or parameters. There are two major types of estimates: point estimates and interval estimates (10). A point estimate uses a single sample value to estimate the population parameter involved, while interval estimate proceeds by specifying a range of values. Since the true value of the population (actual cash flow for the company for 1980) is known in this study, one might like to know whether the true value fell within the interval estimate based on the sample values. Therefore, confidence intervals were constructed to test whether actual cash flow fell within the confidence intervals at the ninety-five per cent
confidence level for each group. The null hypothesis to be tested is that the actual cash flow will fall within the confidence interval for each group. In construction of the confidence intervals, the means of projected cash flow were computed. These means were as follows (see Table IV):

\[ \bar{X}_1 = 515.62 \]
\[ \bar{X}_2 = 491.79 \]
\[ \bar{X}_3 = 552.52 \]
\[ \bar{X}_4 = 533.75 \]

Standard errors \( \hat{\sigma}_X \) for the four groups were computed by using the following formula (10):

\[ \hat{\sigma}_X = \frac{\hat{\sigma}}{n} \]

where \( \hat{\sigma} \) = standard deviation, and
\( n \) = sample size.

The standard deviation can be found in Table IV. \( \hat{\sigma}_X \) value was 1.96 at ninety-five per cent confidence level. The confidence intervals were constructed as follows:

\[ \bar{X} + 1.96 \hat{\sigma}_X \text{ upper limit.} \]
\[ \bar{X} - 1.96 \hat{\sigma}_X \text{ lower limit.} \]

Table XII shows the summary of the computations and results.
The actual cash flow in this study was $532.66 million (Appendix 6). As shown in Table XII, the true value fell within the confidence intervals for all groups except for Group II. Therefore, the null hypothesis that the true value fell within the confidence intervals at ninety-five per cent confidence level cannot be rejected except for Group II, who received financial statements with historical cost with constant dollar disclosures. This could be explained by saying that historical cost with constant dollar disclosures might have insufficient information content in projecting cash flow. One can increase the confidence level -- say ninety-nine per cent -- but only at the cost of making the estimate less precise by widening the confidence intervals.
Tests for Randomization

The random assignment of financial analysts to treatment groups minimized *ex ante* differences between groups on five different variables. These five variables are (a) Chartered Financial Analyst (CFA), (b) educational level, (c) industry specialist, (d) years of experience, and (e) time spent to complete the questionnaire. Tables XIII through XVI summarize the statistics on these five variables for the financial analysts in Group I, II, III, and IV.

Tests were applied to the largest between group differences for these variables to assess the effectiveness of random assignment. Two tests were used: the test of a difference between proportions and the *t* test. The test of a difference between two proportions was applied to those characteristics measured by dichotomous variables. Three of the five variables were dichotomous: (a) whether the financial analyst was a Chartered Financial Analyst (CFA), (b) whether the financial analyst had a bachelor's or master's degree, and (c) whether the financial analyst was classified as an industry specialist. Group I and Group II had the largest difference in variable (a). Group I and Group IV had the largest difference in variable (b), while Group III and Group IV had the largest
TABLE XIII

SUMMARY OF STATISTICS--Group I

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you a Chartered Financial Analyst (CFA)?</td>
<td>21</td>
<td>0.333</td>
<td>0.483</td>
<td>3.913</td>
<td>0</td>
<td>55</td>
</tr>
<tr>
<td>1 = yes  0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the highest level of education you have attained?</td>
<td>21</td>
<td>1.619</td>
<td>0.498</td>
<td>0.109</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1 = Bachelor's degree  2 = Master's degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you classified as an industry specialist?</td>
<td>21</td>
<td>0.190</td>
<td>0.402</td>
<td>0.088</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = yes  0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many years of experience have you been in your present profession?</td>
<td>21</td>
<td>9.762</td>
<td>7.867</td>
<td>1.717</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>How much time you spent to complete this questionnaire?</td>
<td>21</td>
<td>27.619</td>
<td>17.932</td>
<td>3.913</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>Variable</td>
<td>N</td>
<td>Mean</td>
<td>Standard Deviation</td>
<td>Standard Error</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>----</td>
<td>-------</td>
<td>--------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Are you a Chartered Financial Analyst (CFA)?</td>
<td>24</td>
<td>0.625</td>
<td>0.495</td>
<td>0.101</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = yes 0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the highest level of education you have attained?</td>
<td>24</td>
<td>1.375</td>
<td>0.495</td>
<td>0.101</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1 = Bachelor's degree 2 = Master's degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you classified as an industry specialist?</td>
<td>24</td>
<td>0.167</td>
<td>0.381</td>
<td>0.078</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = yes 0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many years of experience have you been in your present profession?</td>
<td>24</td>
<td>11.792</td>
<td>7.265</td>
<td>1.483</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>How much time you spent to complete this questionnaire?</td>
<td>24</td>
<td>30.250</td>
<td>16.477</td>
<td>3.363</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>

TABLE XIV

SUMMARY OF STATISTICS--GROUP II
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you a Chartered Financial Analyst (CFA)? 1 = yes 0 = no</td>
<td>29</td>
<td>0.618</td>
<td>0.492</td>
<td>0</td>
<td>0.091</td>
<td>1</td>
<td>0</td>
<td>0.090</td>
<td>1</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>What is the highest level of education you have attained? ( 1 = \text{Bachelor's degree} ) ( 2 = \text{Master's degree} )</td>
<td>29</td>
<td>1.655</td>
<td>0.484</td>
<td>1</td>
<td>0.090</td>
<td>1</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Are you classified as an industry specialist? 1 = yes 0 = no</td>
<td>29</td>
<td>0.448</td>
<td>0.485</td>
<td>0</td>
<td>0.090</td>
<td>1</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td>0</td>
<td>0.183</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>How many years of experience have you been in your present profession?</td>
<td>29</td>
<td>12.103</td>
<td>8.857</td>
<td>2</td>
<td>1.645</td>
<td>43</td>
<td>2</td>
<td>1.645</td>
<td>43</td>
<td>2</td>
<td>1.645</td>
<td>43</td>
<td>2</td>
<td>1.645</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>How much time you spent to complete this questionnaire?</td>
<td>29</td>
<td>22.862</td>
<td>14.101</td>
<td>5</td>
<td>2.618</td>
<td>60</td>
<td>5</td>
<td>2.618</td>
<td>60</td>
<td>5</td>
<td>2.618</td>
<td>60</td>
<td>5</td>
<td>2.618</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The table data includes summary statistics for various variables related to professional qualification and industry experience. The mean, standard deviation, and standard error are provided for each variable, along with the minimum and maximum values.
### TABLE XVI

**SUMMARY OF STATISTICS--GROUP IV**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you a Chartered Financial Analyst (CFA)?</td>
<td>24</td>
<td>0.500</td>
<td>0.511</td>
<td>0.104</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = yes 0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the highest level of education you have attained?</td>
<td>24</td>
<td>1.750</td>
<td>0.442</td>
<td>0.090</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1 = Bachelor's degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Master's degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you classified as an industry specialist?</td>
<td>24</td>
<td>0.125</td>
<td>0.338</td>
<td>0.104</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = yes 0 = no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many years of experience have you been in your profession?</td>
<td>24</td>
<td>12.667</td>
<td>9.230</td>
<td>1.884</td>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>How much time you spent to complete this questionnaire?</td>
<td>24</td>
<td>25.958</td>
<td>17.958</td>
<td>3.666</td>
<td>5</td>
<td>70</td>
</tr>
</tbody>
</table>
difference in variable (c). Therefore, the tests for differences in proportions were applied to these three variables.

