# THE EFFECTS OF SOURCES OF EARNINGS FORECASTS AND DEGREE OF SOURCE EXPERTISE ON SUBJECTS' ESTIMATES OF EARNINGS PER SHARE: A FIELD EXPERIMENT

BY

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ACCEPTANCE

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ABSTRACT

THE EFFECTS OF SOURCES OF EARNINGS FORECASTS AND DEGREE OF SOURCE EXPERTISE ON SUBJECTS' ESTIMATES OF EARNINGS PER SHARE: A FIELD EXPERIMENT

By John M. Hassell

Motivated by previous research in accounting, finance, and psychology, this dissertation reports the results of a field experiment to determine whether two particular variables affected subjects' estimates of earnings per share. The variables used were the source of an earnings forecast and the degree of expertise of the source of the earnings forecasts. Subjects were professional employees of bank trust departments whose jobs normally entail analyzing firms and estimating the firms' future earnings per share. The research utilized Analysis of Variance (ANOVA) for statistical tests of the dependent variables.

The sources of earnings forecasts used in this study were financial analysts and company officials (management). Earnings forecasts issued by financial analysts and management are widely disseminated in the financial press. Abundant theoretical and empirical literature exists that supports the notion that investors use financial analyst and management earnings forecasts when making investment decisions. The question of whether investors are influenced more by financial analyst or management earnings forecasts has not been

answered. This dissertation provides empirical evidence about which source of earnings forecast was more influential in one particular research setting.

The second experimental variable examined in this study was the degree of expertise of the sources of the earnings forecasts. A stream of social psychology literature has dealt with the variable source credibility, of which source expertise is a component. That literature, in a variety of experimental settings, consistently has reported that source expertise is a significant variable. However, the sources used in the psychology literature ranged from nonexpert to expert. Both financial analysts and company officials are considered to be expert sources of earnings forecasts. Thus, this study investigated whether differences in the degree of expertise of expert sources was a significant variable.

For the experimental setting used in this study, the source variable was found to be a significant variable while the degree of expertise of the source was not significant. Thus, subjects' earnings per share estimates reflected a preference for one earnings forecast source (company officials) over another source (professional financial analysts). On the other hand, subjects' earnings per share estimates were not affected by the degree of expertise of the source.

# CHAPTER I

# OVERVIEW

## Introduction

The purpose of this dissertation is to investigate the extent to which certain information affects investors' judgments. Specifically, this study provides empirical evidence regarding the extent to which the source and the degree of expertise of the source of an earnings forecast affect subjects' estimates of earnings per share (EPS). The results provide information that is important in understanding investor decision processes. The research design of the study is based on accounting, finance, and psychology literature, and, therefore, the results provide additions to each body of literature.

A comprehensive model of an investor's investment decision process, detailing how an investor processes information to make an investment decision, has yet to be developed. However, a wealth of literature posits that investors do use various data when making investment decisions. The data suggested include both historical data (primarily financial accounting data) and expectational data. Generally, it is accepted in the finance and accounting literature that one significant datum, perhaps the most significant datum, to an investor is a company's prospects for future earnings. Most commonly, this expectation of future earnings takes the form of estimates (forecasts) of earnings per share.

## Sources of Earnings Forecasts

Earnings forecasts are available primarily from three sources. The first and most widely available source of earnings forecasts is the financial analyst community. Financial analysts routinely prepare earnings forecasts for a large number of firms. For example, Standard and Poors' Earnings Forecaster, Value Line's Investment Service, the Jones & Ryan Institutional Brokers' Estimation System (IBES), and Zacks Investment Research Icarus Service are four publications specifically devoted to reporting analyst earnings forecasts. The earnings forecasts that are summarized in the four publications primarily are prepared by financial analysts working for large brokerage firms. The forecasts are provided to company clients and perhaps sold to subscribers. A large number of these analyst forecasts also are reported in the financial press. Many large institutions such as banks, insurance companies, and mutual funds hire staffs of security analysts to provide investment advice. Published analyst forecasts are a major source of information for in-house security analysts.

A second source of earnings forecasts for a large number of firms is company management. Many management forecasts are widely reported in the financial press, although they are not nearly as prevalent as analyst earnings forecasts. Also, management forecasts tend not to be as specific as earnings forecasts. During the 1970's the Securities and Exchange Commission (SEC) proposed but never implemented a rule requiring mandatory forecasts. The SEC proposal presumably was predicated on the assumption that management forecasts are important to investors.

The final source of an earnings forecast is some type of mathematical model (usually referred to as mechanical or naive models)

that combines historical and perhaps expectational data to compute an earnings forecast. A regression based on publicly available EPS amounts is an example of such a model. Another example, which is more complicated than a simple regression model, is a Box-Jenkins model.

## Motivation to Prefer One Forecasting Source Over Another

An investor who uses expectational data in an investment decision model should desire the most informative available expectational data. Finance and accounting literature frequently has defined the "most informative" earnings forecast to be the most accurate earnings forecast. Of course, accuracy is not the only criterion by which expectational data can be judged. For example, an earnings forecast can be classified as good news or bad news. In this classification scheme, the accuracy is not of primary importance. What is important is whether the forecast is good news (e.g., higher than previous forecasts) or bad news (e.g., lower than previous forecasts). However, researchers have used accuracy most frequently as the primary criterion of interest. Comparing the accuracy of two forecasts is useful if both forecasts were based upon the same information sets. If based on different information sets, two forecasts might be informative even if they differ in forecast accuracy.

Reflecting the basic assumption that investors desire the most accurate earnings forecast available, a wealth of literature was produced during the past decade regarding the comparative accuracy of analyst, management, and naive model earnings forecasts. An implicit assumption of the forecast accuracy literature is that the forecasts were based on the same information set. The general findings of that literature have been that earnings forecasts produced by naive (mechanical) models are not as accurate as either analyst or management

earnings forecasts. Also, the literature indicates that there is no statistically significant difference in the relative accuracy of analyst and management earnings forecasts.

The finding that there is no significant difference in the comparative accuracy of analyst and management earnings forecasts may be surprising. Many authors in finance and accounting posit that either analyst or management forecasts should be more accurate. However, a belief regarding which source should be more accurate depends upon the point of view of the author. Most frequently, authors posit that management forecasts, reflecting superior firm specific information, should be more accurate. Another frequent argument is that financial analysts are objective with respect to any one firm and therefore are able to produce less biased, more accurate forecasts.

Research results in the social psychology literature dealing with source credibility suggest that one forecasting source should be preferred over another if the sources vary in credibility. Source credibility refers to the extent to which a source is perceived as knowing the right answer (expertise) and being motivated to convey the answer (trustworthiness). The psychology literature consistently indicates that higher credibility sources of information are preferred over sources with lower credibility. If investors believe analysts or management to be a more credible source of earnings forecasts, the more credible source should be preferred.

## Purpose of This Study

The purpose of this study is to provide empirical evidence regarding the question of whether individuals are influenced more by analyst or management earnings forecasts. Theoretical social

psychology literature posits that for a task such as the one conducted in this study (predicting earnings per share), the source's expertise should be the most important variable influencing subjects. Source expertise is a component of source credibility. The ability of a source to accurately predict earnings per share is a way of denoting source expertise. Thus, research evidence indicating that individual subjects prefer one source over another source would be important for several reasons. First, the findings of a preference for one source over another would be interesting in light of the findings of empirical literature that there is no difference in the relative forecast accuracy of analyst and management earnings forecasts. Second, evidence of preference for one source over another would provide additional information about investors' decision models. Third, such evidence might be useful in deciding the policy question of whether the SEC should mandate management earnings forecasts.

## Research Design

This study reports the results of a field experiment where subjects were exposed to two treatments -- the source of an earnings forecast (two levels) and the degree of expertise (credibility) of the source (three levels). A factorial design was used with each subject assigned to one of six groups. The design was a between subjects design where subjects were asked to supply the dependent variable, an EPS estimate, for a hypothetical company. In addition to the manipulated information, certain other background information was provided to the subjects. After the subjects supplied their earnings estimates, they answered background and manipulation check questions.

## Research Findings

Chapter IV provides a discussion of research findings and analyses of the data gathered in this study. Briefly, for the experimental setting used in this study, the source of the earnings forecast was a significant variable. Subjects responses revealed that subjects' estimates were affected more by management earnings forecasts than financial analyst earnings forecasts. Conversely, the degree of expertise variable was not a significant variable. Subjects' estimates were not affected by the various degrees of expertise of the expert sources used in this study. Finally, the interaction of the source and degree of expertise variables was not significant. Analysis of the manipulation check questions indicated that the experimental manipulations were successful.

## Organization of the Study

The organization of the remainder of this study is as follows:

Chapter II - Relevant Prior Research

Chapter III - The Experiment and the Research Methodology

Chapter IV - Data Analysis and Interpretation

Chapter V - Conclusion

Appendix A - The Experimental Instrument

Appendix B - The Pilot Studies

Appendix C - Survey of Subjects' Use of Data When Predicting EPS

Appendix D - Data Collected

# CHAPTER II

## RELEVANT PRIOR RESEARCH

An earnings forecast disseminated by a financial analyst or company official is a potentially useful message to an investor or any other person who seeks data to help in evaluating the future financial position of a firm. This chapter begins by briefly discussing why investors would prefer earnings forecasts presented by financial analysts or company officials. Then, drawing primarily on McGuire (1973, 1969), the process of persuasive communication is discussed. Finally, empirical literature in two different areas is reviewed. The first area includes accounting and finance literature dealing with the comparative accuracy of analyst and management forecasts. The second area of literature, primarily psychology literature, deals with the effects of source credibility on subjects' judgments in a variety of tasks.

### Why Investors Desire Earnings Forecasts

In accounting and finance literature, an almost universally accepted tenet is that investors are interested in predicting the future.[1] Thus, any information that facilitates prediction potentially is useful. Various studies in accounting and finance literature indicate that investors particularly are interested in predicting future cash flows (dividends and share price) and/or future accounting data, especially earnings data [e.g., Gonedes (1974) and Chang and Most

(1980)]. Literature posits that relationships exist between current security price and future cash flows. Future accounting earnings often are used as a surrogate for future cash flows.

No definitive theory explains how accounting earnings are used in the security pricing process because the empirical relationship between future cash flows and future accounting earnings is not known. Therefore, it is not surprising to find that different positions emerge in the literature. At the individual level, investment decisions are made that incorporate heterogeneous individual tastes, preferences, and endowments. At the market level, individuals are ignored and many times homogeneity or the existence of a representative individual is assumed. The picture is that of a market instantaneously digesting all publicly available information and adjusting to a new equilibrium price based on the collective decisions of market participants. What is clear from the literature, however, is that expectations regarding future accounting measurements do affect beliefs about the underlying economic variables that affect stock prices.

This dissertation assumes most basically that information about future earnings is important to a wide variety of users. Most of the theoretical literature concerning the usefulness of forecasted earnings takes the perspective of an equity investor. However, the theoretical motivation is also applicable to lenders and other groups who are interested in forming expectations about the future.

## McGuire's Communication/Persuasion Model

Communication is defined as "a process by which information is exchanged between individuals..." (Webster's New Collegiate Dictionary, 1980). Changing peoples' attitudes and behavior is an important function of communication. This dissertation is concerned with the

attitudes of sophisticated experts about earnings forecasts, one particular kind of information communicated by financial analysts and company management.

Attitude and attitude change research is a major field of social psychology.[2] Webster's New Collegiate Dictionary (1980) simply defines an attitude as "a mental position with regard to a fact or state; a feeling or emotion toward a fact or state." Social psychology literature, of course, takes a much more rigorous approach to defining attitudes. The increased rigor, however, does not lead to an equally simple definition. In fact, in order to define attitudes, McGuire (1969) feels compelled to contrast attitudes and knowledge, attitudes and values, and attitudes and opinions. No unambiguous, straightforward definition of attitude emerges.

Verbal communication is one important determinant of attitudes and behavior. However, there are also other factors that influence a person's attitude toward an object. McGuire (1973, pp. 217-219) lists several other determinants of attitudes -- nonverbal communication, genetic factors, physiological factors, direct experience with the object toward which the attitude is directed, and socializing institutional factors (total environment). This dissertation concentrates on the factor of verbal communication because the issue of interest here is the attitudes of sophisticated investors toward earnings forecasts, a type of verbal communication.

McGuire (1973) finds one of the more interesting uses of communication to be that of persuasion, a process that he defines as "changing peoples attitudes and behavior through the spoken and written word . . ." (p. 216). Although McGuire has difficulty in precisely defining an attitude, he informally describes the role of an

attitude as an intervening variable between the reception of stimuli and a response (see Figure 1). Thus, a person's attitude in part determines the person's response to specific stimuli.

McGuire (1973) has developed a communication-persuasion matrix that allows a finer analysis of the role of attitude change (see Figure 2). Communication (presentation of stimuli) is the independent variable in his framework and persuasion is the dependent variable.

McGuire separates communication, the independent variable, into five more specific variables:

1. The source of the message
2. The message content and organization
3. The channel through which the message is conveyed
4. The characteristics of the receiver of the message
5. The destination variables, the type of issue addressed and the kind of response urged

McGuire breaks down persuasion, the dependent variable, into six behavioral steps:

1. Present the communication
2. Attend to the communication
3. Comprehend the communication
4. Yield to the communication, the step where a change in attitude actually occurs
5. Retain the new attitude
6. Exhibit overt behavior reflecting the new attitude, the step where the effect of persuasion can be observed

The remainder of this section is devoted to describing briefly the process of persuasion and communication.

## Persuasion

The role of attitude change can be explained by examining more closely the behavioral process of persuasion and reviewing Figure 2.

Figure 1

Illustration of the Role of an Attitude

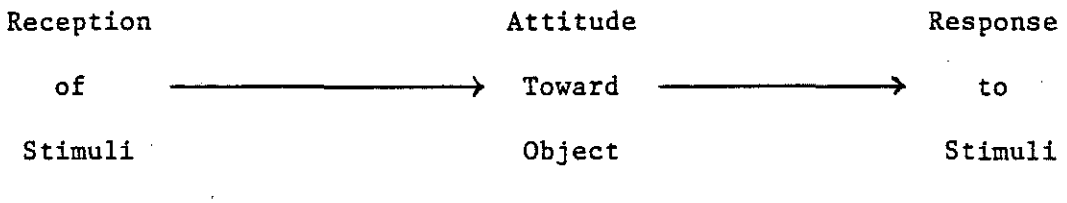


Figure 2

Communication-Persuasion Matrix*

| Persuasion (Dependent Variable) | Communication (Independent Variable) | | | | |
|---|---|---|---|---|---|
| | Source | Message | Channel | Receiver | Destination |
| Presentation | | | | | |
| Attention | | | | | |
| Comprehension | | | | | |
| Yielding | | | | | |
| Retention | | | | | |
| Overt Behavior | | | | | |

*Source: McGuire, 1973, page 223.

The first behavioral step in persuasion necessarily is that communication be presented. Once presented, communication (stimuli) can be received. The general process of receiving stimuli is broken down into behavioral steps two and three, attending to the stimuli and comprehending the stimuli. An individual usually has some attitude toward the object of the communication before the communication arrives. The process of attitude change occurs in yielding and retaining, the fourth and fifth behavioral steps in persuasion. Overt behavior is needed as the sixth step because some measurement is necessary in order to determine if attitude change has occurred.

McGuire's communication-persuasion matrix provides the theoretical framework on which this dissertation relies. However, for the communication of interest here, the dissemination of earnings forecasts, the use of the word persuasion may be inappropriate. McGuire (1973, pp. 225-226) points out that the concepts of persuasion and education are closely related. In some cases, the matrix may be described more aptly as a comunication-education matrix. McGuire summarizes the difference in the concepts thusly:

> [there is] a distinction between "education" and "persuasion" that does justice to common users and also differentiates in terms of generalizability of empirically determined relationships. "Education" is applied to situations where most of the variance in ultimate impact [attitude change] is mediated by the attention and comprehension factors, while "persuasion" is used to refer to communication in which ultimate impact is determined mostly by the yielding mediator (p. 226).

The issue of whether an earnings forecast seeks to persuade or educate is debatable. However, this research is concerned with observing how subjects react to earnings forecasts and is not intended to model the subjects' decision model. Therefore, whether the

behavioral process is described as persuasion or education is not explored further.

Communication

The source (the first communication variable). The focus of this research is whether the source of the communication, McGuire's first communication variable, motivates attitude change in a narrowly defined accounting/finance task. Specifically, whether the source of an earnings forecast affects subjects' estimates of earnings per share is studied. McGuire (1973, pp. 229-232) briefly discusses the source component of the communication independent variable.

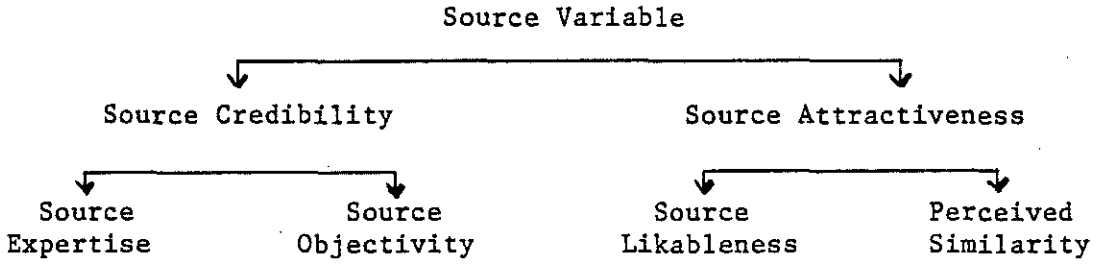
McGuire (1973) divides the general source communication variable into two variables -- source credibility and source attractiveness.[3] Each of these source variables is subdivided further. Source credibility consists of source expertise, the ability to know the truth, and source objectivity,[4] a motivation to convey the truth. The attractiveness of a source is related to the likableness of the source and the perceived similarity of the source by the recipient.[5] McGuire (1973, 1969) reviews a large body of literature that indicates that persuasion increases as a function of increased source expertise, source objectivity, likableness of the source, and the perceived similarity of the source to a judge. A visual overview of the source communication variable is presented in Figure 3.

McGuire (1969) indicates that source credibility rather than source attractiveness is a critical element in the persuasion process if:

> we are conceptualizing the recipient of the persuasive communication in his stance as a rational, problem solving individual, trying to adjust his belief system as closely as possible to external reality (p. 182).

Figure 3

Overivew of the Source Communication Variable



## Literature Concerning the Relative Accuracy of Analyst and Management Forecasts

Stock prices reflect the market participants' predictions of future events, principally future cash flows. There is a widespread belief that investors predict future accounting earnings as a surrogate for future cash flows (see Hassell, 1982 for a discussion of why investors are interested in predicting future earnings).

Givoly and Lakonishok (1983) asserted that "Earnings per-share emerge from various studies as the single most important accounting variable in the eyes of investors" (p. 1). Also, in reviewing a paper by Chang and Most (1980), Givoly and Lakonishok noted that "earnings forecasts were considered by [survey] respondents [financial analysts and investors] . . . to be the most important expectational data." Abdel-Khalik and Thompson (1977) and Givoly and Lakonishok (1983) provide excellent reviews of literature regarding earnings forecasts and the time series properties of earnings.

Much of the earnings forecasts research has dealt with forecast accuracy. The interest among academic researchers in forecast accuracy evolved largely in response to pronouncements during the 1970's by the Securities and Exchange Commission (SEC). Concerned that all investors do not have equal access to forecasts, the SEC indicated that mandatory disclosure of forecasts by management might be useful (for examples, see SEC 1973, 1978, 1979). As Imhoff and Pare (1982) point out:

> The basic premise [of requiring mandatory disclosure of management forecasts] is that if management forecasts are more accurate than those of other sources, it may be socially desirable to have the FASB or the SEC govern forecast disclosure (p. 429).

Earnings forecasts are available from financial analysts, company officials, and mathematical models (mechanical or naive models) that use past time series of reported earnings. Generally, earnings

forecasts generated by mechanical (naive) models have not proved to be as accurate as forecasts prepared by analysts or managers. Accordingly, this section only reviews literature regarding the comparative forecast accuracy of analyst and manager forecasts. Most of the empirical forecast accuracy research was performed because researchers did not know what source of earnings forecast would be more accurate. It is interesting to note, however, that individual researchers did believe that one source of forecasts should be more accurate. For example, each research article presented in the next section had a particular point of view. Base, Carey, and Twark (1976) asserted:

> Ideally, [emphasis added] one would expect corporations to forecast their earnings more accurately than outsiders even when outsiders are professional analysts (p. 244).

Ruland (1978, p. 440) presented arguments regarding why either an analyst or manager should be better able to forecast earnings more accurately. Jaggi (1980) noted that:

> Earlier research did not support the general expectation [emphasis added] that management forecasts would be superior to mechanical or analyst forecasts (p. 96).

Finally, Imhoff and Pare (1982) began by stating:

> [I]t is still not clear which forecasts are relatively more accurate . . ..Based upon the observed flow of forward-looking information in the financial community, no significant differences should be observed between managers' and analysts financial forecasts (p. 430).

Thus, most of the empirical research regarding forecast accuracy should be evaluated in the context that researchers were searching for empirical support regarding what source of forecasts was most accurate.

## A Comparison of the Relative Accuracy of Analyst Forecasts and Management Forecasts

Basi, Carey, and Twark. Beginning with Basi, Carey, and Twark (1976), this literature is interested in determining whether analyst

forecasts (AFs), which presumably are more objective, are more accurate than management forecasts (MFs), which potentially contain more firm specific information. Since investors are interested in prediction and the major sources of nonmechanical forecasts are analysts and managers, the accuracy of the AFs and MFs predictions is of great importance to investors.

Basi, Carey, and Twark compared the accuracy of MFs to AFs. In their study, all the MFs were issued subsequent to AFs, a design flaw corrected in subsequent research. The authors compared cumulative probability distributions of absolute errors (both in dollars and percentages) of MFs and AFs. Among other things, the authors concluded that:

1. Both analysts and management had a tendency to overestimate earnings per share (EPS), the analysts slightly more than the management. In every aggregate grouping, analysts estimated EPS higher than management.

2. Of twenty-six comparisons of cumulative absolute error probability for combinations of 1970/1971, utility/non-utility, and NYSE/AMEX, the management error distribution dominated the analyst error distribution eighteen times and eight times neither dominated. However, the dominance was statistically significant at the $p = .10$ level only four of twenty-six times.

3. Generally, both analysts and management were better predictors of NYSE company EPS than AMEX company EPS. Also, both groups better predicted utility versus nonutility company EPS.

Basi, Carey, and Twark believed that the reason they did not find more instances of the MFs distributions dominating the AFs distributions was due to small sample sizes.

Ruland. Ruland (1978) perceived methodological problems in the Basi, Carey, and Twark study. First, all of the AFs obtained were issued before the MFs. Ruland took AFs for two months on either side of the MFs and split them into before [AF(B)] and after [AF(A)] groups. The forecasts were of EPS made eight to fourteen months before actual.

Ruland compared each group of forecasts -- AFs(B), AFs(A), and MFs -- and found that MFs were more accurate than either AFs(B) or AFs(A) but that the differences were not statistically significant.

It is difficult to interpret Ruland's findings. If, on average, AFs(B) and AFs(A) were issued very close to the date of the MFs, Ruland's findings seem reasonable. In a competitive market for information, no forecast should be consistently more accurate. If, however, on average, AFs(B) and AFs(A) were not close to the MFs, either the MFs contained no new information, an unlikely occurrence, or both AFs(B) and AFs(A) were able to incorporate the information contained in the MFs. It seems unlikely that AFs issued several weeks before the MFs would anticipate all the information contained in the MFs. Likewise, it is unlikely that analyst forecasts issued several weeks after a MF would be based upon only the information available before the release of the MF.

Jaggi. Jaggi (1980) essentially replicated the Ruland (1978) study using AFs from the Value Line Investment Service rather than Standard & Poor's Earnings Forecaster. Also, Jaggi studied the impact of industry classification and firm size on forecast accuracy. Jaggi obtained 156 forecasts of primary EPS from The Wall Street Journal that were made at least eight months prior to year-end during the periods January-April, 1971-1974. Two tests of relative accuracy were conducted. First, MFs were compared to all AFs, both AFs(B) and AFs(A). Second, MFs were compared separately to AFs(B) and AFs(A). Absolute relative prediction errors were obtained for the four groups -- MFs, all AFs, AFs(B), and AFs(A). Wilcoxon Matched-Pairs Signed-Ranks Tests were used to compare forecast accuracy.

Jaggi concluded that MFs were more accurate than AFs(B) but not more accurate than AFs(A). Also, MFs were more accurate than AFs for

industries with high earnings volatility. However, the latter findings were based on pooled AFs that did not separate the AFs into before and after groups.

Jaggi's findings can be interpreted by analyzing the timing of the release of AFs and MFs. AFs(B) presumably contain an older data set than MFs. However, AFs(A) have the ability to update a general information set plus include the impact of the MFs. As the date of release of AFs(B) and AFs(A) approaches the date of the MFs, the data sets upon which each forecast was based should become more comparable. Unfortunately, Jaggi did not provide information to enable an analysis of this timing conjecture.

Imhoff and Pare. The research of Imhoff and Pare (1982) was based on the assertion that the question of whether MFs or AFs are more accurate has not been settled. The authors' basic hypothesis was that in a competitive market for information, where neither analysts nor managers possess superior information or processing ability, neither MFs nor AFs should be more accurate. The authors strived to eliminate any timing problem by obtaining AFs as close as possible to the release dates of the MFs. However, Imhoff and Pare did not separate the AFs into before and after groups. The authors found that neither MFs nor AFs were more accurate for either four or three quarter ahead forecasts and concluded that their hypothesis was confirmed.

Summary. Collectively, the empirical research reviewed above supports the finding that at any point in time, there is no significant difference in forecast accuracy between the most current MFs and AFs. Jaggi concludes that MFs are more accurate than AFs(B), while the Ruland and Basi, Carey, and Twark studies indicate there is no significant difference in forecast accuracy between MFs and AFs(B). The Ruland and Jaggi studies indicate that there is no significant difference in

forecast accuracy between MFs and AFs(A). The Imhoff and Pare study, attempting to eliminate any timing problem, indicates that there is no significant difference in forecast accuracy between AFs and MFs selected as closely as possible to the date of the MFs. The studies incorporate forecasts made both with and without first quarter actual results available. The data presented do not allow the conjecture to be tested that the results may be a function of the timing of the release of the forecasts. The results seem to imply that an individual who wanted to make the best possible estimate of EPS should be indifferent between a MF and an AF.

## Literature Concerning Source Credibility

The research summarized here primarily comes from the psychology literature. The psychology literature regarding source credibility generally utilizes experiments that are interpreted using analysis of variance (ANOVA). Also, information integration theory (Anderson, 1971, 1968), a descriptive theory, is used to motivate several of the studies.[6] Accounting literature dealing with source credibility is also reviewed.

### Psychology Literature

Birnbaum, Wong, and Wong. Birnbaum, Wong, and Wong (1976), replicated by Birnbaum and Stegner (1979), performed two experiments. One experiment investigated source attractiveness. The second experiment dealt with source credibility. The second experiment entailed a numerical prediction task where subjects were asked to predict the true value of a used car. Two sources of information about the value of the car were presented. One source was the blue book value, which was described as a standard fair price used in the

industry. As a second source, a friend of the buyer presented an estimate of the car's value. The degree of the friend's mechanical expertise (source expertise) was manipulated over three levels (high, medium, and low). The friend's numerical estimate was varied over five levels. The friend's source bias was held constant by describing the person as a friend of the buyer.

Birnbaum, Wong, and Wong found that subjects were affected by the degree of expertise of the source. The subjects' estimates of the used car's value were directly related to the degree of the expertise of the friend.[7] As the degree of source expertise increased, less weight was placed on the blue book value and more weight was placed on the source's estimate. These results are intuitively appealing. As the credibility of a source grows, less weight is placed on the information provided by other sources.

In the Birnbaum, Wong, and Wong numerical prediction study, it is not clear whether the experiment manipulated what the authors intended to manipulate. Since the authors described the friend as unbiased, they clearly intended to ignore the source objectivity component of source credibility and deal only with the source expertise component. Whether the subject would treat a friend's estimate as objective is questionable. Thus, the effects of source expertise and source objectivity were not clearly separated in the experiment. Also, the friends were described as having mechanical expertise. The correct manipulation should be of expertise relating to ability to determine the correct value of the car.

Birnbaum and Stegner. Birnbaum and Stegner (1979) performed three related numerical prediction experiments designed to investigate source expertise, source bias, and judge (the decision maker) bias. The experiments were similar to the Birnbaum, Wong, and Wong (1976)

experiment; however, Birnbaum and Stegner's experiments were much more comprehensive. In addition to providing two sources of value for a used car (blue book and a friend's estimate), the authors manipulated source bias, whether the friend was a friend of the buyer or seller of the car, and judge bias, whether the judge was instructed to supply the lowest selling price or the highest buying price.[8] As in the 1976 study, source expertise was manipulated by describing the friend as having high, medium, or low mechanical expertise.

Pertinent results of Birnbaum and Stegner's experiments were

1. The weight assigned to a source's estimate was dependent mostly on source expertise but also was dependent on source bias. The weight assigned to the blue book value was dependent on both the degree of source expertise and source bias.

2. The weight placed on a source's estimate was directly related to the degree of expertise of that source.

3. The weight placed on a source's estimate was inversely related to the expertise of a second source.

4. The weight placed on a biased source's estimate was directly related to the expertise of that source.

5. The weight placed on a biased source's estimate was inversely related to the expertise of a second source.

The results of Birnbaum and Stegner's experiments are intuitively appealing. However, as in the Birnbaum, Wong, and Wong (1976) study, source expertise seems to be incorrectly described. The ability of a source to judge the value of the car rather than the source's degree of mechanical expertise would be a more appropriate indication of source expertise.

Suber. Suber (1981) asked subjects to predict how well hypothetical students would perform on a final exam. Subjects were provided with four pieces of information -- IQ scores, study times, and the reliability of the IQ scores and study times. Of interest to this study are the manipulations of the reliability (credibility) of the IQ

scores and the study times. Each reliability indication was manipulated over three levels (high, medium, low). Subjects were informed by descriptive narrative passages of the degree of reliability. Suber found that as the reliability of a piece of information increased, the subject placed more weight on the information when forming a judgment. Also, as the reliability of either the IQ scores or study times increased, less weight was placed on the other piece of information.

Monaco. The results of research conducted by Monaco (1979) are reviewed by Harris (1981). Monaco provided subjects with two paragraphs about Grover Cleveland. The source credibility (history professor or freshman student) of the writer of the paragraphs was varied. Monaco found that subjects who had paragraphs written by the high expertise source (history professor) rated the author as having better organization and writing style. Also, subjects who were exposed to the high credibility source recalled more propositions discussed in the article.

## Accounting Literature

Little explicit research in accounting regarding the impact of source credibility on judgments of users of financial accounting information is available. The available accounting research is concerned with auditing judgments.

Gibbins. Gibbins (1976) conducted a study at Cornell University using sixty-eight student subjects enrolled in a second year MBA intermediate accounting course. The experimental context was a situation where a company (the selling company) was being purchased. Unaudited financial statements for the seller were presented. The subjects were presented information about the preparer of the financial

statements. The information identified the preparer's expertise as high, moderate, or low. Also, the preparer's degree of objectivity was manipulated by describing the preparer as impartial, from the seller's group, or from the buyer's group. Both the expertise and objectivity manipulations were significant variables.

In the second stage of his study, Gibbins changed his experiment slightly and repeated it in an effort to replicate its findings. He reported the results as experiments 2A and 2B. One major change in experiments 2A and 2B from experiment 1 was the addition of a fourth level of expertise. Subjects in experiments 2A and 2B were 269 accounting students at Cornell University. In both experiments 2A and 2B, the expertise and objectivity manipulations were highly significant.

Bamber. Bamber (1980), in a two stage accounting auditing study, reported the effects of various independent variables on subjects' perceptions (the dependent variable) of the reliability of a company's system of internal accounting control relating to accounts receivable. Of interest here are Bamber's manipulations of source reliability. Bamber's use of the term reliability was a way of describing a source's expertise.

In the first stage Bamber manipulated the reliability of the audit senior who was conducting the audit. Four levels of reliability were used. To indicate the level of reliability, a description of the audit senior's reliability was presented in the form of a consensus judgment of all the audit managers working for the CPA firm.

The four levels were presented as probabilistic assessments regarding the percent of time that a reviewer of the senior's work had found the work acceptable. The four levels presented were 70%, 80%, 90%, and 100%. However, to make the information more useful, Bamber

later in the experimental instrument attached qualitative descriptions to each probabilistic assessment. The four levels were described as 70%, fairly unreliable; 80%, fairly reliable; 90%, highly reliable; and 100%, completely reliable. Using analysis of variance (ANOVA), Bamber found that the level of reliability was a significant variable.

In the second stage, a specific description of the audit senior's reliability was not included. Instead, information that would allow a subject to infer the source's reliability was presented. That information, all qualitative in nature, included the experience of the senior (two levels, little and extensive); the senior's past performance rating (two levels, low and high); and the senior's sampling plan (two levels' statistical and judgmental). Bamber collected seven dependent variable measures. Four related dependent variables were subjected to multivariate analysis of variance (MANOVA). Both the senior's experience and past performance rating were significant variables. In separate ANOVAs on each of the seven dependent variables, the senior's experience was a significant variable three times; the senior's past performance rating was a significant variable all seven times; and the subject's choice of sampling plan was a significant variable one time.

Joyce and Biddle. Joyce and Biddle (1981) reported the results of three related auditing experiments (reported as 2A, 2B, and 2C) where the use of base rate information by practicing auditors was investigated. In each experiment each subject received information about a new company president. A brief personal description of the new president and descriptions of some of the president's policies were provided. In experiments 2A and 2B, the descriptions were designed to be representative of a manager involved in fraudulent activity. Descriptions used in experiment 2C were designed to be representative

of a manager who was not involved in fraudulent activity. Also, subjects were told that the description was selected from a population of ten profiles. Of the ten executives profiled, a certain base rate percentage (30% or 70%, manipulated by the authors) had been found to have been involved in fraudulent activity within the past year. Each subject was asked to provide a probability assessment that the president had been engaged in fraudulent activity.

Joyce and Biddle concluded that while holding constant certain information (a description of the executive and the executive's activities), subjects' probability assessments were affected by different base rates. In these experiments, two cues, personal descriptions (qualitative information) and base rates (quantitative information) about source credibility were provided. Thus, source credibility was found to be a significant variable in the experiments.