The procedures for the Test of Difference between Proportions were as follows (10):

\[
\hat{\theta}(P_{s_i} - P_{s_j}) = \sqrt{\frac{P_{s_i \cdot i}}{n_i} + \frac{P_{s_j \cdot j}}{n_j}}
\]

\[Z = \frac{P_{s_i} - P_{s_j}}{\hat{\sigma}(P_{s_i} - P_{s_j})}\]

where \(P_{s_i}\) = proportion of sample i possessing the characteristic under consideration.

\(\hat{\theta}(P_{s_i} - P_{s_j}) = \) standard error of the difference between two independent sample proportions \(P_{s_i}\) and \(P_{s_j}\).

\(Q_i = (1 - P_{s_i})\),

\(n_i = \) sample size in group i, and

\(Z = \) computed difference deviates from the null hypothesis measured by standard error.

The null hypothesis to be tested is that there is no difference in true population proportions involved. The hypothesis states that \(P_{s_i} = P_{s_j}\); hence, the observed difference
between the sample proportions $P_{si}$ and $P_{sj}$ is caused by sampling errors. In order to test the hypothesis, $Z_\alpha$ was computed and then was used to find the table of areas under the normal curve to determine the probability of difference occurring by chance alone. This probability was computed with the level of significance chosen. If the level of significance is greater than the probability of difference occurring by chance alone, the null hypothesis will be rejected. The computed $Z_\alpha$ value for variable (a) for Groups I and II was 1.45. The areas under the normal curve was 0.853. This indicated that deviations of this size, regardless of sign, from a true value of zero, were expected to occur by chance alone in 14.7 percent of all possible samples. In other words, the probability was about 14.7 percent that a big spread could occur by chance alone, were the null hypothesis true. The level of significance chosen in this study was five percent. Therefore, the null hypothesis could not be rejected. This implied that there was no significant difference between the two groups sampled. Table XVII summarizes the results of the tests for the three variables.
As indicated in Table XVII, none of the differences were significant at the 0.05 $\alpha$-level. The null hypothesis could not be rejected. Chi-squares and/or $Z$ test using $\hat{p}$ yielded similarly non-significant differences.

### TABLE XVII

**TESTS FOR DIFFERENCES BETWEEN GROUPS IN BACKGROUND VARIABLES**

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Variables</th>
<th>$Z$</th>
<th>Areas under normal curve</th>
<th>Percent to be significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; II</td>
<td>CFA</td>
<td>1.45</td>
<td>0.853</td>
<td>14.7</td>
</tr>
<tr>
<td>I &amp; III</td>
<td>Education</td>
<td>0.63</td>
<td>0.471</td>
<td>52.9</td>
</tr>
<tr>
<td>III &amp; IV</td>
<td>Specialist</td>
<td>1.31</td>
<td>0.810</td>
<td>19.0</td>
</tr>
</tbody>
</table>

The $t$ test for arithmetic means was performed to test the statistical significance of effects of years of experience and time spent on the cash flow projection. As shown in Tables XIII through XVI, the largest difference means in years of experience were between Groups I and IV. Therefore, the $t$ test was applied to Groups I and IV only. By the same reason, the $t$ test for time spent was applied to Groups III and IV only.

The purpose of performing the $t$ test was to determine whether there was any significance of difference between the means of two independent populations. The statistic used to determine the difference between the population means is based on the differences between the sample means ($\bar{X}_1 - \bar{X}_2$).
The computation of t value is as follows:

\[ t = \frac{\bar{X}_1 + \bar{X}_2}{\sqrt{S^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}} \]

where \( t \) = computed t value.

\( S^2 \) = the sum of sample variance divided by the sum of their degrees of freedom (d.f). The d.f. is \( (n_1 + n_2 - 2) \),

\( \bar{X}_i \) = mean of sample \( i \), and

\( n_i \) = sample size.

The computed t value was compared with the tabled critical t value at \( (n_1 + n_2 - 2) \) degrees of freedom for a given level of significance. If the computed t value is greater than the critical t value, the null hypothesis can be rejected.

The results of the statistical tests are shown in Table XVIII.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Variables</th>
<th>Computed t value</th>
<th>d.f.</th>
<th>Critical t value ( (\alpha = 0.05) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>I &amp; IV</td>
<td>Experience</td>
<td>1.108</td>
<td>43</td>
<td>2.021</td>
</tr>
<tr>
<td>III &amp; IV</td>
<td>Time Spent</td>
<td>0.703</td>
<td>51</td>
<td>2.000</td>
</tr>
</tbody>
</table>
As shown in Table XVIII, the computed $t$ values were 1.108 for experience and 0.703 for time spent. None of the computed $t$ values were greater than critical $t$ values. Therefore, the null hypothesis could not be rejected. It also indicated that the difference between the sample means was too small to be significant.

**Linear Multiple Regression Analysis**

The framework of the Brunswik Lens Model, as discussed in Chapter II, includes the environmental system and the individual's judgmental system. The environmental system is the firm's actual cash flow and the judgmental system is the predicted cash flow. There are four cues through which the financial analysts attempted to gain information to predict cash flow. The achievement index measuring the prediction accuracy used in this study is the absolute percentage error (APE). The prediction accuracy could be affected by the subject's characteristics. The purpose of performing the regression analysis was to determine the extent to which the absolute percentage error (APE) could be estimated by a linear function rule relating the error to five characteristics of the financial analysts from whom the data was collected. The regression equation used was
\[ \hat{Y} = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5, \]

where \( \hat{Y} \) = estimated absolute percentage error,

\( a \) = intercept,

\( b_i \) = sample regression coefficient of the independent variable \( X_i \),

\( X_i \) = personal characteristic of the financial analysts.

The regression coefficients \( b_1, b_2, \) etc. measure the net effect of each variable on the dependent variable \( Y \). The results of the multiple regression analysis based on transformed data are presented in Table XIX.

The linear regression equations for the data on Table XIX were

Group I: \[ \hat{Y} = 1.33492 - 0.28743 X_1 - 0.11903 X_2 + 0.19014 X_3 - 0.01150 X_4 - 0.00070 X_5 \]

Group II: \[ \hat{Y} = 0.19359 - 0.31823 X_1 + 0.09407 X_2 + 0.21899 X_3 + 0.02298 X_4 + 0.01147 X_5 \]

Group III: \[ \hat{Y} = 0.21135 - 0.00407 X_1 + 0.0599 X_2 - 0.25884 X_3 + 0.01209 X_4 + 0.00801 X_5 \]

Group IV: \[ \hat{Y} = 0.72620 + 0.01593 X_1 + 0.11721 X_2 - 0.17238 X_3 - 0.00834 X_4 - 0.01022 X_5 \]
## TABLE XIX

RESULTS OF MULTIPLE REGRESSION ANALYSIS OF ABSOLUTE PERCENTAGE ERROR ON FINANCIAL ANALYST CHARACTERISTICS USING TRANSFORMED DATA

<table>
<thead>
<tr>
<th>Group</th>
<th>Intercept</th>
<th>Certification (CFA)</th>
<th>Educational Level</th>
<th>Industry Specialist</th>
<th>Years of Experience</th>
<th>Time Spent</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.33492</td>
<td>-0.28743</td>
<td>-0.11903</td>
<td>0.19014</td>
<td>-0.01150</td>
<td>-0.00070</td>
<td>0.00000</td>
</tr>
<tr>
<td>II</td>
<td>0.19359</td>
<td>-0.31828</td>
<td>0.09407</td>
<td>0.21899</td>
<td>0.02298</td>
<td>0.01147</td>
<td>0.28869</td>
</tr>
<tr>
<td>III</td>
<td>0.21335</td>
<td>-0.00407</td>
<td>0.05999</td>
<td>-0.25884</td>
<td>0.01259</td>
<td>0.00801</td>
<td>0.00000</td>
</tr>
<tr>
<td>IV</td>
<td>0.72620</td>
<td>0.01593</td>
<td>0.11721</td>
<td>-0.17238</td>
<td>-0.00834</td>
<td>-0.01022</td>
<td>0.04132</td>
</tr>
<tr>
<td>All</td>
<td>0.64710</td>
<td>-0.14447</td>
<td>0.02755</td>
<td>-0.14560</td>
<td>0.00636</td>
<td>0.00131</td>
<td>0.00000</td>
</tr>
</tbody>
</table>
\[
\hat{Y} = 0.64710 - 0.14447 X_1 + 0.02755 X_2 - 0.14560 X_3 + 0.00636 X_4 + 0.00131 X_5
\]

The coefficient of determination \( R^2 \), as shown in Table XIX, represents the proportion of the variation in the dependent variable that is explained by the set of independent variables selected. Therefore, it can be concluded that about twenty-nine percent (29%) and four percent (4%) of the variation in absolute percentage error (APE) in Group II and Group IV were explained by the five variables used in the model.

The test of the significance of \( R^2 \) was performed to determine whether \( R^2 \) could have arisen by chance or if it departed sufficiently from chance expectation. Table XX summarizes the computed \( F \) value and critical value for this test. Note that the computed \( F \) value exceeded the critical value for Group II. The null hypothesis was rejected for Group II and could not be rejected for Groups I, III, IV, and all the groups together. It may be concluded that no association existed between APE and the five characteristics of the financial analysts for Group I, III, IV and all the groups together.
TABLE XX
SUMMARY OF SIGNIFICANCE TEST ON $R^2$

<table>
<thead>
<tr>
<th>Group</th>
<th>Computed F Value</th>
<th>Critical F value at 0.05 level</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.618</td>
<td>2.90</td>
</tr>
<tr>
<td>II</td>
<td>2.867</td>
<td>2.77</td>
</tr>
<tr>
<td>III</td>
<td>0.866</td>
<td>2.64</td>
</tr>
<tr>
<td>IV</td>
<td>1.198</td>
<td>2.77</td>
</tr>
<tr>
<td>All</td>
<td>0.765</td>
<td>1.984</td>
</tr>
</tbody>
</table>

There are four reasons which may lead to the conclusion reached above: (a) the model was misspecified; (b) a nonlinear relationship existed between the dependent variables and the independent variable; (c) other variables ought to be included in the model to measure the relationship between dependent variable and the independent variables; or (d) the effects of the independent variable were not additive. The third and fourth reasons are believed to be the main cause of obtaining a very low $R^2$ using the five characteristics.

The significant $R^2$ on Group II was investigated further to determine which independent variable makes a significant contribution to the multiple $R^2$. One approach
to evaluating the contribution made by independent variable is based upon the standard error of its regression coefficient (4). The standard error of regression coefficient for each independent variable is part of the output of multiple regression analysis.

The null hypothesis to be tested for the contribution of \( X_1 \) to the model would be

\[ H_0: \text{Variable } X_1 \text{ does not significantly improve the model once variables } X_2, X_3, X_4 \text{ and } X_5 \text{ have been included.} \]

states statistically, the null hypothesis to be tested was

\[ H_0: B_1 = B_2 = B_3 = B_4 = B_5 = 0 \]

To test a hypothesis regarding a regression coefficient, the \( t \) ratio was computed (4):

\[ t = \frac{b_k}{s_{bk}} \]

where \( b_k \) = regression coefficient for independent variable \( k \),

\[ s_{bk} = \text{standard error of the regression coefficient } b_k. \]

The computed \( t \) ratio was compared with the critical value obtained from that statistical table for a given level of significance. If the computed \( t \) ratio is greater than the critical value, the null hypothesis is rejected. The results of the test are presented in Table XXI.
TABLE XXI
SUMMARY OF THE TEST OF SIGNIFICANCE ON THE REGRESSION COEFFICIENT--GROUP II

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reg. Coef</th>
<th>Std Error Coef</th>
<th>T-Ratio</th>
<th>Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) CFA</td>
<td>-0.31828</td>
<td>0.17282</td>
<td>-1.84170</td>
<td>2.101</td>
</tr>
<tr>
<td>(b) Education</td>
<td>0.09407</td>
<td>0.18082</td>
<td>0.52023</td>
<td>2.101</td>
</tr>
<tr>
<td>(c) Specialist</td>
<td>0.21899</td>
<td>0.23100</td>
<td>0.94801</td>
<td>2.101</td>
</tr>
<tr>
<td>(d) Experience</td>
<td>0.02298</td>
<td>0.01264</td>
<td>1.81835</td>
<td>2.101</td>
</tr>
<tr>
<td>(e) Time Spent</td>
<td>0.01147</td>
<td>0.00551</td>
<td>2.08331</td>
<td>2.101</td>
</tr>
</tbody>
</table>

The critical values in Table XXI were obtained from the t table at eighteen degrees of freedom. The degree of freedom (df) was computed by (4)

\[ df = n - k - 1, \]

where \( n \) = sample size,
\( k \) = number of independent variables.

As Table XXI shows, none of the computed t values was greater than critical value. Therefore, the null hypothesis cannot be rejected.

It is possible to find examples where \( R^2 \) is statistically significant, but none of the tests of significance on the individual \( X_i \) reaches significance criterion to reject the null hypothesis. Cohen (4) indicates that this finding occurs when the variables which correlate with \( Y \) are so substantially redundant that none of the unique effects are large enough to be significant.
Multiple Regression Using Group as Dummy Variables

The results from multiple regression analysis indicated that $R^2$ was significant in Group II and not significant for Group I, III and IV using five characteristics of the financial analysts as independent variables. Group II was investigated further to determine whether any single variable contributed significantly to the multiple $R^2$. The finding was that not any of the single independent variables contributed significantly to the multiple $R^2$. There is a possibility that all groups might contribute significantly to the multiple $R^2$. In other words, the APE as dependent variable may differ significantly from one group to another. This possibility is assessed in this section.