Summary. The source credibility studies reported in the psychology literature used student subjects while the studies reported in the accounting literature used practicing auditors. These studies regarding source credibility provide consistent results. As the credibility (expertise, reliability) of a piece of information increases, subjects place more weight on the information when forming judgments. Also, as the credibility of a piece of information increases, subjects place less weight on other pieces of information when forming judgments.

This characterization is similar to the implicit characterization that emerges in the accounting and finance literature of the potential investor as a person seeking the best information possible on which to base estimates of future earnings. The task considered in this proposal is estimating EPS. This proposal assumes that persons interested in predicting EPS are motivated to acquire the most informative estimates of EPS. McGuire's description indicates that for the task of estimating EPS, individuals should be affected more by the source's credibility than the source's attractiveness.

Recall that source credibility is subdivided into source expertise and source objectivity. McGuire defines source objectivity as the motivation to convey the truth. In the task at hand, source objectivity (bias) should not be an important variable. Even though a manager or financial analyst might be motivated to prepare a forecast that is less than veridical, a competitive market for information will act to keep managers or financial analysts from consistently preparing biased forecasts. Since source objectivity is assumed to be an unimportant variable for the task at hand, the source expertise component of source credibility is left as the variable that most probably should influence individuals' EPS estimates.

The research design used in this research (see Chapter III) explicitly manipulates the source variable component of communication. The other four variable components of communication discussed next in this section are not explicitly manipulated. The discussion is included as background information explaining McGuire's model so that the reader will understand what variables are not explicitly being controlled in this experimental design.

The message (the second communication variable). McGuire (1973, pp. 232-237; 1969, pp. 200-224) points out that more laboratory

research has been done on message factors than any other class of communication variables. Regarding the content of the message, research has studied the effect of the style of the message; whether the message appeals to the receiver's moral principles, emotions, or intellect; how the message treats rebuttal arguments; whether the message is more effective if it presents a conclusion or allows the receiver to draw a conclusion; and whether repetition in the message is effective. Regarding the organization of the message, research has studied the order of presentation of information and whether the communication should appear before or after rebuttal arguments.

The message communicated in this research is an earnings forecast (Appendix A contains the experimental instrument). The message is simple, is designed to appeal to the receiver's intellect, and contains no rebuttal arguments or additional reasons (messages) as to why the message should be believed. The message is a realistic replication of a real-world type of communication. In this experiment, the level of the message is not manipulated.

The channel (the third communication variable). Channel factors (McGuire, 1973, p. 237; 1969, pp. 224-235) also have been studied extensively. Researchers have examined whether persuasion is facilitated more by direct contact with an object or by communication about an object, and whether written or spoken communication is more effective. Also, researchers have studied the effectiveness of mass media and the relative effectiveness of various media. The channel used in this research is The Wall Street Journal, probably the most influential and frequently used source of business information. Most empirical studies regarding the relative accuracy of analyst and management earnings forecasts (discussed later in this chapter) have used publication in The Wall Street Journal as the date and place that information becomes

publicly available. The subjects used in this research scour The Wall Street Journal daily in search of information.

The receiver (the fourth communication variable). Among receiver variables that have been researched (McGuire, 1973, pp. 237-241; 1969, pp. 235-247), two stand out. First, how certain individual differences among subjects correlate with pursuasibility has been studied. Those individual differences regard demographic characteristics, such as age and sex; ability levels, such as intelligence and mental health; and personality characteristics. Second, research has been conducted regarding the effect that a receiver's initial opposition to the position being urged in the message has on persuasibility.

In this research, the receivers (subjects) are sophisticated security analysts who work in bank trust departments. The subjects routinely work with the type of message and channel used in this study.

The destination (the fifth communication variable). Finally, McGuire (1973, pp. 241-244) discusses destination variables that deal with both the target (receiver) at which the communication is directed and the type of response urged. McGuire cites two examples of destination factors. First, the temporal effects of persuasive communication are discussed. Second, the effects of immunizing the recipient of communication against persuasion are discussed. Immunization can be induced, for example, by forcing the subject publicly to take a position before the communication is transmitted. Also, conditioned avoidance and/or changing a subject's personality can be used to achieve immunization.

The studies described in this section deal with the manipulation of source credibility only. The next sections report the findings of literature that deal with the effect of two communication variables, the source variable and the message variable.

## Source Credibility and Message Content

McGuire (1973, 1969) identified five independent communication variables. The Birnbaum, Wong, and Wong (1976) and Birnbaum and Stegner (1979) studies dealt only with source variables. However, some work has dealt with the impact of both source and message variables. These studies have attempted to unravel the impact of both the source and the message on persuasion.

Maddux and Rogers. Maddux and Rogers (1980) conducted an impression formation experiment and examined the relationships between two source variables (source expertise and source physical attractiveness) and one message variable on persuasion. The authors cited two theories that would hypothesize different results.[9] The experiment manipulated source expertise (expert or nonexpert), source physical attractiveness (attractive or unattractive), and supporting argumentation (presence or absence of objective data) using an immediate delayed posttest design. Subjects were told they were participating in a study to determine how accurately people are able to assess the personality characteristics of another person, given a limited amount of information. Subjects were given a folder containing a picture of, a description of, and an opinion by a person. Also, some subjects were provided with supporting argumentation for the person's opinion. After reviewing the materials, each subject completed a questionnaire that elicited opinions about the person. The authors concluded:

> Source expertise did not interact with the supporting argumentation variable . . . the effectiveness of an expert is not predicated on providing supporting arguments (p. 241).
>
> Physical attraction had no main or interaction effects (p. 235).

At first, the results of Maddux and Rogers might seem counterintuitive. It is reasonable to assume that message and source variables should interact in an impression formation task. However, Maddux and Rogers did not manipulate the quality of argumentation; they manipulated the presence or absence of high quality argumentation. Petty, Goldman, and Cacioppo (1981) addressed the issue of the impact of varying the quality of argumentation.

Petty, Goldman, and Cacioppo. Petty, Goldman, and Cacioppo (1981) hypothesized that there are two routes to persuasion. A central route stresses message factors. A peripheral route stresses source factors. The authors noted that evidence supporting both routes has been provided in the psychology literature. The authors designed an experiment that manipulated source expertise (high or low) and quality of argumentation (strong, represented by objective data, and weak, represented by subjective statements). Petty et al. wanted to discover when the central route to persuasion would be used and when the peripheral route would be used. They hypothesized that one moderating variable would be the subject's personal involvement with the task:

> under conditions of high personal involvement, persuasion would be more affected by the quality of message arguments employed but that under low-involvement conditions, persuasion would be tied more strongly to the expertise of the source (p. 849).

Personal involvement with the task (high or low) was manipulated by requiring a judgment that would affect the subjects personally within one year (high) or in ten years (low). Petty et al.'s hypothesis was confirmed:

> A source of high expertise produced significantly more agreement than a source of low expertise "only" under low-involvement conditions . . . [and] strong arguments produced significantly more agreement than the weak "only" under the high-involvement conditions (p. 851).

Danos and Imhoff. Danos and Imhoff (1982) conducted an experiment where auditors were asked to make judgments regarding the degree of reasonableness of client forecasted income statements. The authors manipulated five variables that practicing auditors had indicated should be important in judgments regarding the reasonableness of forecasted income statement data. In terms used previously, three of the variables were source variables,[10] one variable was a message variable, and one variable was the forecasted increase in net income over the prior year's net income. Danos and Imhoff found each of the five variables to be significant. The source variables were ranked as the first, second, and fifth most important. Also, the authors did report one significant interaction between one source and the message variable.

## Source Credibility and Message Relevance

Beach, Mitchell, Deaton, and Prothero. Beach, Mitchell, Deaton, and Prothero (1978) conducted an experiment that contained a numerical prediction and an impression formation task. The authors manipulated source credibility (the percent of times historically a source had been correct) and relevance of the message (adjectives were used to achieve a high, medium, or low relevance). Note that Beach et al.'s use of source credibility is different than that used in the other studies described in this section. The authors really were manipulating the reliability of the source data, not the credibility of the source. Reliability is a quantitative rather than qualitative way of attacking

the problem of source expertise assuming that McGuire's definition of expertise, the knowledge of the truth, is used.

The results of the numerical prediction experiment were that the main effects of credibility and relevance were significant. Also, the interaction of credibility and relevance was significant. This means that as source credibility or message relevance increased, the subject's predictions increased. Also, the subject's judgment was affected by both source credibility and message relevance.

In a second experiment, source credibility was manipulated (high or low) based upon descriptions of the source. The subjects were given information and asked to make a judgment. Then the subjects were given an expert's opinion and asked to make a revised judgment. Beach et al. hypothesized and found that as the source's credibility increased, the subjects placed more weight on the information in revising their estimates. Based on both experiments, Beach et al. concluded:

> the use of information in opinion revision is heavily influenced by relevance of the information and by the credibility of the source (p. 14).

## Summary

This chapter reviews accounting, finance, and psychology literature that is both theoretical and empirical. Accounting and finance researchers posit that users of earnings forecast information generally should believe that either an analyst or management forecast is more accurate. Many researchers posit that users should believe that the management forecast is more accurate. However, empirical accounting and finance literature reports no statistically significant difference in the comparative forecast accuracy of analyst and management earnings forecasts. Theoretical social psychology literature posits that the source of communication should be an

important variable to receivers of communication. Empirical psychology and accounting literature has reported consistently that source credibility (one aspect of a source of communication) and source expertise (a subcomponent of source credibility) have been found to be significant variables in behavioral research. Other research has shown that, in addition to being a significant variable by itself, source credibility sometimes interacts with other communication variables.

The purpose of this research was twofold. First, the research was designed to investigate whether subjects' estimates were affected differently by two sources (analyst or management) of earnings forecasts. This question was motivated by the theoretical and empirical accounting and finance literature. Second, the research was designed to investigate whether source expertise affected subjects' estimates. This question was motivated by social psychology literature. How the two questions were incorporated into a research design and experimental instrument is discussed in Chapter III.

## CHAPTER II ENDNOTES

1. A more detailed review of the accounting and finance literature on which this section is based is found in Hassell (1982). Revsine (1973), Staubus (1977), and Foster (1978) are major sources of the ideas that this section describes.

2. McGuire's (1973, 1969) reviews of attitude and attitude change literature provide the basis for most of this section. For additional literature reviews, see Eagly and Himmelfarb (1978) and Cialdini, Petty, and Cacioppo (1981).

3. McGuire (1969) used an additional source variable, source power. Birnbaum and Stegner (1979) discuss another potential component, the judge's (receiver's) bias in filtering information provided by credible sources.

4. Many times, source objectivity is referred to as source bias. This is especially true of Birnbaum (1976) and Birnbaum et al. (1979, 1976).

5. McGuire (1969) used the additional source attractiveness variable of source familiarity.

6. Information integration theory, a descriptive theory, seeks to determine what mathematical model best describes how subjects combine multiple information cues to form judgments. The psychology literature reviewed in this section generally seeks to test empirically several different mathematical models.

7. Further, the authors reported that the relative-weight information integration model best described the results of the experiment. A relative-weight model posits that the weight assigned to one source is inversely related to both the number of other sources and the weights assigned to other sources.

8. Birnbaum and Stegner's experiments were: (a)Experiment 1. A (3 x 3 x 5) [Bias x Expertise x Estimate] design was used. Bias was represented by describing the source as a friend of the buyer, friend of the seller, or independent. Expertise was described as high, medium, or low mechanical expertise. Five levels of the source's estimate were used. (b)Experiment 2. A (3 x 3 x 5) x 4 [(Bias x Expertise x Estimate) x Blue Book Value] design was used. Four blue book values were used in addition to the information used in Experiment 1. (c)Experiment 3. A [(2 x 2 x 2) x (2 x 2 x 2)] (Bias x Expertise x Estimate) design for two different sources was combined. Bias was manipulated as friend of buyer or seller. Expertise was high or low. Two levels of estimate were used.

9. Reinforcement theory holds "individuals are motivated to accept conclusions that will lead to reward or will be validated by experience" (p. 237). If reinforcement theory holds, the authors hypothesized "experts should produce greater agreement with the advocated position . . . regardless of whether the sources provide supporting argumentation" (p. 237). A second theory, functional theory, would hypothesize that the effect of source expertise would be mediated by the presence of argumentation.

10. Each source variable detailed some aspect of management's past track record in forecasting accuracy. The degree of previous forecast accuracy is a quantitative way of conveying source expertise.

# CHAPTER III

## THE EXPERIMENT AND RESEARCH METHODOLOGY

This chapter discusses the experiment administered in this study, the experimental environment, and the experimental research methodology. Regarding the experiment and experimental environment, the following topics are covered:

General Research Questions

The Task

The Subjects

The Pilot Study

Administration of the Experiment

The Experiment

Hypotheses

Regarding the experimental research methodology, the following topics are covered:

General Discussion of Scientific Research

Review of McGuire's Communication/Persuasion Model

The Research Design

Internal and External Validity

### General Research Questions

Two general research questions are of interest in this study. Each question is motivated by, and anticipated results are supported

by, different bodies of literature (see Chapter II for the literature reviews). Specific, testable hypotheses are presented later in this chapter.

Question one primarily is motivated by theoretical and empirical accounting and finance literature regarding earnings forecasts. The findings of the literature seem to be conflicting. Theoretical support exists for the widely held belief that individuals might react differently to analyst and management earnings forecasts. However, empirical literature concerning the comparative accuracy of analyst and management forecasts finds no difference in relative forecast accuracy. If obtaining the most accurate earnings forecast available is the goal of an individual, the empirical results imply that, in general, an individual should be indifferent between analyst and management earnings forecasts.

Question One - Are individuals who prepare estimates of EPS influenced by the sources of earnings forecasts?

The second question is motivated by theoretical and empirical literature regarding source credibility. For the task of predicting EPS used in this study, the source's degree of expertise should be a significant, influential variable.

Question Two - Are individuals who prepare estimates of EPS influenced by the degree of expertise of the sources of earnings forecasts?

## The Task

In this study the task was to predict EPS for a hypothetical company for the upcoming year. The subjects estimated EPS after being exposed to certain information. The task is one with which the subjects (see the next section) are highly familiar. A major part of

each subject's job is to analyze a large amount of data and predict company earnings. A prediction of EPS has been shown to be an influential variable in investors' decision models. In many investors' decision models, an EPS prediction is the most important variable.

## The Subjects

Most of the theoretical literature (see Chapter II) regarding the importance of earnings forecasts takes the perspective of an equity investor. In order to conduct behavioral research with investors, a group of representative investors must be selected. It is extremely difficult to find a group that has as its basis for existence the fact that all members are investors and whose members will agree to participate in behavioral research.

Therefore, some surrogate for or subset of investors is appropriate for behavioral research. The subjects selected for this study were security analysts in trust departments of five major banks located in the midwest and northeast. Bank security analysts are integral to a trust department's investment process. They are the primary seekers and processors of information on which investment decisions are based.

The job of a security analyst is to follow and become expert in certain industries. For the industries in which the security analyst specializes, the analyst provides specific recommendations about which stocks should be bought, sold, or continued as part of the bank's investment portfolio. Generally, a security analyst periodically completes a highly detailed analysis of firms that the analyst follows. Between in depth analyses, the security analyst closely monitors the performance of firms in the analyst's industries of interest. Data for

monitoring performance comes from a wide variety of sources such as the financial press, principally The Wall Street Journal, communications with management, reports from brokerage houses, publicly available financial reports, etc.

The banks that participated in this study are large enough to have several security analysts in their trust departments. A newly hired security analyst usually possesses a degree in finance and probably has an MBA. Major banks encourage their security analysts to be active professionally and to pursue certification as certified financial analysts (CFAs). Employees are hired from schools with reputations for producing high quality graduates. Security analyst jobs are highly sought after and prized by undergraduate and MBA students. Thus, security analysts at major banks are highly trained, motivated, and competent individuals. Exhibit 1 presents more information about the subjects who participated in this study.

## The Pilot Studies

Two pilot studies were conducted using MBA students at Indiana University as subjects. The results of the pilot studies are reported and discussed in Appendix B. Because of the difficulty in securing an appropriate number of security analyst subjects, the experiment was not pilot tested with bank security analysts. However, key contact security analysts at each participating bank did review and critique the experimental instrument before and after the pilot studies were conducted.