A set of categorical or dummy variables was assigned by treating each group as a separate variable and assigning 1's and 0's to each group depending upon the presence or absence of the APE in that group. Cohen (4) indicates that using dummy variables is especially appropriate in research where there is a control group and other experimental groups.
TABLE XXII

DUMMY VARIABLE CODING WITH G = 4 GROUPS

<table>
<thead>
<tr>
<th></th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I control</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>II treatment</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>III treatment</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>IV treatment</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Multiple regression analysis was performed using transformed data from APE as dependent variables and groups as independent variables, which were coded as Table XXII. The multiple $R^2$ was 0.0439. The test of the significance of $R^2$ was performed to determine whether $R^2$ could have arisen by chance or could be significant. The null hypothesis to be tested was that the group as an independent variable contributed no significance to the multiple $R^2$. The computed $F$ value was 2.484. In comparing this value with the critical value 2.71 at the 0.05 $\alpha$-level of significance with three and ninety-four degrees of freedom, the null hypothesis could not be rejected. It is concluded that the group accounted for no significant effects on the multiple $R^2$. 
Consideration of Nonresponse Bias

Nonresponse bias represents one of the serious problems in the use of mailed questionnaires. The problem relates to the bias which may be present in a survey measure because of the failure to obtain responses from some of the elements in the original sample. Thus, the sample results may not be truly representative. There was a 26.27 per cent response rate and a 73.73 percent nonresponse rate in this study as shown in Chapter III. This raises some doubt as to the representativeness of the responses.

Because of the potential seriousness of the problem, an effort was made to test for the possible presence of a significant nonresponse bias. The test method employed was based on the methods used by Buzby (2), Casey (3), and Pany and Reckers (9).

The responses received from financial analysts were considered as two waves, one before and one after the follow-up letters. Fifty-four responses were received before follow-up letters and forty-four responses were received after the follow-up letters. ANOVA was used to analyze the absolute percentage error based on the transformed data from the two waves, and the t-tests were performed for the five variables contained in the questionnaire.
Table XXIII contains the results of the ANOVA model. The computed F value was less than the critical value at 0.05 \( \alpha \)-level.

**TABLE XXIII**  
ANALYSIS OF VARIANCE OF NON-RESPONSE BIAS

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degree of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>Computed F-value</th>
<th>Critical F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between the Groups</td>
<td>1</td>
<td>0.22166</td>
<td>0.22166</td>
<td>0.75090</td>
<td>3.94</td>
</tr>
<tr>
<td>Within the Groups</td>
<td>96</td>
<td>28.55984</td>
<td>0.29519</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>28.55984</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the \( t \) test for the five variables are summarized in Table XXIV. None of the computed \( t \) values is greater than the critical value at the 0.05 \( \alpha \)-level. The results of both tests did not indicate any presence of significant nonresponse bias at 0.05 \( \alpha \)-level.
TABLE XXIV

SUMMARY OF THE t TEST FOR NONRESPONSE BIAS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Degree of Freedom</th>
<th>Computed t</th>
<th>Critical t at 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFA</td>
<td>96</td>
<td>0.00000</td>
<td>1.98</td>
</tr>
<tr>
<td>Education</td>
<td>96</td>
<td>0.07813</td>
<td>1.98</td>
</tr>
<tr>
<td>Specialist</td>
<td>96</td>
<td>1.52937</td>
<td>1.98</td>
</tr>
<tr>
<td>Experience</td>
<td>96</td>
<td>1.54867</td>
<td>1.98</td>
</tr>
<tr>
<td>Time spent</td>
<td>96</td>
<td>0.49051</td>
<td>1.98</td>
</tr>
</tbody>
</table>

Chapter Summary

In summary, various statistical tests were performed and the results were interpreted in this chapter. Data collected were first tested to see whether the data confirmed to the underlying assumptions of ANOVA. Data were not confirmed to be homogeneous--one of the necessary assumptions of ANOVA. Therefore, logarithmic transformations of the APE was performed. The transformed data met the homogeneity assumption, and thus were used for analysis. ANOVA were performed to determine whether the means of the four groups had a significant difference. Multiple comparison procedures were performed to locate the specific differences which contributed to the overall significant effect. Pearson's correlation coefficients were computed
and tested for the significance between the error rates and time spent to complete the questionnaire. Confidence intervals at ninety-five per cent level of significance were constructed to determine whether the actual value fell within the confidence intervals. Multiple regression analysis was performed to determine whether the knowledge of the five characteristics of financial analyst can be based to predict the APE.

To assess the possibility of the bias from the samples, a test for randomization was performed. A regression analysis using groups as dummy variables was performed to determine whether the group had a significant effect on the APE. The possibility of nonresponse bias was also assessed. These details were presented in various sections in this chapter.
CHAPTER BIBLIOGRAPHY


Summary of the Research

In Statement No. 33, "Financial Reporting and Changing Prices," the FASB requires for some large companies the disclosures of historical cost with constant dollar, and current cost information in the published annual financial statements sent to their shareholders.

One of the purposes of the inflation disclosures, as indicated by FASB, is to help users of the financial statements in assessing future cash flow. The FASB reasons that when users wish to assess future cash flow, they will often examine the components of financial statements in detail instead of just looking for one bottom-line number. Users may be interested in, for example, cost of goods sold at current cost, depreciation expense at current cost, current cost of inventory, plant and equipment, etc. Therefore, the disclosures of historical cost with constant dollar and current cost may incorporate more up-to-date information about the resources used or held by an enterprise than the corresponding historical cost accounting.
This study was directed toward the examination of the effects of the different levels of disclosures on the cash flow projection. Three distinct levels of disclosures from FASB No. 33 were used to assess the effects of the disclosure on the cash flow projection. These three levels of disclosures are (a) historical cost with constant dollar disclosures, (b) current cost disclosures, and (c) historical cost with constant dollar and current cost disclosures. The subjects were divided into a control group and three experimental groups. The control group received no disclosures, while the experimental groups received three different levels of disclosures. The major assertion is that if the inflation disclosures can help the users of the financial statements in assessing the future cash flow of the enterprise, then the users who received financial statements with all inflation disclosures should perform better in cash flow projection than those who received financial statements without or with less inflation disclosures. The effects of the different levels of disclosures on cash flow projection were assessed.

The theoretical developments of the Brunswik Lens model and information overload were reviewed. These theories served as a conceptual framework for this study and were applied to examine the financial analysts' cash flow projection processes.
Financial analysts in the Dallas-Fort Worth and Houston areas were used as subjects in this study. Subjects were randomly divided into four groups: one control group and three experimental groups. Four groups of financial analysts were presented with varying amounts of accounting data from an actual firm and were asked to make cash flow projections for the coming year. The projected cash flows were then compared with the actual cash flow of the firm. The performance measure used was the absolute percentage error between the projected value and the actual value for that period. The performance of the groups was compared by examining the mean percentage errors from each group.

Analysis of variance (ANOVA) was performed to test whether the mean of absolute percentage error from each group had a significant difference. Multiple comparisons procedures were used to locate the source of significant differences. The Pearson's correlation coefficient between absolute percentage error rate and time spent was computed to see whether subjects performance was correlated to time spent. Confidence intervals at a ninety-five per cent confidence level were constructed for each group to determine whether actual cash flow fell within the intervals. Multiple regression models were used to examine whether absolute percentage errors could be predicted based on the knowledge
of five variables of the analysts. These five variables are (a) Chartered Financial Analyst, (b) educational level, (c) industry specialist, (d) experience, and (e) time spent on the task.