The MBA students used in the pilot studies were deemed appropriate because they possess educational backgrounds similar to that of newly hired security analysts. Specifically, the subjects of the pilot

Exhibit 1

Descriptive Statistics Regarding Participating Subjects and Banks

| | Banks | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| SUBJECTS: | | | | | | |
| Number Participating | | | | | | |
| Classified By | | | | | | |
| (1) Responses | | | | | | |
| Usable | 14 | 8 | 10 | 2 | 3 | 37 |
| Unusable | 0 | 1 | 1 | 1 | 1 | 4 |
| Total | 14 | 9 | 11 | 3 | 4 | 41 |
| (2) Sex | | | | | | |
| Male | 12 | 8 | 7 | 1 | 2 | 30 |
| Female | 2 | 0 | 3 | 1 | 1 | 7 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |
| (3) Age | | | | | | |
| 20-24 | 3 | 1 | 1 | 0 | 0 | 5 |
| 25-29 | 4 | 2 | 5 | 1 | 1 | 13 |
| 30-34 | 5 | 2 | 1 | 0 | 1 | 9 |
| 35-39 | 2 | 3 | 1 | 1 | 1 | 8 |
| 40-44 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45-49 | 0 | 0 | 1 | 0 | 0 | 1 |
| 50-54 | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |
| Mean: | 28.3 | 31.3 | 33.2 | 31.5 | 30.7 | 30.6 |
| Range: | | | | | | 21-53 |
| (4) Years/Work Experience | | | | | | |
| Less than 1 | 2 | 1 | 1 | 0 | 0 | 4 |
| 1 to less than 2 | 2 | 0 | 4 | 0 | 0 | 6 |
| 2 to less than 3 | 4 | 1 | 1 | 0 | 1 | 7 |
| 3 to less than 4 | 0 | 1 | 1 | 0 | 1 | 3 |
| 4 to less than 5 | 2 | 0 | 0 | 0 | 0 | 2 |
| 5 to less than 6 | 1 | 2 | 0 | 0 | 1 | 4 |
| 6 to less than 7 | 2 | 1 | 0 | 1 | 0 | 4 |
| 7 to less than 8 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8 to less than 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 to less than 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| Greater than 10 | 0 | 2 | 2 | 1 | 0 | 5 |
| Greater than 20 | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |
| Mean: | 3.1 | 5.4 | 6.6 | 8 | 2.5 | 4.7 |
| Range: | | | | | | .08-25 |

studies were MBA students enrolled in a second year investments class at Indiana University. Among the topics covered in the investments class were institutional background, capital market theory, security analysis, industry analysis, portfolio theory and analysis, investment vehicles (stocks, bonds, options, warrants, futures, etc.) and investment strategy. Most of the participating subjects had prior work experience and many desired careers as financial analysts in brokerage firms or corporate environments such as banking. Many MBA students also take the investments class to further prepare for their future individual investing needs.

## Administration of the Experiment

Subjects who participated in this research volunteered to participate; however, they were not contacted directly by the researcher. Rather, key contact security analysts were approached at five major banks that are interested in Indiana University and recruit Indiana University graduates. With each of these key contact persons, the research design and research instrument were discussed. The contact persons volunteered to distribute the research instrument to their colleagues and then to collect and mail the completed instruments back to the researcher. In effect, the contact persons encouraged their colleagues to participate in the study. This encouragement brought about much higher response rates than would normally be expected. The comments of the contact persons during the research process were valuable in preparing the pilot instruments and the final research instrument. None of the contact persons participated in the study or discussed the study with their colleagues before the research was completed.

The administration of the experiment proceeded as follows:

1. The research instruments were prepared by the researcher and an appropriate number were mailed to each contact person at each participating bank. The first two pages of the instrument were paper clipped to the outside of an 8 1/2 x 11 envelope. The remaining four pages were inserted inside that envelope (see Appendix A for a copy of the experimental instrument). Pages one and two contained background information and required the subject to produce an estimate of EPS (the dependent variable). Pages three through six contained manipulation checks and other background questions.
2. Contact security analysts received the instruments and distributed them to appropriate colleagues in their departments. The contact analysts attached a short note asking their colleagues to return the instrument when it was completed. If the instrument was not returned in a few days, the contact person reminded each security analyst to return the instrument. If a security analyst did not respond promptly to the second communication from the contact analyst, the security analyst was classified as a nonresponse. In some cases, the contact security analysts held back instruments for colleagues who were on vacation. Upon returning, the security analysts received the instrument.
3. After completing the experiment, each subject placed the instrument in the 8 1/2 x 11 envelope and sealed the envelope. The contact security analyst collected all the responses and mailed them to the researcher.

## The Experiment

A copy of the experimental instrument is contained in Appendix A. The experiment asked security analysts to predict ten months in advance based on certain limited information the annual EPS for a hypothetical company. Certain information (nonmanipulated) was standard across all groups and certain information (manipulated) was systematically varied across groups. The purpose of the experiment was to determine whether groups of subjects who were exposed to specific treatments (manipulated information) reported different EPS estimates.

### The Nonmanipulated Information

Three major nonmanipulated pieces of information were presented in the experiment. First, a statement about the subject's hypothetical prior EPS estimate was presented. Second, a new earnings forecast was presented. The third piece of information was the channel, The Wall Street Journal, where the hypothetical earnings forecast was reported. The reasons for including each piece of information are discussed in the remainder of this section.

Information about subjects' prior EPS estimates. The two variables manipulated in this study were the source of the earnings forecast and the degree of expertise of the source. In order to determine whether the manipulated variables affected subjects' responses, the position of the subjects prior to exposure to the information must be known. For this study, one possible way to have created prior EPS estimates would have been to let the subjects calculate their prior EPS estimates based on the information they normally use. However, as Appendix C shows, security analysts have wide ranging requests for information when they estimate EPS. To have given the subjects all the information they

requested to produce EPS would have necessitated designing an experiment that took a long time to complete. When discussing the experimental design with contact security analysts, the contacts stressed the need to keep the experiment short so as to ensure that their busy colleagues would be more likely to participate.

Therefore, instead of asking subjects to compute their prior EPS estimates, the subjects were given their prior estimates as part of the nonmanipulated data. The process of asking subjects to assume certain information, attitudes, or prior positions is common in behavioral research. In this research, subjects were told that one month ago they had completed an in-depth analysis of American Industries. Based upon the analysis they normally performed, they estimated that American Industries' fiscal annual EPS would range between $2.75 - $3.05, centering on $2.90. The process of estimating an EPS range and then a best point estimate is consistent with the process actually used by security analysts when analyzing companies.

The Earnings Forecast. To investigate the effect of a source of an earnings forecast, it is necessary that the source provide an earnings forecast. Also, in order for the forecast to be treated as significant new information by a subject, the forecast must be substantially different from prior EPS estimates. The new earnings forecast provided in this research was $3.75, a 29.3% increase over the subjects' $2.90 prior EPS estimate. The use of an approximately 30% increase was supported by previous literature[1] and by the results of the pilot studies (see Appendix B). It should also be noted that the subjects themselves (see Chapter IV) reported that they would expect approximately a plus or minus 18% error in EPS to be normal for the sources of information used in this study. Thus, a change of

approximately 30% was deemed an appropriate level to be considered new information by the subjects.

The channel through which the earnings forecast is delivered. The final piece of significant nonmanipulated background information was the channel through which the earnings forecast was delivered. The channel used in this study was The Wall Street Journal. Subjects were given a hypothetical excerpt from a Wall Street Journal article that contained an earnings forecast.

The Wall Street Journal is the cornerstone of the financial press in the U.S. Empirical accounting and finance studies (e.g., Jaggi, 1980) commonly consider an event to be publicly available when it is published in The Wall Street Journal. Publication in The Wall Street Journal is relevant for this research. Contact security analysts at each bank participating in this research noted that security analysts commonly begin their work days by scanning The Wall Street Journal for financial information. Financial analyst and management earnings forecasts are routinely published in The Wall Street Journal. Thus, the use of The Wall Street Journal to convey an earnings forecast to the subjects was consistent with the subjects' normal work patterns.

## The Manipulated Information

Two variables (treatments) of interest were manipulated in this experiment. First, the source of the earnings forecast (financial analyst or manager) was manipulated. This variable was investigated to determine whether subjects' estimates were affected more by one source than the other source. The second manipulated variable was the degree of expertise of the source of the forecast. This variable was investigated to determine if the general findings regarding source

credibility reported in the social psychology literature (see Chapter II) held in a task important to investors.

The source of the forecast. Theoretical accounting and finance literature supports the widely accepted notion that one of two sources, either a financial analyst or company manager, should be able to produce earnings forecasts that prove to be more accurate than the forecasts of the other source. Whether, a priori, the financial analyst or management forecast is considered to be more accurate depends upon the beliefs of a particular individual. Conversely, empirical accounting and finance literature suggests that there is no statistical difference in the relative accuracy of analyst and management earnings forecasts. If investors desire the most accurate available earnings forecast for their decision models, empirical literature suggests that they should be indifferent between two competing sources who have proved to be of the same relative accuracy.

Theoretical and empirical psychology literature is replete with the notion that the source of information can be a significant variable in determining whether and how an individual processes information. Empirical psychology literature consistently has found that the source of information does make a difference to information recipients.

The primary purpose of this research is to determine whether sophisticated information processors, bank security analysts, prefer one source of earnings forecast over another source. The results provide empirical evidence usable to interpret existing theoretical and empirical accounting, finance and social psychology literature.

The degree of expertise of the source. Social psychology literature (see Chapter II) indicates that the source of information may have an impact on the degree of persuasiveness of information. The

degree of persuasiveness of information supplied by two competing sources theoretically depends upon the relative credibility of the sources and the relative attractiveness of the sources. For a task such as predicting EPS, the credibility of a source should be much more important to an investor than the attractiveness of a source. Source credibility has two components, source expertise and source objectivity. For a task such as predicting EPS, source expertise should be the most important component. Therefore, the degree of expertise of the source was manipulated in this research while source objectivity and source attractiveness were not manipulated.

Source objectivity was not manipulated for two reasons. First, for a task such as predicting EPS, market forces should ensure that both sources have approximately the same amount of objectivity. Second, a between subjects design was chosen for this experiment. Adding another manipulated variable such as source objectivity would have required doubling the sample size unless a partial factorial design were used. Securing an appropriate number of subjects was one of the major constraints on this research; adding another variable was not feasible.

Literature regarding source expertise has used two different methods of conveying the concept of source expertise. Most frequently, qualitative information has been ascribed to a source to indicate the source's expertise. However, quantitative information can also be used to indicate a source's expertise. Examples of qualitative information would be the level of education, length and type of work experience, and professional credentials of the source. An example of quantitative information would be the source's track record in predicting variables of interest.

For the experimental environment of this study, the use of qualitative information was deemed more appropriate because qualitative information about the source normally is more available than quantitative information. In general, it is easier for a security analyst to find information such as a source's job title, educational background, work experience, etc. than it is to determine the source's track record in predicting earnings. Undoubtedly, knowing a source's track record would be valuable information, but that kind of information is not available publicly. Some individuals or firms may keep track records for selected security analysts; however, that information would be highly confidential and probably would be kept only for a small number of analysts.

Accordingly, qualitative information was used in this study to indicate source expertise. The specific items of information presented were the source's level of education (MBA, undergraduate, or no indication), length of work experience (10 years, 13 months, or no indication), and job title (high corporate official, low corporate official, or no indication). These items are consistent with information used in previous source credibility studies. An additional piece of information, professional certification, was discarded after a pilot study (see Appendix B).

## Hypotheses

The research design of this study is discussed more extensively later in the chapter (see Research Methodology). However, before the specific hypotheses that were tested in this study can be stated, a brief overview of the research design is appropriate. Exhibit 2 presents the general research design.

The specific testable hypotheses for this study can be better understood by referring to Exhibit 2.

H(1) There is no difference in the mean earnings estimates of subjects who were given financial analyst earnings forecasts and those subjects who were given management earnings forecasts. [Y(11) + Y(12) + Y(13) = Y(21) + Y(22) + Y(23)]

H(2) There is no difference in the mean earnings estimates of subjects who were given earnings forecasts accompanied by descriptions of the source as having high, low, or no indication of expertise. [Y(11) + Y(21) = Y(12) + Y(22) = Y(13) + Y(23)]

## Research Methodology

This section discusses four different topics that relate to research methodology. The four topics are:

General Discussion of Scientific Research

Review of McGuire's Communication/Persuasion Model

The Research Design

Internal and External Validity

### General Discussion of Scientific Research

Much of the background for this section comes from Campbell and Stanley (1963), Isaac and Michael (1971), Kerlinger (1973), and Stone (1978). Kerlinger (1973) defines scientific research:

> Scientific research is systematic, controlled, empirical, and critical investigation of hypothetical propositions about presumed relationships among natural phenomena (p. 11).

After reviewing several definitions of scientific research, Stone notes:

> The common thread that appears to bind all these definitions together is that scientific "research is the investigation of phenomena via practices consistent with the method of science" (p. 12).

Exhibit 2

General Research Design

| Source | Degree of Expertise | | |
|---|---|---|---|
| | High | Low | No Indication |
| Financial Analyst | Y(11) | Y(12) | Y(13) |
| Manager | Y(21) | Y(22) | Y(23) |

where Y(ij) represents the mean earnings forecast (dependent variable) of the group.

Stone identifies the method of science as a "way of knowing" (p. 10). Stone also identifies the three major objectives of science and scientific research as description, explanation, and prediction (p. 11).

Isaac and Michael (1971) list nine basic methods of research (p. 14):

Historical
Descriptive
Developmental
Case and Field
Correlational
Causal-comparative or "ex post facto"
True Experimental
Quasi-experimental
Action

Other authors writing about research design use different categories of design. For example, Stone classifies research designs as true experimental, quasi-experimental, and nonexperimental designs. Campbell and Stanley (1963) classify designs as pre-experimental, true experimental, quasi-experimental, and correlational and ex post facto designs. Regarding behavioral research, Kerlinger (1973) classifies research as laboratory experiments, field experiments, field studies, and survey research.

In experimental design, each author identified above emphasizes the need for control. Control is exercised by the researcher when deciding what variables should be manipulated and what variables should not be manipulated. Also, the researcher controls the environment in which the research is conducted. True experiments, usually conducted in a laboratory, control more of the environment than quasi-experiments. In turn, quasi-experiments control more of the environment than nonexperiments. The specific research design of this study is discussed later in this chapter.

Based on Dewey's (1933) work, Kerlinger (1973) discusses the general paradigm of the scientific approach (pp. 11-15):

Problem-Obstacle-Idea
Hypotheses
Reasoning-Deduction
Observation-Test-Experiment

This paradigm will be used next as the basis for discussing how this study meets the criteria of good research. Specifics about the research design are discussed elsewhere in this chapter.

Problem. Kerlinger (1973) notes that there are three criteria of good problem statements. The statements should express a relation between two or more variables, should be stated clearly and unambiguously in question form, and should be able to imply possibilities for empirical testing (pp. 17-18). The general research question for this study evolved into two specific questions that meet Kerlinger's criteria:

> Will individual subjects, when asked to predict EPS, be influenced in different degrees by alternative sources of earnings forecasts?
>
> Will individual subjects, when asked to predict EPS, be influenced in different degrees by the degree of expertise of a source of an earnings forecast?

Hypotheses. After a problem is identified, specific, testable hypotheses should be generated. Kerlinger (1973) notes that a hypothesis "always in declarative sentence form . . . is a conjectural statement of the relation between two or more variables" (p. 18). Two criteria for a good hypothesis are that a hypothesis is a statement about relations between variables and that the hypothesis carries clear implications for testing the stated relations. The hypotheses of this study (also discussed in this chapter) are:

> H(1) There is no difference in the mean earnings estimates of subjects who were given financial analyst earnings forecasts and those subjects who were given management earnings forecasts.

H(2) There is no difference in the mean earnings estimates of subjects who were given earnings forecasts accompanied by descriptions of the source as having high, low, or no indication of expertise.

The conjectural statement in these hypotheses is that there is no difference. The variables in these hypotheses were the subjects estimates (dependent variable), the presence of information identifying the source (treatment 1), and the presence of information about the degree of expertise of the source (treatment 2).

Reasoning-Deduction. The reasoning-deduction process, as described by Kerlinger (1973, pp. 12-13), occurs in the evolution of a research study. Tentative problem statements are modified and refined in an ongoing effort to generate the final hypotheses and experimental instrument. The hypotheses of this study did indeed evolve as they were subjected to the reasoning-deduction phase.

Observation-test-experiment. Chapter IV presents an analysis of the results of the experiment and the statistical analysis of the hypotheses tests.

## A Review of McGuire's Communication/Persuasion Model

Research ultimately should be based on some theoretical model. A theory becomes accepted because it describes real world phenomena and it repeatedly survives research designed to reject the theory. A theory remains credible only as long as it continues to meet the two tests of descriptive validity and surviving empirical testing. The design of this study is based on McGuire's communication/persuasion theory, a formal theory espoused in the social psychology literature (see Chapter II). Specific, testable hypotheses are formulated to

determine whether the results of the experiment are consistent with the communication/persuasion model.

McGuire's model posits that the source of communication (information) is a significant, influential variable in determining the degree to which a recipient is persuaded by the information. As a general variable, the source can be broken down into components (Figure 3 in Chapter II shows the component variables). The influence of the source is determined by the source's credibility and the source's attractiveness. The source credibility and source attractiveness variables can be further subdivided: source credibility into source expertise and source objectivity; source attractiveness into source likableness and the perceived similarity of the source to the information recipient.

For a task such as the one used in this experiment, prior research indicates that the subject should be influenced primarily by the source's credibility rather than the source's attractiveness. Also, the subject should be mostly influenced by the source's expertise rather than the source's objectivity. The research design of this study explicitly manipulated the source and the degree of expertise of the source and did not manipulate source objectivity, source likableness, or source perceived similarity.

## The Research Design

This study used a quasi-experimental (field study) design.[2] Subject to two major constraints (availability of subjects and length of the experiment), the research design of this study was appropriate to test McGuire's communication/persuasion model. A quasi-experimental design rather than a true experimental design was used for a variety of

reasons. The primary reason was that a sufficient number of subjects could not be brought into a laboratory setting. Research using security analysts could only have been conducted in a field setting. Also, the experimental task, estimating EPS, was a task routinely performed by the subjects in their natural environment. Asking the subjects to perform the task in the field was consistent with their normal routines.