Research Results and Conclusions

One-way ANOVA showed that there was a significant effect on group mean absolute percentage error rates associated with the levels of disclosures. Multiple pairwise comparisons determined that there was a significant difference in absolute percentage rates between each group. The results from correlation analysis indicated that more time spent on either historical cost with constant dollar disclosures or current cost disclosures would not improve the subject's performance. The construction of confidence intervals at ninety-five per cent of confidence level would include the actual cash flow of the firm except for Group II, which only had historical cost with constant dollar information. Multiple regressions were run to determine the proportions of variance in the absolute percentage error accounted for by a linear regression equation on five personal characteristics of the analysts. Only Group II had regression with significant explanatory power at 0.05 $\alpha$-level. Significant explanatory power in Group II required further investigation. In examining the regression coefficients for each independent variable for Group II,
it was found that no significant relations existed between the five characteristics and the forecasted absolute errors.

The research results have led to the following conclusions:

1. The different levels of disclosures have effects on the cash flow projection. Group IV, who received both historical cost with constant dollar and current cost disclosures, appeared to be the most accurate in cash flow projection, while Group I, who received no disclosure, had the least accuracy. The introduction of maximum inflation disclosures did not confirm the theory of information overload. The disclosures of historical cost with constant dollar and current cost actually improve the performance of the financial analyst in predicting cash flow. The maximum level of inflation disclosures does not overtax financial analysts' information processing capacity, as indicated in the theory of information overload.

2. Subjects who spent more time on either historical cost with constant dollar or current cost disclosures did not improve their performance. This strongly indicated that historical cost with constant dollar or current cost disclosures alone would not improve the cash flow projection. Both disclosures must be present to improve the subjects' performance.
3. Group II, who received historical cost with constant dollar disclosures, tended to understate cash flow. This implies that historical cost with constant dollar disclosures might have insufficient information content in projecting cash flow. This is probably caused by the weakness of the historical cost with constant dollar disclosures. Historical cost with constant dollar accounting which is based on the Consumer Price Index for All Urban Consumers (CPI-U) is a method of reporting financial statement items in dollars having the same purchasing power. It attempts to portray how general inflation has affected the exchange value of the dollar. However, individual specific price changes do not necessarily move in the same direction as the general index. Specific price changes of individual assets or goods may be due in part to general inflation; they also can be caused by other factors.

4. The multiple regression model cannot be used to determine the proportion of variance in the absolute percentage error (APE) accounted for by a linear equation of the five personal characteristics of the analysts. The multiple regression analysis was based on the framework of the Brunswik Lens model. The model divided the world into the environmental and judgmental systems as discussed in Chapter II. In the judgmental system, the concentration focuses on the individual using each cue to predict the
distal variable. The multiple correlation coefficient indicated the degree of linear relationship between the set of cues and the individual's prediction. The purposes of this study is not to construct the statistical models for individual's prediction. However, the results of the multiple regression analysis from this study confirm the results from other empirical research which indicated that the user's prediction model is very difficult to identify. The lens model may be most easily utilized in stable situations in which an individual must make a relatively large number of predictions based upon the same set of cues.

Recommendations

The research results obtained in this study indicate that financial analysts used disclosures in predicting cash flow. Different levels of disclosures had different effects on the accuracy of cash flow projections. Only both historical cost with constant dollar and current cost disclosures presented together can improve the subject's performance. Both disclosures did not pass over the maximum information processing capacity to induce the information overload as suggested by the information overload theory.

FASB No. 33 is an experiment. The Board indicated that it intends to assess the usefulness of the experimental disclosure of changing prices as required by FASB No. 33. It expects this ongoing assessment process to provide a
basis for decisions on whether the dual measurement approach should continue and whether other changes should be made. Also, the Board has announced plans to undertake a comprehensive review of this Statement no later than five years after its publication. In its Status Report (1) issued in June, 1981, FASB has invited comments on the kinds of research needed such as (a) whether inflation-adjusted disclosures are used and how they are used, (b) whether the FASB should continue to require the reporting of information about the effects of price changes, and (c) whether it should continue to ask for both constant dollar and current cost information disclosures, or select only one method.

The findings in this study strongly indicate that inflation adjusted disclosures were used by financial analysts in the cash flow projections and that both historical cost with constant dollar and current cost information must be present for better performance.

The implications of these findings to accounting policy-makers are two-fold. First the FASB should continue Statement No. 33 disclosure requirements. Second, the FASB might consider extending the disclosure requirements to more publicly held companies.
Limitations

The company used in this study was not selected on a random basis. The criterion used to select the company was that the company disclosed all inflation information according to the requirements of FASB No. 33 in its financial statements for the fiscal years of 1979 and 1980. The company chosen was a relatively large, stable, and highly diversified firm. It is difficult to compare the results of this study with possible results from other companies because of the differences between companies.

The method of administering the experiment also limits the validity of the study. The use of questionnaires has some drawbacks. One of these drawbacks is the inability to check the responses received. The results depend upon the unsupervised cooperation of the subjects and their compliance with the task instructions.

When financial analysts actually make cash flow projections, they may achieve a better degree of accuracy than the results shown in this study because they may have access to other accounting and non-accounting data such as quarterly earnings report, quarterly earnings forecast, segment data, and business outlook for specific industries prepared by various research organizations. These data were not present in this study.
Suggested Future Studies

Future studies could be undertaken by using a different experimental design. Several firms with different size assets and different industry classifications could be used. However, using a lot of data may require more time for response, and therefore discourage analysts' participation. To minimize the nonresponse problem, the researcher should secure an agreement from institutions to insure participation or have the institutions sponsor the research project.

The results of mail questionnaires are contingent upon the subject's unsupervised cooperation with the questionnaire's instructions, and in general, did not permit optimum control. A more controlled approach such as laboratory or field experiment with researcher present should be used.

Financial analysts are not the only users of financial statements. Financial institutions also use financial statements in making decisions as to whether to make loans or extend credit. The effect of the introduction of different levels of inflation disclosures on these decisions and size of loan or credit amount could be examined.

The inflation disclosure requirements according to FASB No. 33 are limited to some items with aggregation amounts only. The effect of aggregated versus disaggregated inflation disclosures on the decision maker could be examined.
The inflation disclosure requirements according to FASB No. 33 are limited to some items with aggregation amounts only. The effect of aggregated versus disaggregated inflation disclosures on the decision maker could be examined. This exploration could determine what specific items most affected the decision maker.

The inflation disclosures required by Statement No. 33 are supplemental to the basic financial statements. Thus the information is unaudited. The required information could be presented in supplemental statements or schedules or in the notes to financial statements in the annual reports. Whether the information should continue to be supplementary or be part of the primary financial statements could be examined.