Exhibit 3 [consistent with Campbell and Stanley's (1963) notation] shows that subjects were exposed to two treatments. Control groups may or may not be included in factorial designs. In this study, a control group was provided for the second treatment (source expertise) but it was not feasible to provide a control group for the first treatment (the source). Exhibit 3 denotes the use of a control group by using an asterisk, which indicates that the subject was not exposed to the treatment.

## Internal vs. External Validity

Isaac and Michael (1971) comment on internal and external validity:

> "Internal validity" asks the question: did, in fact, the experimental treatment make a difference "in this specific instance?"
>
> "External validity" asks the question: to what population settings, treatment variables, and measurement variables can this effect be "generalized" (p. 31)?

The following sections discuss how this study met the tests of internal and external validity.

### Internal validity.

Isaac and Michael (1971) note:

> When checking the internal validity of his design, an experimenter asks: Did the independent variable X really produce a change in the dependent variable [Y]? Before claiming that it did, he must make certain that some of

Exhibit 3

General Experimental Design

| | | | |
|---|---|---|---|
| R | X(1a) | X(2a) | 0(1) |
| R | X(1a) | X(2b) | 0(2) |
| R | X(1a) | * | 0(3) |
| R | X(1b) | X(2a) | 0(4) |
| R | X(1b) | X(2b) | 0(5) |
| R | X(1b) | * | 0(6) |

where

| | |
|---|---|
| R | denotes randomization |
| X(1a & 1b) | indicate exposure to two levels of the first (source) treatment |
| X(2a & 2b) | indicate exposure to two levels of the second (degree of expertise) treatment |
| 0(1-6) | denotes group membership |
| * | indicates that the subject was not exposed to the treatment (a no indication group); this is the third level of the second treatment |

Notation is consistent with Campbell and Stanley (1963).

> the extraneous variables [listed below] have not produced an effect that can be mistaken for the effect of X.
>
> 1. Contemporary history
> 2. Maturation processes
> 3. Pretesting procedures
> 4. Measuring instruments
> 5. Statistical regression
> 6. Differential selection of subjects
> 7. Differential experimental mortality
> 8. Interaction of 1-7 (pp. 32-33)

The problem of contemporary history can never be totally controlled even though a laboratory experiment where all subjects complete the tasks at one time is the best possible alternative. The problem of contemporary history is that subjects may experience an event other than exposure to the independent variable that affects their dependent variable answers. In this study, contact security analysts distributed and collected the experimental instruments. Given vacation and work schedules, the contacts distributed the instruments when they thought the maximum number of subjects would be secured. The coordination with contact security analysts occurred over several months. It was not possible to have each participating bank administer the instrument during exactly the same time. Exhibit 4 shows the dates during which subjects at each participating bank completed the experiment.

Complete knowledge of the subjects' personal and professional lives is lacking. To the extent that contemporary history affected subjects' responses, the interpretation of this experiment's results is compromised. However, the task in this study was one with which the subjects were intimately familiar. Since the company used in the experiment was a hypothetical company, no change in economic factors or stock market reaction (which was fairly stable over the period during

Exhibit 4

1983 Dates During Which Subjects Completed the Experiment

| Bank | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 6/20-7/5 | 6/27-7/15 | 7/13-7/31 | 6/28-7/21 | 8/19 |

which the subjects participated) should have affected subjects' judgments.

Maturation pertains to the fact that subjects' biological (e.g., fatigue) and psychological processes (e.g., loss of interest) may change during the conduct of the experiment. Due to the fact that the experiment was short, it is unlikely that any subject became fatigued during the experiment. However, the subjects did participate in the study at their convenience at different times during the day. Exhibit 5 shows the time of day that each participant completed the study. Of the thirty-seven participants, fourteen subjects completed the instrument in the morning and twenty-three subjects completed the instrument in the afternoon. There does not seem to be any reason why maturation should be a problem in this study.

Pretesting procedures have been found to cause subjects to alter their responses. For this reason no pretest was conducted in this study. Also, since no retesting was performed, the problem of statistical regression was avoided.

Each subject was exposed to the same measurement instrument. Each subject provided an EPS estimate, which is defined as ratio scale measurement. The manipulation checks used ordinal scale data, primarily Likert scaled questions. The types of questions asked and measurement scales used are quite common in behavioral research.

The problem with differential selection of subjects is that subjects' responses, rather than reflecting the influence of exposure to the experimental variables, may reflect some inherent differences of the subjects assigned to the groups. The primary technique to deal with this problem is randomization. Also, a researcher can gather data about subjects such as age, sex, or attitudes (for example, risk taking

Exhibit 5

Time of Day Subjects Completed the Study

| Source | Degree of Expertise | | |
|---|---|---|---|
| | High | Low | No Indication |
| Financial Analyst | 10:45 AM (1) | 8:52 AM (1) | 4:10 PM (1) |
| | 11:10 AM (1) | 11:43 AM (1) | 9:45 AM (1) |
| | 2:10 PM (2) | 2:48 PM (1) | 11:45 AM (2) |
| | 4:44 PM (2) | 11:25 AM (2) | 2:37 PM (2) |
| | 9:40 AM (3) | 4:35 PM (2) | 3:24 PM (2) |
| | 4:40 PM (4) | 4:00 PM (3) | 2:35 PM (3) |
| | | 6:20 PM (3) | 2:10 PM (3) |
| | | | 5:24 PM (3) |
| | | | 1:25 PM (4) |
| Manager | 10:25 AM (1) | 12:50 PM (1) | 4:50 PM (1) |
| | 11:46 AM (1) | 3:55 PM (1) | 4:00 PM (1) |
| | 12:25 PM (3) | 11:35 AM (2) | 1:15 PM (3) |
| | 8:40 AM (5) | 4:30 PM (2) | 11:10 AM (3) |
| | 9:30 PM (5) | 5:30 PM (3) | 11:20 AM (5) |

where (1-5) denotes participating banks

propensity). The additional gathered information can be analyzed separately or used as statistical controls (for example, using analysis of covariance) to determine if subjects did differ along certain dimensions. In this study, additional information gathered pertained to the age, sex, and years of work experience of the subjects. Exhibit 1, presented elsewhere in this chapter, presents a breakdown of the subjects by age, sex, and years of work experience. In addition, Exhibit 6 presents an analysis of the number of subjects, classified by bank, assigned to each of the six experimental groups.

A major problem that could have occurred in this study would have been a bank bias whereby certain banks would be over (under) represented in any of the six experimental groups. Since the researcher did not control the administration of the experiment, it was impossible to ensure that each bank was equally represented in all experimental groups. However, inspection of Exhibit 6 does not reveal that differential selection of subjects should be a problem in this study. Only banks 4 and 5 showed grossly disproportionate representation in any particular group. However, since banks 4 and 5 contributed only two and three responses, respectively, it does not seem likely that the disproportionate representation greatly biased the results of the study. Chapter IV presents an analysis of the dependent variables classified by bank and experimental group to see if a bank effect was present.

Differential experimental mortality presents a problem if one particular type of subject drops out of the experiment thereby leaving the final sample unrepresentative of the population studied. Exhibit 7 shows the number and percentage of subjects who participated and who did not participate. Fifty-six security analysts, excluding contact

Exhibit 6

Analysis of Experimental Groups Classified by Bank

| | Bank | | | | | |
|---|---|---|---|---|---|---|
| Group | 1 | 2 | 3 | 4 | 5 | Total |
| Financial Analyst/High | 2 | 2 | 1 | 1 | 0 | 6 |
| Financial Analyst/Low | 3 | 2 | 2 | 0 | 0 | 7 |
| Financial Analyst/ No Indication | 3 | 2 | 3 | 1 | 0 | 9 |
| Management/High | 2 | 0 | 1 | 0 | 2 | 5 |
| Management/Low | 2 | 2 | 1 | 0 | 0 | 5 |
| Management/No Indication | 2 | 0 | 2 | 0 | 1 | 5 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |
| Number of Participants Receiving Source Treatment | | | | | | |
| Financial Analyst | 8 | 6 | 6 | 2 | 0 | 22 |
| Management | 6 | 2 | 4 | 0 | 3 | 15 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |
| Receiving Degree of Expertise Treatment | | | | | | |
| High | 4 | 2 | 2 | 1 | 2 | 11 |
| Low | 5 | 4 | 3 | 0 | 0 | 12 |
| No Indication | 5 | 2 | 5 | 1 | 1 | 14 |
| Total | 14 | 8 | 10 | 2 | 3 | 37 |

Exhibit 7

Response Rate of Subjects

| | Number of Subjects | | |
|---|---|---|---|
| Bank | Participating | Not Participating* | Total Eligible |
| 1 | 14 | 1 | 15 |
| 2 | 8 | 2 | 10 |
| 3 | 10 | 12 | 22 |
| 4 | 2 | 2 | 4 |
| 5 | 3 | 2 | 5 |
| Total | 37 | 19 | 56 |

*Four unusuable responses are included in this group. Subjects failed to specify a revised EPS estimate.

security analysts, were eligible to participate in this study. Of the fifty-six eligible, thirty-seven usable instruments were returned, a response rate of 66%. This is a high response rate. Of those classified as nonresponders, four represented completed instruments that were unusuable because subjects failed to specify their revised EPS estimates. Of the remaining fifteen nonresponses, some occurred because the security analysts were on vacation. However, the bulk of the fifteen nonresponses occurred because the analysts felt they were too busy to participate in the study.

The 66% response rate for this study was excellent. However, little is known about the nineteen potential subjects who did not participate. Therefore, the effect of differential experimental mortality on this study is not known. However, the large response rate and the fact that security analysts have relatively homogeneous educational experiences and perform similar jobs should negate most of the potential impact of differential experimental mortality.

The final extraneous variable, interaction of selection with history, maturation, etc., that potentially confounds internal validity is the most difficult to assess. To assess an interaction, a researcher would first have to know what particular factor or factors compromised the internal validity of the design. If several factors compromised the design, the researcher would have to have some way to assess the particular interaction. Since most researchers cannot assess the effects of the interaction of threats with internal validity, a researcher tries to prepare the best research design possible subject to any imposed constraints.

The best way to control for interaction is to use randomization. Isaac and Michael (1971) state:

> The most rigorous [experimental design] means of making meaningful comparisons [between groups] is the controlled experiment with random assignment of subjects, occasions and treatments (p. 60).

Other authors writing about research design also emphasize that randomization is a powerful means of obviating threats to internal validity. In this study random assignment of subjects was accomplished. In addition, to minimize the potential that any bank would be over or under represented in any of the six experimental groups, the following procedures were followed. First, the number of eligible security analysts was obtained from the contact security analyst at each bank. Then, the experimenter mailed the appropriate number of instruments to each contact security analyst. The contact security analysts at each bank distributed the instruments to their colleagues at random. For the mailing to each bank, the experimenter was careful to mail, as nearly as possible, an equal number of instruments for each of the six experimental groups. For bank number five, the last participating bank, only five subjects were available. In an attempt to equalize the group sample sizes, bank five was mailed instruments that only reflected management forecasts. The response pattern of the first four banks had worked so that the financial analyst groups were over represented. Since subjects at the fifth bank could not have been assigned to the financial analyst group, the assignment at the fifth bank was not truly random. However, the participants at the fifth bank were assigned at random the management group experimental instruments that were mailed to the fifth bank.

External Validity. External validity refers to the generalizability or representativeness of the experimental findings.

Isaac and Michael (1971, pp. 34-35) briefly discuss factors threatening external validity:[3]

1. Interaction effects of selection bias and X (the independent variable)
2. Reactive or interaction effect of pretesting
3. Reactive effects of experimental procedures
4. Multiple treatment interference

Since the experimental design used neither a pretest nor repeated measures, the effects of factors 2 and 4 above will not be discussed. The reactive effects of experimental procedures undoubtedly limits the generalizability of the study. It is not possible in this research, and, in general, it is impossible in behavioral research to determine how the fact that the subject was participating in an experiment affected the subject's responses. This study tried to minimize this effect by using a realistic task and administering the instrument in the subject's normal environment.

The problem of interaction effects of selection bias and X really deals with how representative is a sample of the population of interest. This factor is the factor most damaging to the external validity of this study. The subjects certainly are not representative of investors in general. In fact, the subjects probably are not representative of bank security analysts in general. Subjects who participated in this research worked in some of the largest banks in the country. Security analysts employed by smaller banks are unrepresented.

## Summary

The study described in this chapter consciously was designed as a field experiment (quasi-experimental design). A field experiment necessarily sacrifices some degree of experimental control in return for the ability to involve subjects who otherwise would (could) not

have been studied. Bank security analysts were selected as subjects for two reasons. First, a group of representative investors was not available. Bank security analysts, while not investing their own money, are responsible for recommendations on which investment decisions are made. Although a bank security analyst is probably more sophisticated than the average investor, both analysts and investors are concerned with the process of analyzing information on which decisions are based. The information presented in the study is important to investors and security analysts.

A second reason to use security analysts was to test the model of source credibility with nonstudent subjects. The bulk of literature regarding source credibility has been performed with student subjects. The task used in this study provided an excellent opportunity to determine if the general findings regarding source credibility held when a group of sophisticated information processors was examined.

The study, given the quasi-experimental design and the overriding constraints of subject availability and keeping the experiment brief, was structured to minimize the factors potentially impairing the external and internal validity of the study. Chapter IV presents the data, the statistical tests, and the data analysis. Chapter V summarizes and interprets the results, discusses the limitations of the study, and presents ideas for future research.

## CHAPTER III ENDNOTES

1. When asked what error rates they [the auditors] considered "reasonable" in one-year ahead sales and net income forecasts, auditors responded on average that an error of about 20 percent was the threshold (Danos and Imhoff, 1982).

2. Campbell and Stanley (1963) discuss quasi-experimental designs (pp. 34-64).

3. Campbell and Stanley (1963, pp. 16-22) provide a more extensive discussion of factors jeopardizing external validity.

# CHAPTER IV

# DATA, STATISTICAL TESTS, AND DATA ANALYSES

## Introduction

This chapter is organized into three sections. The first section deals with the dependent variables produced in the field experiment. Both data and statistical tests are presented. The second section discusses the manipulation check and background questions administered in the field experiment. Summary data are presented and the results of the statistical tests are presented. For a complete listing of all the data collected during the field experiment, see Appendix D. The final section provides a general discussion of the results of the field experiment.

## The Dependent Variables

Table 1 presents the dependent variables collected in the field experiment. The dependent variables are the subjects' revised EPS estimates that they reported after being exposed to the experimental information (prior EPS estimate of $2.90, source and expertise treatments). Thirty-seven usable responses were collected. The thirty-seven responses are distributed unevenly among the experimental groups. The most obvious characteristic of the data is the number of responses that were not different from the subjects' prior EPS estimates. Of the thirty-seven responses, only ten (two in the financial analyst

Table 1

The Dependent Variables

| | Degree of Expertise | | | |
|---|---|---|---|---|
| Source: | High | Low | No Indication | Total |
| Financial Analyst | 2.90 2.90<br>2.90 2.90<br>2.90 3.05 | 2.90 2.90<br>2.90 2.90<br>2.90 2.90<br>2.90 | 2.90 2.90<br>2.90 2.90<br>2.90 2.90<br>2.90 2.90<br>3.50 | |
| Mean | 2.925 | 2.90 | 2.967 | 2.934 |
| Variance | .004 | .000 | .04 | .017 |
| n | 6 | 7 | 9 | 22 |
| Manager | 2.90 2.90<br>2.90 2.90<br>3.57 | 2.90 3.35<br>3.05 3.50<br>3.70 | 2.90 3.00<br>2.90 3.20<br>3.25 | |
| Mean | 3.034 | 3.30 | 3.05 | 3.128 |
| Variance | .090 | .106 | .027 | .080 |
| n | 5 | 5 | 5 | 15 |
| Total | | | | |
| Mean | 2.975 | 3.067 | 2.996 | 3.013 |
| Variance | .041 | .081 | .035 | .049 |
| n | 11 | 12 | 14 | 27 |

treatment groups and eight in the manager treatment groups) were different from the subjects' prior estimates. Therefore, only 9.1% (2/22) of the subjects receiving the financial analyst treatment and 53.3% (8/15) of the subjects receiving the manager treatment reacted to the experimental information in a way that resulted in revised EPS estimates. Clearly, the lack of subjects' movement from their prior estimates, a reaction discussed in more depth in Chapter V, dominates the results of the experiment.

Statistical Tests

Analysis of variance (ANOVA) was used to analyze the subjects' revised EPS estimates. ANOVA is a parametric test that assumes that each score "is sampled randomly and independently from a normally distributed population having a mean . . . and a constant variance" (Lindman, 1974, p. 21). When a factorial design is used, the assumptions are that:

1. All scores are independently drawn from a normally distributed population.
2. Each experimental group (cell) has equal sample sizes.
3. The variance of the scores in each cell is the same (homogeneity of variance)

Kerlinger (1964) briefly introduces ANOVA.

> Analysis of variance is what the name implies -- and more: a method of identifying, breaking down, and testing for statistical significance variances that come from different sources of variance. That is, a dependent variable has a total amount of variance, some of which is due to the experimental treatment, some to error, and some to other causes. Analysis of variance's job is to work with these different variances and sources of variance (p. 147).

For a more complete discussion of ANOVA, see any text book devoted to ANOVA.