Inflation may have different impact on different industries. Therefore, a study of the particular use of inflation adjusted data by a particular industry could be explored.
CHAPTER BIBLIOGRAPHY

APPENDIX 1
SUMMARY OF INFLATION ACCOUNTING PROPOSALS
IN FOREIGN COUNTRIES
### SUMMARY OF INFLATION ACCOUNTING PROPOSALS IN FOREIGN COUNTRIES

<table>
<thead>
<tr>
<th>Country/latest literature</th>
<th>Applicability</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Economic Community (EEC) United Kingdom</td>
<td>Voluntary for fiscal years ended after Dec. 1977 and directed primarily to listed companies.</td>
<td>A separate income statement showing: excess of current cost of inventories as of time of sale over the historical cost; additional depreciation based on current replacement cost; and &quot;gearing,&quot; or leverage, adjustment for monetary items.</td>
</tr>
<tr>
<td>Interim Recommendation &quot;The Hyde Guidelines&quot; (Nov. 1977)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>Voluntary for all companies</td>
<td>Reflect in the primary financial statements with footnote disclosure: replacement cost of inventories and fixed assets; cost of goods sold based on replacement cost as of time of sale; and depreciation based on current replacement cost.</td>
</tr>
<tr>
<td>Royal Decree on Financial Statements of Enterprises (Oct. 1976)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Mandatory generally for fiscal years ended after Dec. 1977, for listed companies (optional for other companies).</td>
<td>Reflect in the primary financial statements the revaluation of all assets based on current replacement cost subject to a maximum limit, i.e., net book value multiplied by a given coefficient, and disclose the effect on stockholders' equity (and restrictions on distribution of earnings).</td>
</tr>
<tr>
<td>Country/Latest Literature</td>
<td>Applicability</td>
<td>Presentation</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Germany</td>
<td>Voluntary for stock corporations and other companies required to publish annual reports.</td>
<td>Footnote disclosure of the effect on net earnings of: cost of goods sold based on replacement cost as of time of sale; and depreciation based on average replacement cost. Only those inventories and fixed assets that are considered financed by equity capital are included in determining the effect on net earnings.</td>
</tr>
<tr>
<td>Pronouncement of H. F. A. (Technical Committee of the German Institute), &quot;To Maintain the Net Worth of an Enterprise at Current Value in Determining the Results of Operations&quot; (Nov. 1975)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Voluntary for all companies.</td>
<td>Dutch accounting rules do not contain stringent regulations as to valuation methods other than that they must be &quot;generally acceptable.&quot; Preference is for a current value balance sheet with historical cost in notes; and operating results on a current value basis either in the income statement or notes.</td>
</tr>
<tr>
<td>Institute note accompanying LAS no. 6 (June 1977)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEC</td>
<td>When effective, would be voluntary for all companies.</td>
<td>Reflect in the primary financial statements: replacement cost of inventories and fixed assets; cost of goods sold based on replacement cost as of time of sale; and depreciation based on current replacement cost.</td>
</tr>
<tr>
<td>Draft 4th Directive (Revised Feb. 1974)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country/Latest Literature</td>
<td>Applicability</td>
<td>Presentation</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Other Commonwealth Nations: Australia</td>
<td>Would be mandatory for fiscal years beginning July 1979, for all companies.</td>
<td>Reflect in the primary financial statements: replacement cost of inventories and fixed assets; cost of goods sold based on replacement cost as of time of sale; and depreciation based on average replacement cost.</td>
</tr>
<tr>
<td>Provisional Accounting Standard, &quot;Current Cost Accounting&quot; (Oct. 1976)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>Would be voluntary for all companies.</td>
<td>Furnish a supplementary statement of &quot;Funds Available for Distribution or Expansion&quot; reflecting (a) additional funds required to replace inventory sold during the year; (b) funds required to finance the current replacement cost of plant, machinery and equipment; (c) extent to which the additional funds required to finance the increased cost of inventory and plant may be available from borrowings, assuming the maintenance of a constant ratio of equity to non-equity capital.</td>
</tr>
<tr>
<td>Report of the Ontario Committee on Inflation Accounting (June 1977)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country/Latest Literature</td>
<td>Applicability</td>
<td>Presentation</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(I) EDL4, &quot;Accounting in Terms of Current Costs and Values&quot; (Aug. 1976)</td>
<td>When effective, would be mandatory for all companies.</td>
<td>Reflect in the primary financial statements: &quot;value to the business&quot; of inventories and all noncurrent assets (generally replacement cost, but in some circumstances not realizable value); cost of goods sold based on replacement cost as of time of sale; and depreciation based on replacement cost of fixed assets held at the balance sheet date.</td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(II) Report of the Committee of Inquiry into Inflation Accounting &quot;The Richardson Report&quot; (Dec. 1976)</td>
<td>When effective, would be mandatory for all companies; implementation would be over a three-year period depending on whether the company is publicly listed, or in the case of &quot;private company,&quot; its size.</td>
<td>Reflect in the primary financial statements: current replacement cost of all assets &quot;essential to the business&quot; (broadly defined); net realizable value of other assets; cost of goods sold generally based on replacement cost as of time of sale; and depreciation generally based on replacement cost of fixed assets held at the balance sheet date.</td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circular to all Chartered Accountants (S.A.), &quot;Accounting for Inflation and Other Changes in Price Levels&quot; (Oct. 1975)</td>
<td>Voluntary for all companies.</td>
<td>Present in the directors' report or in a supplemental statement or footnote, the impact of inflation on the enterprise. (The circular provides no specific guidance and permits the impact to be determined by a general purchasing power, current cost, or combination approach.)</td>
</tr>
<tr>
<td>Country/earliest literature</td>
<td>Applicability</td>
<td>Presentation</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Latin and South America:</td>
<td>Mandatory in certain provinces for all corporations with paid-in capital exceeding five million pesos (approximately $700,000) that (a) have issued stock to the public; (b) are in joint ventures with the government; or (c) utilize public concessions or services.</td>
<td>Present complete restatement of all nonmonetary items, by means of a general price index as supplemental information in (a) a second column in the primary financial statements; (b) a footnote to the primary financial statements; or (c) a complementary set of financial statements. (Note that resultant adjustments in the income statement are presented as &quot;nonoperating&quot; items.)</td>
</tr>
<tr>
<td>Argentina Pronouncement of the Argentine Technical Institute of Public Accountants (1972)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil Brazilian Corporation Law (1976)</td>
<td>Mandatory for fiscal years beginning after Jan. 1, 1978, for all companies. (Prior to this date, revaluations of fixed assets and working capital were required under the previous law.)</td>
<td>Reflect in the primary financial statements: revaluations of all &quot;permanent asset accounts,&quot; including fixed assets (not inventories), investments and deferred charges, based on an &quot;official index&quot;; reduction of shareholder equity accounts by using the official general index; and net effect on earnings of the above revaluations and reduction.</td>
</tr>
</tbody>
</table>

July 6, 1981

Dear Sir:

In 1979 the Financial Accounting Standard Board (FASB) issued Statement No. 33, "Financial Reporting and Changing Prices" which required the disclosure of information about the effects of (1) general inflation and (2) specific price changes. Statement No. 33 is concerned with historical cost/constant dollar and current cost accounting techniques. These disclosures are intended to benefit the users of financial statements in assessing the amounts, timing and uncertainty of prospective cash flow to the relative enterprise.

I am conducting a research project in connection with my doctoral dissertation in Accounting at North Texas State University to determine whether these additional disclosures will benefit the financial analyst in making cash flow projection more accurate. This project is being conducted under the supervision of Dr. Barry King, Department of Accounting and Information System at North Texas State University.

Financial analysts in the Dallas/Fort Worth and Houston areas have been selected to respond. Your opinion and participation is invaluable and would increase the validity of the conclusions drawn from this research. The finding of this research project will provide empirical evidence to accounting policy-makers such as FASB and SEC in evaluating the disclosure policy and in turn, will benefit the users of financial statements, especially financial analysts.

Therefore, I ask you to complete the attached questionnaire and return it to me. A pre-addressed postage-paid envelope is enclosed for your convenience. Your response will be kept in absolute confidence. The findings of this research project will be made available to all participants who request them.

Your cooperation and help is highly appreciated.

Sincerely,

Chao M. Liu

CML/mms

Enclosure
APPENDIX 3

QUESTIONNAIRE
QUESTIONNAIRE  
No.  
(Code for follow-up use only)

Part A:

Please read the attached financial statements and all related information regarding Company A for the fiscal year ended 1979. Apply the techniques that you usually use to project the cash flow for fiscal year 1980.

1. Do you define cash flow as net income after taxes plus depreciation, depletion, amortization, and other similar non-cash outlay adjustments?
   
   _______ yes.  
   _______ no. Please specify ____________________________________________

2. How much cash flow do you project for 1980? $_________ (to the nearest million). If the cash flow for 1980 will be stated as a range, the most likely range will be between $_________ (million) and $_________ (million).

3. Please briefly indicate formulas, computations or a description of what you did in projecting 1980 cash flow.
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. Please rank as the most important to the least important types of information in projecting cash flow by placing 1, 2, 3, 4 and 5 in descending order (i.e. 1 = the most important, 5 = the least important):
   
   _______ cash flow trend based on historical cost data.  
   _______ historical cost/constant dollar disclosure.  
   _______ current cost disclosure.  
   _______ segment data disclosure.  
   _______ other. Please specify __________________________________________

Part B:

Most items can be answered by placing an (x) mark in the space provided. Please respond appropriately where information is requested for other questions.
5. Are you a member of Financial Analysts Federation?
   ______ yes.
   ______ no.

6. Are you a Chartered Financial Analyst (CFA)?
   ______ yes.
   ______ no. If holder of other certificate, please specify ____________________________

7. What is the highest level of formal education you have attained?
   ______ Bachelor's degree.
   ______ Master's degree.
   ______ Other. Please specify ____________________________

8. Are you classified as an industry specialist?
   ______ yes. Please specify ____________________________
   ______ no.

9. How many years of experience have you been in your present profession?
   ______ years.

10. How much time you spent to complete this questionnaire?
    ______ hour ______ minutes.

Thank you very much for your time and cooperation. If you would like to receive a copy of the results of this research, please check: ______ Yes.
APPENDIX 4

COMPANY A's FINANCIAL STATEMENTS AND BACKGROUND DATA
Company's Background

The Company was incorporated in Delaware in 1927. Today, the Company is a highly diversified industry firm. The Company operates within the following two groups:

Control Systems Group—Company makes controls for heating and air conditioning systems in homes and buildings. The Company also designs, develops, and produces various guidance systems and control for military and commercial use.

Information Systems Group—Company makes and markets a wide range of electronic data processing and communications systems and provides a variety of data processing and related services for business, government, industry and scientific applications.

The Company achieved substantial gains in revenue, net income and earnings per share in 1979—a fifth consecutive year of increased earnings. The Company achieved a 17% return on shareholders' equity. The return on total capital invested in the business increased to 13%. The Company re-established new higher targets for 1980's:

- 18% return on shareholders' equity
- 14% on total capital employed
- Debt ratio remaining under 50%
- Regular dividend increases at earnings increase.

Business Outlook

Despite the expectation of an economic slowdown in 1980, the Company faces the eighties confident of its ability to provide products and services needed by the growth markets the Company serves. The short-range decline in housing starts and commercial construction will be offset by the demand for energy-saving controls in existing homes and buildings. The expanding market for heating systems from oil to natural gas in the United States. In industrial markets the Company looks for continued plant modernization, exports to developing countries, and increased demand for electronic components.

The Company continued to expand plant and equipment in 1979 to substantially increase capacity to meet customer needs of the eighties. Capital spending was $182 million dollars in 1979 and will exceed $250 million in 1980.

The Company and its subsidiaries will spend a total of $600 million for research and development in 1980.

Cash Flow and Earnings Per Share (in thousands of dollars except earnings per share)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
<th>Earnings per share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>522,100</td>
<td>10.95</td>
</tr>
<tr>
<td>1978</td>
<td>429,600</td>
<td>8.48</td>
</tr>
<tr>
<td>1977</td>
<td>376,640</td>
<td>6.39</td>
</tr>
<tr>
<td>1976</td>
<td>320,195</td>
<td>5.12</td>
</tr>
<tr>
<td>1975</td>
<td>363,223</td>
<td>3.89</td>
</tr>
</tbody>
</table>

* Before extraordinary items


COMPANY A

INCOME STATEMENT

For the Fiscal Year Ended 12/31/79

(Dollars in Millions Except Per Share Amounts)

| Revenue                                      | $ 4,209.5 |
| Costs and Expenses                          |
| Cost of revenue                             | $2,858.4  |
| Research and Development                    | 234.6     |
| Selling, general and admin                  | 997.0     |
| Interest                                    | 22.3      |
| Other income                                | (28.8)    |
| Total Costs and Expenses                    | 3,793.5   |
| Income before income taxes                  | $ 416.0   |
| Income taxes                                | 176.0     |
| Net Income                                  | $ 240.0   |
| Earnings per common share                   | $ 10.95   |
### Company A

**Statement of Changes in Financial Position**

For the Year Ended 12/31/79

(Dollars in Millions)