The hypotheses to be tested, as well as the general research design, are discussed in Chapter III (see Exhibit 8). The null hypotheses of interest in this study are:

H(1) There is no difference in the mean earnings estimates of subjects who were given financial analyst earnings forecasts and those subjects who were given management earnings forecasts. [Y(11) + Y(12) + Y(13) = Y(21) + Y(22) + Y(23)]

H(2) There is no difference in the mean earnings estimates of subjects who were given earnings forecasts accompanied by descriptions of the source as having high, low, or no indication of expertise. [Y(11) + Y(21) = Y(12) + Y(22) = Y(13) + Y(23)]

Table 2 presents the ANOVA results relating to the dependent estimates contained in Table 1. The ANOVA results were obtained using the BMDP Statistical Software (UCLA, 1981 edition) program BMDP7D. Table 2 presents the sums of squares (SS), degrees of freedom (DF), and mean square (MS) for each source of error. Also, Table 2 presents the results of F tests, significance level (p), and omega squared on each treatment and the interaction of the treatments. In addition, the results of Levine's Test, which tests the null hypothesis that the variance of each cell is equal, is presented. As Table 2 shows, H(1) is rejected ($F = 8.92$, $p = .005$) and H(2) is not rejected ($F = 1.18$, $p = .320$), assuming that a level of $p = .05$ indicates acceptable significance. Also, the interaction of both the source and degree of expertise treatments is not a significant variable ($F = 2.37$, $p = .109$). The omega squared for the source group was .16, which indicates that 16% of the total variance was associated with the source variable. Overall, the experimental variables explained 23% of the variance. Thus, the source variable explained 70% (.16/.23) of the variance associated with the experimental data.[1]

To analyze further the significance of the source effect,

Table 2

ANOVA Results

| | SS | DF | MS | F | P | Omega Squared |
|---|---|---|---|---|---|---|
| Source | .344 | 1 | .344 | 8.92 | .005 | .16 |
| Degree of Expertise | .091 | 2 | .046 | 1.18 | .320 | .01 |
| Source/Degree Interaction | .183 | 2 | .091 | 2.37 | .109 | .06 |
| Error | 1.233 | 32 | .039 | -- | -- | -- |
| Total | 1.851 | 37 | | | | |

Levine's Test for equal variances - 5.23, p = .0023

a chi square test was conducted on the difference between the number of subjects assigned to the financial analyst and manager groups who revised their EPS estimates. The null hypothesis stated that there was no difference between the proportions of subjects who revised their EPS estimates. The null hypothesis of no difference was rejected ($p < .01$, chi square statistic = 9.12 with one degree of freedom). Thus, the results of the chi-square test confirm the ANOVA results that the source variable was highly significant in the study.

The data in Table 1 violate the assumptions of ANOVA. The cell sizes are unequal; the data are not normally distributed (skewness = 4.46, kurtosis = 2.31); and the cell variances are unequal. ANOVA is robust (relatively insensitive) to departures from the assumptions of normality and homogeneity of variance if sample sizes are equal (Lindman 1974, pp. 31 and 105). If sample sizes are unequal, adjustments in the normal calculations of ANOVA are necessary before the model becomes robust to departures from the assumptions of normality and homogeneity of variance. Several ways of adjusting the ANOVA computations for unequal sample sizes are available (Lindman, 1974, pp. 100-102). In the BMDP7D program, adjustments are made for unequal sample sizes (BMDP Manual, p. 109). Thus, the results of Table 2 reflect adjustments for the unequal sample sizes. Lindman (1974, p. 31) points out that the effect of large values of skewness and kurtosis is to understate the significance of the F statistic. Thus, even though BMDP7D adjusts for unequal sample sizes, the significance levels reported in Table 2 probably are conservative.[2]

Summary

The ANOVA results presented in Table 2 indicate that in this field experiment the source treatment is significant while the

degree of expertise treatment and the interaction of the two treatments are not significant. Thus, H(1) is rejected and H(2) is not rejected. The calculations of omega squared indicated that the source treatment accounted for most of the variance explained by the variables used in the study.

## Manipulation Check and Background Questions

After subjects prepared their revised EPS estimates, they completed manipulation check and background questions. Appendix D presents the data gathered in the experiment for each participant. Table 3 condenses the data and presents the mean response to each question (except question VI, which is discussed separately in Appendix C) for the five groups receiving the financial analyst, manager, high expertise, low expertise, and no indication of expertise treatments. Chapter III discussed the background data (age, sex, length of work experience, and the amount of time used to complete the study).

### Statistical Tests of Manipulation Check and Background Questions

This section presents the results of statistical tests on the manipulation check and background questions used in this study. To review the questions, see Appendix A. Questions I, IIA, IIB, IIIA, IIIB, IV, V, and VII are manipulation check questions. Questions VIII and IX are background questions and question X is used to calculate the time used to complete the experiment. Questions I, IIA, IIB, IIIA, IIIB, IV, V, and VII used Likert scale responses and, therefore, the answers are ordinal measures. The answers to IX (sex) are nominal measures. The answers to questions VIII, IX (age, experience), and X are ratio measures.

A manipulation check question is a question designed to determine,

Table 3

Mean Responses For Manipulation Check and Background Questions

| | Group | | | | | |
|---|---|---|---|---|---|---|
| | Source Treatment | | Degree of Expertise | | | |
| Question(*) | Financial Analyst | Manager | High | Low | No Indication | Total |
| I (Realistic) | 4.7 | 4.3 | 4.4 | 3.8 | 5.2 | 4.5 |
| IIA (Ability) | 4.8 | 4.9 | 6.6 | 3.9 | 4.3 | 4.8 |
| IIB (Motivation) | 5.9 | 5.8 | 6.3 | 5.8 | 5.6 | 5.9 |
| IIIA (Education) | 5.4 | 4.5 | 6.0 | 4.9 | 4.5 | 5.0 |
| IIIB (Experience) | 6.7 | 6.0 | 6.0 | 5.2 | 6.9 | 6.4 |
| IV (Objectivity) | 5.0 | 4.7 | 4.8 | 5.4 | 4.5 | 4.9 |
| V (Accuracy) | 4.8 | 4.6 | 5.2 | 5.1 | 4.1 | 4.7 |
| VII (Know Source) | 7.9 | 7.3 | 7.2 | 7.8 | 8.0 | 7.7 |
| VIII (Percentage) | 18.2 | 17.1 | 16.7 | 17.1 | 19.2 | 17.8 |
| IX: | | | | | | |
| Age | 29.4 | 32.5 | 31.6 | 30.3 | 30.1 | 30.7 |
| Sex (#) | 1.2 | 1.2 | 1.3 | 1.2 | 1.1 | 1.2 |
| Experience | 4.7 | 5.0 | 5.3 | 4.5 | 4.8 | 4.8 |
| Time | 13.6 | 13.4 | 13.4 | 14.6 | 12.7 | 13.5 |
| Sample Size (**) | 22 | 15 | 11 | 12 | 14 | 37 |
| Sample Size (VIII) | 18 | 14 | 9 | 11 | 12 | 32 |

(*) For the complete wording of these questions, see Appendix A. For questions I through VII, the possible responses range from 1 to 9.
(**) For all questions except VIII
(#) 1 = male, 2 = female

after the administration of an experimental instrument, whether a researcher was successful in manipulating the experimental treatment variables. Also, a manipulation question can be used to determine whether a variable that was not manipulated was important in the experiment. Both types of manipulation check questions were used in this study. All questions were Likert scale questions, which are ordinal in nature. Accordingly, the results of the manipulation check questions were analyzed using nonparametric statistics. Also, as suggested by Grove and Savich (1979, p. 531), the results were analyzed using parametric statistical tests. The results of both parametric and nonparametric tests are reported.

Table 4 presents the results of nonparametric Kruskal-Wallis tests on the manipulation check questions and the background question IX (sex), which is nominal in nature. The Kruskall-Wallis test (see Conover, 1971, pp. 256-263) is the nonparametric analog of the parametric t test. Table 5 presents the results of t tests on all manipulation check and background questions. Both the nonparametric Kruskal-Wallis and the parametric t tests utilize the same null hypothesis of no difference in group means. Tables 4 and 5 present comparisons of answers provided by thirty-seven subjects categorized by groups. The categories are by source (financial analyst and manager) and by degree of expertise (high and low, high and no indication, and low and no indication). In addition, Table 4 provides an overall test of the three degree of expertise groups. The results of the statistical tests on each question's answers are discussed next.

Table 4

Analysis of Manipulation Check Questions and Question IX (Sex) Using Kruskal-Wallis (Nonparametric) Tests

| | Source | | Degree of Expertise | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Analyst/ Manager | | High/Low/No Indication | | High/ Low | | High/No Indication | | Low/No Indication | |
| | K-W | P | K-W | P | K-W | P | K-W | P | K-W | P |
| I | .18 | .67 | 2.96 | .23 | .77 | .38 | .85 | .36 | 2.69 | .10# |
| IIA | .01 | .94 | 20.22 | .00* | 15 | .00* | 14.12 | .00* | .96 | .33 |
| IIB | .16 | .69 | 3.68 | .16 | 2.16 | .14 | 3.18 | .07$ | .12 | .73 |
| IIIA | 1.81 | .18 | 4.00 | .14 | 1.71 | .19 | 4.00 | .05# | .27 | .60 |
| IIIB | 1.96 | .16 | 1.70 | .43 | .05 | .83 | 1.34 | .25 | 1.07 | .30 |
| IV | .05 | .82 | 2.61 | .27 | 2.02 | .16 | .00 | .98 | 1.96 | .16 |
| V | .15 | .70 | 5.65 | .06$ | .01 | .92 | 4.66 | .03# | 3.56 | .06$ |
| VII | .18 | .68 | .78 | .68 | .36 | .55 | .77 | .38 | .03 | .87 |
| IX: Sex | .02 | .89 | .72 | .70 | .36 | .55 | .62 | .43 | .03 | .87 |
| n | 22/15 | | 11/12/14 | | 11/14 | | 11/14 | | 12/14 | |

* Significant at less than the p = .01 level
\# Significant at the p = .01-.05 level
$ Significant at the p = .06-.10 level

Table 5

Analysis of Manipulation Check and Background Questions Using t Tests

| Question | Groups Compared: Source: Analyst/Manager t | p | Degree of Expertise: High/Low t | p | High/No Indication t | p | Low/No Indication t | p |
|---|---|---|---|---|---|---|---|---|
| I | .43 | .67 | .58 | .57 | -.98 | .33 | -1.58 | .13 |
| IIA | -.05 | .96 | 6.51 | .00* | 5.16 | .00* | -.98 | .33 |
| IIB | .43 | .67 | 1.50 | .15 | 1.88 | .07$ | .32 | .75 |
| IIIA | 1.48 | .15 | 1.39 | .18 | 2.14 | .04# | .56 | .58 |
| IIIB | 1.35 | .19 | -.30 | .76 | 1.71 | .10$ | -1.53 | .14 |
| IV | .48 | .64 | -.91 | .37 | .47 | .64 | 1.71 | .10$ |
| V | .53 | .60 | .25 | .80 | 2.53 | .02# | 2.00 | .06# |
| VII | 1.06 | .30 | -.64 | .53 | -1.09 | .29 | -.46 | .65 |
| VIII | .48 | .64 | -.14 | .89 | -1.06 | .30 | -.75 | .46 |
| IX: | | | | | | | | |
| Age | -1.43 | .16 | .40 | .69 | .60 | .55 | .11 | .91 |
| Sex | -.13 | .89 | .59 | .56 | .78 | .44 | .16 | .87 |
| Experience | -.16 | .89 | .36 | .72 | .24 | .81 | -.18 | .86 |
| X | .10 | .92 | -.57 | .57 | .29 | .77 | .80 | .43 |
| Sample Size** | 22/15 | | 11/12 | | 11/14 | | 12/14 | |
| Sample Size VIII | 18/14 | | 9/11 | | 9/12 | | 11/12 | |

*Significant at less than the p = .01 level
#Significant at the p = .01-.05 level
$Significant at the p = .06-.10 level

Question I.

> The previous pages presented an excerpt from a newspaper article that reported estimated earnings per share (EPS) data for American Industries. How realistic was the setting? Please circle your answer. [1 = not highly realistic and 9 = highly realistic]

This question was designed to determine whether groups differed in attitudes toward the realism of the experimental setting. A priori, no difference was expected. A finding of a difference between groups in attitude toward experimental realism might indicate that the results of the ANOVA should be viewed circumspectly.

Overall, the results reported in Tables 4 and 5 are consistent. The results indicate that tests of the hypothesis of no difference in mean responses cannot be rejected. Of the eight parametric and nonparametric tests performed, a single Kruskal-Wallis test on the responses of low and no indication degree of expertise groups was significant at approximately the $p = .10$ level. Therefore, there is no reason to believe that subjects' revised EPS estimates were affected because of different group attitudes toward the realism of the experimental setting. Also, the overall mean response of 4.5 is slightly less than the median Likert scale value of 5.0. This indicates that subjects rated the experiment as neither highly realistic nor highly unrealistic.

Question IIA.

> Your colleague described the [source] as follows:
>
> "Quote from instrument was included here."
>
> How would you evaluate the ability of the [source] who prepared the earnings forecast to forecast accurately American Industries' fiscal 1984 EPS? [1 = low ability and 9 = high ability]

Qualitative characteristics were used in this study to convey source

expertise. A more expert source should have a greater ability to forecast EPS accurately. If the degree of expertise manipulation were effective in the study, the responses to question IIA by degree of expertise groups should be different. However, a priori, no difference was expected between source groups since each source group used the same qualitative characteristics to convey different levels of source expertise.

Table 4 shows that overall (high/low/no indication) the hypothesis of no difference in mean responses between the three degree of expertise groups was rejected ($p < .01$). When comparing the responses between pairs of degree of expertise groups, the tests applied to high/low and high/no indication groups showed significant differences ($p. < 01$). For the test of the low/no indication groups, the test proved insignificant. Similar results are reported in Table 5. The differences between the financial analyst and manager groups were not significant.

Thus, the degree of expertise manipulation was effective overall (high/low/no indication) and for two of the three pairs of degree of expertise groups. The manipulation was not successful in differentiating source expertise between low and no indication groups. For the experimental setting used in this study, it appears that subjects ascribed low expertise to the no indication group. In fact, the fourteen subjects who were assigned to the no indication group rated the sources as having slightly higher ability than did those subjects assigned to the low expertise group (4.3 versus 3.9). Overall, the source expertise manipulation was successful. Question V, which also was included to test for the effect of source expertise, confirms the results to question IIA.

Question IIB.

> Please respond to the following statement.
>
> The [source] who prepared American Industries' fiscal 1984 earnings forecast would be motivated to prepare an EPS forecast that was [1 = highly pessimistic, 5 = neither optimistic nor pessimistic, and 9 = highly optimistic].

Source objectivity, a component of source credibility, was not manipulated in this experiment. Source objectivity is defined as the motivation to tell the truth. Question IIB was designed to see whether subjects within groups exhibited different attitudes toward the source's degree of objectivity. Some accounting and finance literature posits that financial analysts should be more objective than management when predicting EPS. However, other literature posits that neither source should be more objective. Differences between source groups' answers to IIB would mean that subjects reported that they believed one source was more objective than the other. A priori, no differences between groups would be expected.

Table 4 indicates that no differences were found between the source groups or, overall, the three degree of expertise groups. However, for the high/no indication degree of expertise groups, a significant difference in responses was present at the $p = .07$ level. Table 5 presents similar results. This result does not seem likely to compromise greatly the overall conclusion that source objectivity was not an important variable in this study. Given the fact that eight tests were presented, there is a 44% $[1 - (1 - .07)^{8}]$ chance that one test would be significant by chance. Question IV, which also was included to test for the effect of source objectivity, confirms that source objectivity was not an important influence on the results of the study.

Question IIIA and IIIB.

> To what extent do you believe that the following characteristics are related to a [source's] ability to forecast accurately EPS? [1 = highly unrelated and 9 = highly related]

Question IIIA asked the subjects to rank the characteristic of education while question IIIB asked the subjects to rank the characteristic of length of work experience. Education and length of work experience were the two characteristics used in the experiment to indicate source expertise. This question was used to determine whether groups had different attitudes toward the importance of the characteristics. If the groups did have different attitudes, then the experiment might not have conveyed the same sense of source expertise to each group of subjects.

Table 3 indicates that, generally, subjects assigned higher rankings to the length of work experience characteristic (6.4 overall) than to the education characteristic (5.0). Table 4 reports that, overall (high/low/no indication), there were no statistically significant differences in the mean responses of various groups. A single Kruskal-Wallis test comparing high and no indication groups' responses on Question IIIA was significant ($p = .05$); Table 5 reports similar results. Also, Table 5 shows that for question IIIB, a single t test comparing the high and no indication groups was significant at the $p = .10$ level. In Table 4, the Kruskal-Wallis test comparing the high and no indication group was not significant ($p = .25$).