<table>
<thead>
<tr>
<th>Funds Provided by Operations</th>
<th>1979</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>$260.5</td>
</tr>
<tr>
<td>Item not affecting funds</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>244.7</td>
</tr>
<tr>
<td>Deferred income taxes</td>
<td>59.4</td>
</tr>
<tr>
<td>Equity income, including finance subsidiaries (less dividends received)</td>
<td>(42.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>522.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Funds Used by Operations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Working capital</td>
<td></td>
</tr>
<tr>
<td>Receivables</td>
<td>237.7</td>
</tr>
<tr>
<td>Inventories</td>
<td>212.4</td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities</td>
<td>(125.7)</td>
</tr>
<tr>
<td>Customer advances</td>
<td>(24.4)</td>
</tr>
<tr>
<td>Income taxes</td>
<td>(4.1)</td>
</tr>
<tr>
<td><strong>Capital expenditures (net of retirements—1979, $137.6, 1978, $85.4)</strong></td>
<td>295.9</td>
</tr>
<tr>
<td>Increase in long-term receivables</td>
<td>84.0</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Net funds used by operations</strong></td>
<td>711.0</td>
</tr>
<tr>
<td><strong>Financing and Investment Activities</strong></td>
<td>(52.7)</td>
</tr>
<tr>
<td>Dividends paid to stockholders</td>
<td></td>
</tr>
<tr>
<td><strong>Debt transactions</strong></td>
<td></td>
</tr>
<tr>
<td>Issuance of long-term debt</td>
<td>176.4</td>
</tr>
<tr>
<td>Reduction of long-term debt</td>
<td>(37.9)</td>
</tr>
<tr>
<td>Increase (decrease) in short-term debt</td>
<td>(37.2)</td>
</tr>
<tr>
<td><strong>Finance subsidiary transactions</strong></td>
<td></td>
</tr>
<tr>
<td>Increase in receivables sold to finance subsidiaries</td>
<td>127.7</td>
</tr>
<tr>
<td>Decrease in obligation for rental contracts conveyed</td>
<td>(72.5)</td>
</tr>
<tr>
<td><strong>Acquisition transactions</strong></td>
<td></td>
</tr>
<tr>
<td>Purchase of treasury stock</td>
<td></td>
</tr>
<tr>
<td>Treasury stock reissued—at market</td>
<td>22.9</td>
</tr>
<tr>
<td>Increase in goodwill</td>
<td>(14.7)</td>
</tr>
<tr>
<td>Increase in investments</td>
<td>(10.9)</td>
</tr>
<tr>
<td>Exercise of stock options</td>
<td>25.3</td>
</tr>
<tr>
<td><strong>Increase in cash, time deposits and marketable securities</strong></td>
<td>126.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company A Balance Sheet</th>
<th>12/31/79</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
</tr>
<tr>
<td>Current Assets:</td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>$14.6</td>
</tr>
<tr>
<td>Time deposits and marketable securities</td>
<td>161.0</td>
</tr>
<tr>
<td>Receivables</td>
<td>853.4</td>
</tr>
<tr>
<td>Inventories</td>
<td>751.6</td>
</tr>
<tr>
<td><strong>Investments</strong></td>
<td>1,780.0</td>
</tr>
<tr>
<td>Investment in subsidiary</td>
<td>172.8</td>
</tr>
<tr>
<td>Finance subsidiaries</td>
<td>118.3</td>
</tr>
<tr>
<td>Other companies</td>
<td>76.7</td>
</tr>
<tr>
<td><strong>Property</strong></td>
<td></td>
</tr>
<tr>
<td>Equipment (net)</td>
<td>469.1</td>
</tr>
<tr>
<td>Other property (net)</td>
<td>964.0</td>
</tr>
<tr>
<td><strong>Other Assets</strong></td>
<td></td>
</tr>
<tr>
<td>Long-term receivables</td>
<td>79.1</td>
</tr>
<tr>
<td>Goodwill</td>
<td>87.8</td>
</tr>
<tr>
<td>Other</td>
<td>60.9</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td>$3,339.6</td>
</tr>
<tr>
<td><strong>Liabilities and Stockholders' equity</strong></td>
<td></td>
</tr>
<tr>
<td>Current liabilities:</td>
<td></td>
</tr>
<tr>
<td>Short-term debt</td>
<td>$81.6</td>
</tr>
<tr>
<td>Accounts payable and accrued liabilities</td>
<td>651.9</td>
</tr>
<tr>
<td>Customer advance</td>
<td>77.2</td>
</tr>
<tr>
<td>Income taxes</td>
<td>126.0</td>
</tr>
<tr>
<td>Other liabilities:</td>
<td>936.7</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>439.7</td>
</tr>
<tr>
<td>Obligation for rental contracts conveyed</td>
<td>1.8</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>239.7</td>
</tr>
<tr>
<td>Other</td>
<td>75.2</td>
</tr>
<tr>
<td><strong>Stockholders' equity</strong></td>
<td></td>
</tr>
<tr>
<td>Common stock, 51.5 par value</td>
<td></td>
</tr>
<tr>
<td>Authorized 60,000,000 shares</td>
<td></td>
</tr>
<tr>
<td>Issued 44,053,000 shares</td>
<td>33.4</td>
</tr>
<tr>
<td>Additional paid-in capital</td>
<td>594.4</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>1,014.7</td>
</tr>
<tr>
<td><strong>Treasary stock</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total liabilities and Stockholders' equity</strong></td>
<td>1,642.5</td>
</tr>
</tbody>
</table>

### Five-Year Comparison of Selected Supplementary Financial Data Adjusted for Effects of Changing Prices

<table>
<thead>
<tr>
<th>Years Ended December 31</th>
<th>Average Consumer Price Index</th>
<th>As Adjusted for General Inflation</th>
<th>Net Assets Adjusted for General Inflation</th>
<th>Net Assets Adjusted for General Inflation Per Common Share</th>
<th>Net Income (Net Income Per Common Share)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,009.5</td>
<td>$3,547.8</td>
<td>$2,911.1</td>
<td>$2,495.3</td>
<td>$2,931.9</td>
<td>$3,291.9</td>
</tr>
<tr>
<td>$184.28</td>
<td>$176.56</td>
<td>$240.00</td>
<td>$240.00</td>
<td>$240.00</td>
<td>$240.00</td>
</tr>
<tr>
<td>$2,215.00</td>
<td>$2,215.00</td>
<td>$2,215.00</td>
<td>$2,215.00</td>
<td>$2,215.00</td>
<td>$2,215.00</td>
</tr>
<tr>
<td>$50.6</td>
<td>$50.6</td>
<td>$50.6</td>
<td>$50.6</td>
<td>$50.6</td>
<td>$50.6</td>
</tr>
</tbody>
</table>

#### Disclosure Requirements According to SEC Registration No. 33

**Supplementary Statement of Income Before Extraordinary Income Adjusted for Changing Prices**

For the Year Ended December 31, 1979

<table>
<thead>
<tr>
<th>Item</th>
<th>As Reported</th>
<th>Adjusted for General Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$4,209.5</td>
<td>$4,209.5</td>
</tr>
<tr>
<td>Cost of goods sold (excluding depreciation)</td>
<td>2,483.8</td>
<td>2,483.8</td>
</tr>
<tr>
<td>Depreciation</td>
<td>2,900.8</td>
<td>2,900.8</td>
</tr>
<tr>
<td>Other costs and expenses (excluding depreciation)</td>
<td>1,105.0</td>
<td>1,105.0</td>
</tr>
<tr>
<td>Income before extraordinary income</td>
<td>$1,720.0</td>
<td>$1,720.0</td>
</tr>
<tr>
<td>Inventories</td>
<td>3,171.0</td>
<td>3,171.0</td>
</tr>
<tr>
<td>Other property net (net of depreciation)</td>
<td>473.4</td>
<td>473.4</td>
</tr>
<tr>
<td>Gain from decline in purchasing power of net monetary items</td>
<td>-3,406.0</td>
<td>-3,406.0</td>
</tr>
<tr>
<td>Increase in specific prices (current cost of inventory, equipment, leasehold property, and other property held during the year)</td>
<td>-3,406.0</td>
<td>-3,406.0</td>
</tr>
<tr>
<td>Effect of increase in general price level</td>
<td>$1,720.0</td>
<td>$1,720.0</td>
</tr>
<tr>
<td>Loss on sale of plant and equipment</td>
<td>51.3</td>
<td>51.3</td>
</tr>
<tr>
<td>Effect of increase in specific prices (current cost of plant and equipment, leasehold property)</td>
<td>51.3</td>
<td>51.3</td>
</tr>
<tr>
<td>Basic earnings per share</td>
<td>$1.10</td>
<td>$1.10</td>
</tr>
<tr>
<td>Diluted earnings per share</td>
<td>$1.09</td>
<td>$1.09</td>
</tr>
</tbody>
</table>
APPENDIX 5

INSTITUTIONAL AFFILIATION OF RESEARCH PARTICIPANTS
INSTITUTIONAL AFFILIATION OF RESEARCH PARTICIPANTS

Dallas/Fort Worth (Alphabetically Arranged):

Ackerman Associates
Annuity Board of Southern Baptist Convention
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Vaughan, Nelson & Harper Inc.
APPENDIX 6

COMPUTATION OF 1980 CASH FLOW FROM OPERATIONS
COMPANY A

Cash Flow From Operations (Dollars in Millions):

Net income ......................... $293.50

Add back non-cash outlay adjustment:

Depreciation ....................... 256.20
Deferred income tax ............... 22.46
Equity income, including finance subsidiaries (less dividends received) (39.50)

Total cash flow from operations ... $532.66

BIBLIOGRAPHY

BOOKS


Articles


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Reports


Unpublished Material