Table 3 can be inspected to determine if various groups ranked both education and work experience similarly. A priori, it was expected that work experience would be ranked higher in any group. However, it is clear from inspecting Table 3 that the mean responses to

questions IIIA and IIIB by the high expertise group were not consistent with answers of the other groups. The high expertise group rated both education and the length of work experience as equally important. As expected, all other groups ranked work experience as more important than education. The significant difference ($p = .05$ in Table 4) between the high expertise and no indication groups does not appear to be a problem from the standpoint of the subjects' interpretations of source expertise. The no indication group, which rated education as statistically significantly less important than the high expertise group (4.5 versus 6.0), ranked work experience much higher, but not statistically significantly higher, than the high expertise group (6.9 versus 6.0). Because the two attributes work in tandem to convey a sense of source expertise, there is no reason to believe that the difference in the high expertise group's attitudes regarding the importance of the characterics education and length of work experience affected the revised EPS estimates in a manner different from other groups.

Question IV.

> How would you evaluate the objectivity of the [source] who prepared American Industries' fiscal 1984 earnings forecast? [1 = low objectivity and 9 = high objectivity]

Question IV has the same purpose as question IIB and therefore acts as a consistency check. Table 3 indicates that overall subjects ranked the sources as possessing neither high nor low objectivity (4.9 average ranking). Table 4 reports no statistically significant differences in group responses. Table 5 reports one difference significant at the $p = .10$ level for the low and no indication degree of expertise groups. Therefore, subject groups did not differ in their assessments of the objectivity of the source. These findings are consistent with the analysis of question IIB.

Question V.

> How accurately do you believe that the [source] who prepared American Industries' fiscal 1984 earnings forecast is able to forecast 10 months before year end? [1 = low accuracy and 9 = high accuracy]

This question is used as a consistency check to question IIA. Technically, the responses to questions IIA and V ranked different attributes. Question IIA ranked the source's ability (low to high) to predict EPS while question V ranked the expected relative accuracy (low to high) of a source EPS forecast 10 months before year end. Nevertheless, both questions deal with the issue of forecast accuracy, and the answers to both questions should be similar. In fact, Table 3 reveals that for all thirty-seven subjects, the mean responses to questions V and IIA were 4.7 and 4.8, respectively. Further, Table 4 indicates that, overall (high/low/no indication), the degree of expertise manipulation as measured by question V was successful: statistically significant differences were found between the three degree of expertise groups at the $p = .06$ level. This finding is clearly consistent with and supportive of the overall test for question IIA, although the finding is not nearly as strong as the finding of the overall test for question IIA ($p < .01$).

Question VII.

> In general, when you are using a [source's] forecast as part of your analysis of a company, how important is it that you know the [source] personally or of the [source's] reputation? [1 = not very important and 9 = very important]

To make the experimental setting as general as possible, subjects were told that they did not know personally the source of the earnings forecast. The purpose of question VII was to see if the choice of the experimental setting was important. High rankings on this question would indicate that an experimental setting where the subject knew the source might make a difference in the subjects' responses. Table 3

reports that subjects did attach high importance to knowledge of the source (average rating = 7.7). Table 4 shows that there were no statistically significant differences between groups' responses on this question.

Question VIII. This question is lengthy. To see the entire question refer to Appendix A. In the experiment, the earnings forecast (new information) was 30% higher than the prior EPS estimates. The 30% parameter was based on previous literature and pilot testing. Question VIII was asked to determine how accurately subjects believed the sources generally are able to predict EPS. Overall, subjects reported that generally they would expect the sources used in this study to be able to forecast EPS (ten months in advance) at plus or minus 17.8% (see Table 3). This finding supports the decision to use an earnings forecast that was 30% more than the subjects' prior estimate. Subjects might be willing to discount the information provided by an earnings forecast that was approximately 18% different from their own estimates because they expect sources of earnings forecasts to be accurate plus or minus approximately 18% 10 months before year end. The 30% level is much larger than a 17.8% threshold and should be considered new information. Also, Table 5 shows that there were no significant differences between the groups in terms of expected forecast accuracy.

Questions IX and X. Table 5 indicates that there were no statistically significant differences between the various groups along the dimensions of age, length of work experience, or time taken to complete the experiment. Table 4 indicates that there were no differences between groups regarding the sex of the subjects. These results mean that the subjects who received exposure to various

treatments did not differ along certain characterics that might have affected subjects' responses.

## General Summary of Results

The statistical tests on the data collected in this study reveal that the source treatment was a significant variable while the degree of expertise treatment and the interaction of both treatments were not significant. The primary purpose of this study was to determine whether subjects were affected more by one source of earnings forecast than another. The findings are that subjects were influenced more by the management source than the financial analyst source.

The secondary purpose of the study was to determine whether subjects were influenced by the degree of expertise of the source of an earnings forecast. The concept of source expertise was operationalized by indicating the source's level of education and length of work experience. Surprisingly, the degree of expertise variable was not significant in the experimental setting used in this study. Responses to manipulation check questions clearly indicate that subjects perceived the differences in source expertise used in the three degree of expertise groups. However, subjects' responses were not different as a function of the degree of expertise of the source. In this regard, observation of the average revised EPS estimate by degree of expertise group is especially interesting (refer to Table 1). A priori, subjects exposed to the higher expertise description were expected to prepare higher revised EPS estimates than those subjects exposed to the lower degree of expertise description, whereas how subjects would react to the no indication description compared to the high and low expertise descriptions was unknown.

Contrary to expectations, the average revised EPS estimate ($3.07) of the low expertise group is higher than the revised EPS estimate ($2.98) of the high expertise group. An additional interesting result of this experiment is that the average revised EPS estimate ($3.00) of the no indication expertise group is lower than low expertise group and higher than the high expertise group. These results may be related to the small sample sizes and may just be random in nature. Even though the degree of expertise variable was not significant, the directions of the EPS differences are surprising.

Analysis of the manipulation check questions indicates that the experimental manipulations were successful. Overall, no differences other than those expected (Questions IIA and V) were observed between responses of various groups. Analysis of background questions indicated that, overall, respondents in various groups did not significantly differ along the dimensions of sex, age, length of work experience, or time taken to complete the field experiment.

## CHAPTER IV ENDNOTES

1. The omega squared computation determines the "proportion of variance accounted for" (Lindman, 1974, p. 51). Omega squared describes the relationship of the differences between group means compared to the differences in the variability of data within groups. The ANOVA F statistics report whether differences exist between group means. The omega squared statistic is used to determine whether the differences between group means is of practical value. For the source treatment, omega squared is calculated using the formula:

$$\text{Omega Squared} = \frac{SSs - MSe}{MSe + SSt}$$

   Since MSe in Table 1 = .039, the omega squared statistic reports approximately the relationship of SSe to SSt.

2. Since ANOVA is robust to the departure from the assumptions of normality and equal variances when equal cell sizes are present, an unusual procedure was used to check the propriety of the results presented in Table 2. Seven financial analyst observations were "thrown out" and ANOVA results were obtained for the resulting sample of thirty, each cell having five observations. Since so many of the financial analyst revised EPS estimates were $2.90, only four possible combinations of fifteen financial analyst forecasts were possible. ANOVA was performed on all four possible combinations of thirty responses. The results confirmed the results presented in Table 2. For example, the source variable was significant at significance levels ranging from .002 - .035. No instances of significance (p .10) were found for the degree of expertise variable or the source/degree interaction.

# CHAPTER V

# CONCLUSION

## Summary and Interpretation of Results

Theoretically, the task of estimating EPS is an important part of an investor's investment decision process. Abundant theoretical and empirical literature exists that supports the notion that investors use financial analyst and management earnings forecasts when making investment decisions. However, the question of whether investors are influenced more by financial analyst or management earnings forecasts has not been answered.

The purpose of this dissertation was to investigate the extent to which two variables affect investors' revised EPS estimates. The variables manipulated in the field experiment were the source of an earnings forecast (financial analyst or company official) and the degree of expertise of the source (high, low, or no indication). The choice of the source variable was motivated by accounting and finance literature while the choice of the degree of expertise variable was motivated by psychology literature.

### Source Effect

For the experimental setting used in this study, analysis of the data reveals that subjects' revised EPS estimates were influenced more by a company official's earnings forecast than by a financial analyst's

earnings forecast. Yet, the subjects' answers to questions IIA and V (refer to Tables 3 and 4 in Chapter IV) indicate that they do not believe either source has more ability to forecast EPS accurately (IIA) or that there is a difference in how accurately the source is able to forecast EPS (V). This finding is interesting in light of the existence of accounting and finance literature that assumes that investors seek the most accurate EPS forecasts when they make investment decisions. The data collected for this study provide contradictory signals. While subjects reported that they did not believe that the sources differ in forecasting ability and accuracy , the subjects were influenced more by management forecasts than analyst forecasts.

The information obtained in conducting this study does allow for a conjecture about why the subjects were more influenced by management earnings forecasts. When discussing with professional security analysts what their jobs require of them, it is apparent that they regard themselves as highly trained professionals possessing good analytic skills. Perhaps the security analyst subjects believed that they would use an information set similar to the information set a financial analyst would use when preparing an EPS forecast. Therefore, the subjects were not influenced by financial analyst earnings forecasts. Alternatively, subjects may have believed that management earnings forecasts are based upon a different information set. If subjects believe that management earnings forecasts are based on a different information set (potentially superior on a firm specific basis), they may be influenced more by management forecasts.

Source Expertise Effect

The second finding of this study is that the degree of expertise of the source was not a significant variable. This conclusion is surprising given the findings of previously published behavioral psychology literature. Those studies repeatedly reported that the source's degree of expertise is a significant variable. However, in the psychology studies researchers have varied the levels of expertise from nonexpert to expert. This study only used sources who would be considered expert and whose forecasts were published in The Wall Street Journal.

The channel that was used to deliver the earnings forecast, The Wall Street Journal, was intended to lend credence to the earnings forecast. Even though the answers to questions IIA and V (refer to Tables 3 and 4 in Chapter IV) indicate that subjects did perceive a difference in expertise, the channel effect may have been so strong as to overwhelm the degree of expertise manipulation. It is possible that subjects may believe that any earnings forecast source quoted in The Wall Street Journal is so expert that it is not possible to significantly improve on the forecast. Thus, a second source who clearly is more expert than the first source may not be any more influential.

A second possible explanation for the lack of revision from the prior EPS amount is that subjects simply did not find the earnings forecast to be new information. It is unlikely, however, that the subject security analysts would find an earnings forecast that was 30% higher than the security analysts' previous earnings estimates not to be new information. In fact, several subjects who did not report revised EPS estimates reported that even though they did not revise

their estimates, they would immediately contact the source to determine why the earnings forecast was different from the subject's prior EPS estimates.

Another reason subjects may not have revised EPS estimates is that they require multiple information cues before revising estimates. As discussed in Appendix C, subjects reported that they do use earnings forecasts when they are preparing EPS estimates. However, they also use other data. Since this experiment did not give the subjects the other data that they would normally use (e.g., economic forecasts), some subjects may have refused to revise their EPS estimates until they had further corroborating information. Thus, many subjects may not have found the one datum used in this study to be sufficiently important, by itself, to cause them to revise their EPS estimates.

The subjects' answers to background question VII also are informative regarding the decisions of many subjects not to revise their EPS estimates. Some subjects believe it is very important to know a financial analyst or company official personally or know the source's professional reputation in order to know how much credence to put in an earnings forecast attributed to the source. Since the setting of this study forced the subjects to have no personal knowledge of the source, some subjects might have discounted the information.

The subjects' responses to question VI (See Appendix C) can be analyzed to attempt to determine whether the reluctance to revise an EPS estimate is related to the type of information the subject uses when estimating EPS. Question VI asked subjects to rank how they used seventeen data items when preparing EPS estimates. The data items can be classified as historical-financial (financial statements, footnotes and ratios based on financial statements), historical-market (S&P

measures, Beta, and dividend payout) and expectational. The item "direct contacts with management" does not fit into one of the three categories. Whether subjects moved from their prior EPS estimates was analyzed as a function of classifying subjects as being primarily users of historical-financial, historical-market, or expectational data users. The experiment's thirty-seven subjects were assigned to one of the three categories by computing the subject's average rankings of the responses to the items in each of the three categories. The lowest average rank determined the classification to which each subject was assigned. As a check to ensure that the classification was appropriate, two out of three items that each subject ranked as most important had to be in the category to which the subject was assigned.

Table 6 presents the results of the analysis. Of those twenty-one subjects who did not revise their EPS estimates from 2.90, and who ranked the data items across groups (ranked the seventeen items on one scale), ten were classified as historical-financial users, ten as expectational users, and one could not be classified. Of the seven subjects who did move from their prior EPS positions and who ranked the data items across groups, four were classified as historical-financial and three as expectational. Thus, whether the subjects were classified as historical-financial or expectational seemingly had no bearing on whether they moved from their prior EPS estimate.

The remainder of this chapter discusses the limitations of this study, suggests possibilities for future research, and includes concluding remarks.

## Limitations

The most obvious limitation of this study is that the findings are

Table 6

Analysis of Subjects By Response to Question VII and Whether the Subject Moved from the Prior EPS Estimate

| | Did the Subjects Move From Their Prior EPS Position? | | |
|---|---|---|---|
| Category | Yes | No | Total |
| Historical-financial | 4 | 10 | 14 |
| Historical-market | 0 | 0 | 0 |
| Expectational | 3 | 10 | 13 |
| No classification | 0 | 1 | 1 |
| Did not rank items across groups | 3 | 6 | 9 |
| Total | 10 | 27 | 37 |

not generalizable beyond the specific experimental setting used in this study. In general, this limitation pertains to all behavioral research. The subjects probably are not representative of all investors or even of all security analysts in all U.S. banks. Likewise, the experimental setting probably is not representative of all possible settings in which a person would predict EPS.

The most important limitation of this study is the artificiality of the setting. As Appendix C notes, subjects report that they use many variables other than an earnings forecast when they predict EPS. Thus, a univariate setting, in which subjects only receive an earnings forecast, does not reflect the richness of a security analyst's environment in which a variety of information variables are available. Also, as the results to manipulation check question VII indicate, subjects report that knowing the source of the earnings forecast personally or the source's reputation is important in their EPS estimation processes. Subjects may have considered this study's setting to be artificial because they did not know and had never heard of the source of the EPS forecast. Thus, the artificiality of this study's setting probably contributed to the lack of movement from prior EPS estimates on the part of many subjects.

A third limitation is that, compared to a true experimental design, a quasi-experimental design does not allow the researcher to control the environment in which subjects participate in the experiment. A quasi-experimental design necessarily gives up some degree of control in order to study subjects in their natural environment. Subjects in this research participated in different places, at different times during the day, on different days, and under different conditions. Therefore, it is not possible to determine whether some of the

threats to internal validity, which were discussed in Chapter III, affected the subjects. The absence of the researcher from the sites where the experiment was administered means that direct observation of the subjects' participation was not possible. Direct observation of the subjects generally is valuable in behavioral research.

A fourth limitation of this study is the small sample sizes. Sample sizes of ten or more per cell would have been preferable. If all other things are equal, a particular random error influences the statistical tests more if the sample sizes are small rather than large. Thus, the data generated by small samples may not properly reflect the sampled population's statistical properties.

## Suggestions for Future Research

Suggestions for future research can be separated into research investigating the source variable and research investigating the degree of expertise variable.

### Investigating the Source Variable

This study can be extended by investigating the relative importance of financial analyst and management earnings forecasts when the operationalization of the financial analyst source is changed. This study used a single financial analyst as the source of an earnings forecast. As discussed earlier, it appears that the subjects in this field experiment were not influenced greatly by a single financial analyst's earnings forecast. Instead of presenting a single financial analyst's earnings forecast, future research could use a consensus financial analyst earnings forecast. Each bank that participated in this study subscribes to at least one service that provides consensus

financial analyst forecasts. The use of a consensus forecast rather than a single financial analyst's forecast may be more appropriate for the way security analysts make EPS prediction decisions.

Another way to extend the investigation of the relative influence of financial analyst and management forecasts would be to create a multivariate experimental setting. It seems likely that, compared to a univariate setting, a well constructed multivariate experiment would increase a subject's involvement with the task. However, a multivariate setting would require a much longer time commitment on the part of the subjects. Only if subjects are willing to spend more time can a multivariate experiment begin to approach the setting of the subject's natural environment.

In a multivariate setting, subjects would be given several items of information on which to base an EPS forecast. A multivariate setting could be created in at least two ways. First, a traditional case that uses a predetermined number of information variables, selected by the researcher, could be created. For example, an experimental instrument might contain historical financial statements, a forecast of general economic activity, and an earnings forecast prepared by a financial analyst or company official. A second way to create a multivariate environment would be to utilize a computer. The subject could be asked to create an EPS estimate after calling up a limited number of items from a large data base. For example, the subject could be restricted to any five items from a list of seventeen items. The seventeen items could be the items listed in Appendix C. The computer could keep track of the order of item selection to provide information about the subject's decision processes.

Earlier in this chapter, a conjecture was made that subjects may have been influenced more by the management forecast because they felt the management forecast represented a different information set. Future research could hold constant a specified information set on which an earnings forecast was based and vary the source of the earnings forecast.

The issuance of a management forecast is an infrequent event compared to the more routine issuance of an analyst forecast. Among some financial analysts, there is speculation that certain key analysts dominate the analysis of some companies (or industries). A public earnings forecast by the key analyst for any particular company may be an infrequent event. Future research might construct samples of firms that issued management forecasts and also were followed by a key analyst. For the two samples, stock price reactions surrounding the dates of a management earnings forecast and a key analyst earnings forecast could be compared in some fashion. A related extension would be to compute the relative forecast accuracy [(forecast-actual)/actual] of the financial analyst and management samples.

Investigating the Degree of Expertise Variable

In this study, conveying a sense of source expertise was operationalized by including certain qualitative source characteristics (years of work experience and educational level). Future research could use quantitative characteristics to indicate source expertise. Psychology studies have used both qualitative and quantitative characteristics to convey a sense of source expertise. An example of a quantitative characteristic would be the source's degree of forecasting accuracy over a specified period of time. Further, analysis of the

subjects' responses to manipulation check question VII shows that subjects would prefer to know the source personally or have personal knowledge of the source. Although the experimental setting might be difficult to create, an experiment that coupled quantitative information about the source with personal knowledge of the source would be an interesting extension of this study.

## Concluding Remarks

This dissertation was conducted to provide evidence about how investors use certain information in a decision important to the investment process. Theory present in the social psychology literature was the underlying theory on which the quasi-experimental design was based. The results of this study provide an initial step in the process of investigating how investors use various data to predict EPS. Since predicting EPS is, theoretically, an important step in the investment decision process, the results of this study also contribute to the literature regarding how investors use data to make investment decisions.

# APPENDIX A

## THE RESEARCH INSTRUMENT

Subjects who participated in this research were exposed to two treatments. The first treatment was the source (financial analyst or company official) of an earnings forecast. The second treatment was the degree of expertise (high, low, or no indication) of the source of the earnings forecast. Each subject was exposed only to one level of each treatment.

This appendix contains the complete instrument for the high expertise/financial analyst treatments. The instrument is structured as follows:

Page 1 -- Introduction and Instructions

Page 2 -- The Experimental Manipulations
-- Request for Subject's Response

Pages 3-6 -- Manipulation Checks and Background Questions

The wording for the other treatment levels (financial analyst - low and no indication degree of expertise; company official - high, low, and no indication degree of expertise) is presented directly after the experimental instrument.

Thank you for participating in this research project conducted at Indiana University. The purpose of this project is to study how individuals combine information to make judgments. In the following pages you will be asked to read an excerpt from a newspaper article. Based on the information in that article, you will be asked to form a judgment and write down a response. Your response should be based solely on the information provided. There are no right or wrong answers. Your answers are confidential. No one other than the researcher will see them. No individual responses from this study will be reported.

Indiana University requires that before participating in a research project all subjects must consent to participate. Your signature below indicates that you have agreed to participate in this study. You may withdraw at any time if you do not wish to participate. The consent forms will be kept on file for a short time and then will be destroyed.

Several of your colleagues also will be participating in this study. In order to draw valid conclusions from the study, it is necessary that each participant be unaffected by other people's opinions. Therefore, although you may wish to discuss this study with your colleagues, PLEASE DO NOT DISCUSS THE PROJECT IN ANY WAY WITH YOUR COLLEAGUES UNTIL EVERYONE HAS COMPLETED AND RETURNED THE STUDY.

Again, thank you for participating in the project.

_____ _____

Signature Date

At this time, please write down the time of day that you are beginning this project.

_____

A month ago you completed your analysis of American Industries and estimated that American Industries' annual earnings per share for fiscal 1984 (the fiscal year to be completed 10 months from today) would range between $2.75 - $3.05. Your best point estimate of American Industries' fiscal 1984 earnings per share was $2.90. Your range and point estimates were based upon the analysis you normally complete for the projects assigned to you. In this morning's Wall Street Journal, you read the following:

Analyst Estimates American Industries' Earnings

> Mr. Don Johnson, senior financial analyst with the national brokerage firm of Smith and Company, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. However, a colleague who works in your section knows Mr. Johnson and told you that Mr. Johnson has an MBA degree in finance and an undergraduate degree in accounting. Mr. Johnson has been with Smith and Company for 10 years, and he has followed American Industries' industry exclusively for the past 6 years.

Based solely on the information above and assuming that you previously have not talked to Mr. Johnson, what is your best point estimate of American Industries' fiscal 1984 earnings per share?

_____

AFTER YOU HAVE COMPLETED THIS PAGE, TAKE OUT THE CONTENTS OF THE ATTACHED ENVELOPE.

Please answer the following questions in the order presented. Each question will ask you to indicate your response by circling a number on a scale, checking a box, or listing certain items of information. Please consider each question carefully before you answer.

I. The previous pages presented an excerpt from a newspaper article that reported estimated earnings per share (EPS) data for American Industries. How realistic was this setting? Please circle your answer.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not highly realistic | | | | | | | | Highly realistic |

II A. Your colleague described the financial analyst as follows:

> Mr. Johnson has an MBA degree in finance and an undergraduate degree in accounting. Mr. Johnson has been with Smith and Company for 10 years, and he has followed American Industries' industry exclusively for the past 6 years.

How would you evaluate the ability of the financial analyst who prepared the earnings forecast to forecast accurately American Industries' fiscal 1984 EPS?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Low ability | | | | | | | | High ability |

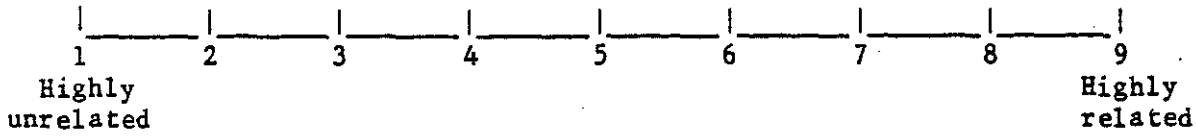
B. Please respond to the following statement.

The financial analyst who prepared American Industries' fiscal 1984 earnings forecast would be motivated to prepare an EPS forecast that was

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Highly pessimistic | | | | Neither optimistic nor pessimistic | | | | Highly optimistic |

III. To what extent do you believe that the following characteristics are related to an external financial analyst's ability to forecast accurately EPS?

A. Education




B. Length of work experience

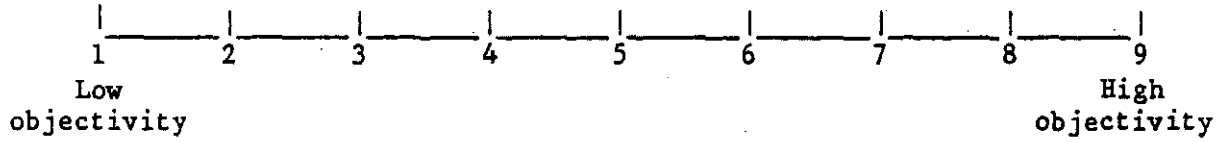

C. What other factors do you believe are related to a financial analyst's ability to accurately predict EPS?

1._____

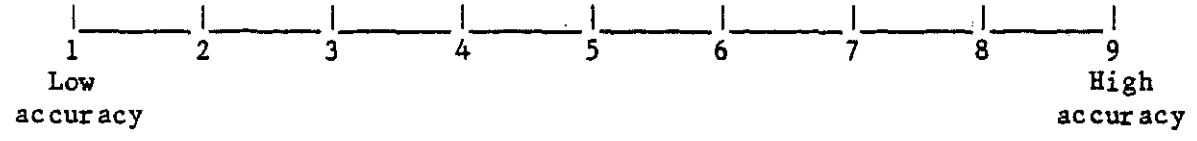
2._____

3._____

IV. How would you evaluate the objectivity of the financial analyst who prepared American Industries' fiscal 1984 earnings forecast?




V. How accurately do you believe that the financial analyst who prepared American Industries' fiscal 1984 earnings forecast is able to forecast EPS 10 months before year end?



VI. When you prepare your own forecasts of earnings per share, usually you gather large amounts of information on which to base your forecast. Listed below are several sources of information plus space to add additional sources of information. Please rank from most important to least important the sources listed below. You may add any additional sources you normally use. The most important source should be given a rating of 1. Larger numbers imply the source is less important. If you do not normally use a source listed below, write NU (not used) in the blank. For your benefit, the types of information have been separated into three groups -- historical, expectational, and other data. Do not rank within groups. Rank all your sources by one scale. Read all the possible responses before answering.

| | Rank | Source |
|---|---|---|
| Historical Data: | | Financial Statement Information |
| | ____ | Income Statements |
| | ____ | Balance Sheets |
| | ____ | Statements of Changes in Financial Position |
| | ____ | Auditor Opinions |
| | ____ | Footnotes to Financial Statements |
| | ____ | Return on Equity/Assets/etc. Data |
| | ____ | S&P 500 Earnings |
| | ____ | S&P 500 Dividends |
| | ____ | Dividend Payout Ratio |
| | ____ | Company Beta or Other Measure of Risk |
| | ____ | _____ |
| | ____ | _____ |
| | ____ | _____ |
| Expectational Data: | ____ | Analysts Forecasts of Earnings |
| | ____ | Management Forecasts of Earnings |
| | ____ | Forecasts of Earnings Generated by Some Mathematical Model (Regression, Box-Jenkins, etc.) |
| | ____ | General Macro-economy Forecast |
| | ____ | General Industry Forecast |
| | ____ | The Company's Internal Budget for the Upcoming Year |
| | ____ | _____ |
| | ____ | _____ |
| | ____ | _____ |
| Other Data: | ____ | Direct Contacts with Members of Management |
| | ____ | _____ |
| | ____ | _____ |
| | ____ | _____ |

If you use historical data, generally do you use (check one):

five years _____ ten years _____ Other (specify) _____

VII. In general, when you are using a financial analyst's earnings forecast as part of your analysis of a company, how important is it to you that you know either the analyst personally or of the analyst's reputation?

|_____|_____|_____|_____|_____|_____|_____|_____|
1 2 3 4 5 6 7 8 9

Not very important — Very important

VIII. The accuracy of an earnings forecast sometimes is judged by computing the percentage forecast error. The percentage forecast error is computed as follows.

$$\text{Percentage forecast error} = \frac{\text{Forecasted EPS} - \text{Actual EPS}}{\text{Actual EPS}}$$

For instance, a forecasted earnings per share of $1.00 per share and an actual earnings per share of $1.05 would yield a percentage forecast error of -4.8%, while a forecast of $1.00 and actual of $.50 would yield a percentage forecast error of +100%. In general, disregarding the specific facts presented earlier about Mr. Johnson and American Industries, what would you expect the range of average percentage forecast errors of a financial analyst's EPS forecast to be 10 months before the fiscal year end? (± means plus or minus and ≥ means greater than or equal to). Please circle your answer.

±0% ±5% ±10% ±15% ±20% ±25% ±30% ±35% ≥ ±40%

IX. What is your age? _____
What is your sex? M___ F___
How long have you worked as a security analyst? _____
What is your job title? _____

X. Please write down the time of day, now, that you have completed the study. _____

PLEASE PUT THESE PAGES BACK INTO THE ENVELOPE AND RETURN TO THE APPROPRIATE PARTY. YOU SHOULD HAVE SIX PAGES TO PUT IN THE ENVELOPE. INDIANA UNIVERSITY AND THE RESEARCH TEAM WORKING ON THIS PROJECT THANK YOU FOR YOUR PARTICIPATION.

Wording used in the other treatments is shown below.

## The Financial Analyst Treatment

### Low Expertise Treatment

#### Analyst Estimates American Industries' Earnings

Mr. Don Johnson, financial analyst with the national brokerage firm of Smith and Company, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. However, a colleague who works in your section knows Mr. Johnson and told you that Mr. Johnson has an undergraduate degree in finance. Mr. Johnson has been with Smith and Company for 13 months since he graduated from college. He follows American Industries' industry as well as four other industries.

### No Indication Treatment

#### Analyst Estimates American Industries' Earnings

Mr. Don Johnson, financial analyst with the national brokerage firm of Smith and Company, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. Based solely on the information above and assuming that you previously have not talked to Mr. Johnson, what is your best point estimate of American Industries' fiscal 1984 earnings per share?

## The Manager (Company Official) Treatment

### High Expertise Treatment

#### American Industries Estimates Earnings

Mr. Don Johnson, chief financial officer of American Industries, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. However, a colleague who works in your section knows Mr. Johnson and told you that Mr. Johnson has an MBA degree in finance and an undergraduate degree in accounting. Mr. Johnson has been with American Industries for 10 years and has been chief financial officer for the past 6 years.

Low Expertise Treatment

American Industries Estimates Earnings

Mr. Don Johnson, a company official of American Industries, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. However, a colleague who works in your section knows Mr. Johnson and told you that Mr. Johnson has an undergraduate degree in finance. Mr. Johnson has been with American Industries for 13 months since he graduated from college. Mr. Johnson is a member of American Industries' special projects team. Among other things, he spends approximately 20% of his time helping prepare American Industries' annual budget.

No Indication Treatment

American Industries Estimates Earnings

Mr. Don Johnson, a company official of American Industries, yesterday estimated that American Industries' fiscal 1984 earnings will be about $3.75.

You do not know Mr. Johnson personally. Based solely on the information above and assuming that you previously have not talked to Mr. Johnson, what is your best point estimate of American Industries' fiscal 1984 earnings per share?

# APPENDIX B

## THE PILOT STUDIES

Two pilot studies were conducted prior to the administration of the experimental study to the bank security analysts. The first pilot study (hereafter the first pilot), conducted in December 1982, was the first formal attempt to test the experimental instrument. Several different tests were involved to determine the wording and parameters appropriate for the experimental instrument. Subjects for the first pilot were sixty-two MBA students enrolled in a second year finance class at Indiana University. The second pilot study (hereafter the second pilot), conducted in April 1983, was a full scale use of the instrument that, with slight modifications, was administered to the security analysts. Subjects for the second pilot were thirty-eight MBA students enrolled in a second year MBA class at Indiana University. Each pilot study is discussed more specifically in the remainder of this appendix.

### The First Pilot Study

The first pilot differed dramatically from the final study in one respect only. Subjects in the first pilot computed their own prior EPS estimates before they were exposed to the experimental manipulation. The subjects were given five years of historical EPS on which to base their priors. After being exposed to the experimental treatments, subjects were asked to provide revised EPS estimates.

The use of historical EPS data to allow subjects to compute their priors was later abandoned. As Appendix C shows, the security analysts subjects used in this research required much more information than historical EPS data when predicting EPS. Also, having the subjects anchor on an amount before they computed their revised estimates could be a threat to the internal validity of the experiment (see Chapter III) because the initial estimate elicitation process might be considered a pretest.

There were other differences between the pilot instrument and the final instrument. Primarily, the exact wording of the manipulation check and information gathering questions evolved because of both pilot studies. The first pilot was the basis for several decisions about what to include in the second pilot. The important research design questions answered by the first pilot were:

What qualitative characteristics should be used to indicate source expertise

What source description should be used

Should the earnings forecast be positive (higher than previous estimates) or negative (lower than previous estimates)

What should be the magnitude of the earnings forecast that would cause subjects to revise their EPS estimates

## Qualitative Characteristics Used to Indicate Source Expertise

In the first pilot, four types of information were used to convey the degree of source expertise. In the order encountered by the subjects, the information included the source's job title, level of education, length of work experience, and indication of professional certification. Each of these items was considered to be appropriate for the task at hand. Also, each item was consistent with qualitative source information used in previous psychology literature (see Chapter

II). In a follow-up question, subjects were asked to list which characteristic (education, professional certification, and length of work experience) was the most important and which was the least important in contributing to a source's ability to predict EPS accurately. Also, the subjects completed a Likert scaling question asking them to rate each characteristic regarding its relationship to the source's ability to predict EPS accurately.

Overwhelmingly, subjects listed length of work experience as the most important characteristic and professional certification as the least important characteristic. Education was mentioned as both the most and least important characteristic. Regarding the Likert scaling question, subjects were asked:

> To what extent do you believe the following characteristics are related to a [source's] ability to accurately predict EPS?

Subjects answered on a 1 (very highly unrelated) to 9 (very highly related) scale. Based on sixty-two responses, the average answer was 7.54 for length of work experience, 6.33 for education, and 5.30 for professional certification.

From the subjects' responses, it was clear that they felt that length of work experience was the most important characteristic and professional certification was the least important. In order to keep the amount of information given to participating subjects to a necessary minimum, professional certification information was not included in the second pilot or the final study.

Description of the Source

The first pilot used five levels of source expertise: high, medium A, medium B (where medium B indicated lower expertise than medium A), low, and no indication. The purpose of testing various descriptions

was to determine the lowest degree of expertise description that would be considered credible by subjects and cause the subjects to revise their prior estimates.

Of the sixty-two subjects (who generated sixty usable responses) participating in the first pilot, nineteen (32%) did not revise their prior estimates. Of the nineteen, nine (47%) were in the no indication expertise group and six (32%) were in the low expertise group. Since there were eleven subjects in the low expertise group, 55% (six of eleven) did not revise their prior estimates This result seemed to imply that the low expertise description was not sufficient to convey the impression of a credible source. Thus, the medium B description became the lowest acceptable description of a credible source. The medium B description was labeled the low expertise description in the second pilot and the final study.

The final study used three levels of source expertise (high, low, and no indication). Each level of expertise was conveyed by describing the source as having a certain job title, level of education, and length of work experience (see Appendix A for the experimental instrument).

Positive or Negative Earnings Forecast

Two overriding experimental constraints were known at the time the first pilot was conducted. First, a limited number of volunteer subjects would be available. Second, designing a brief instrument would encourage more subjects to take the time to participate. Also known at the time the first pilot was conducted was the desired nature of the experimental design. A full factorial, between subjects, nonrepeated measures design was desired.

The final study was designed to assess whether the information

about the source of an earnings forecast (two levels), the degree of expertise of the source (three levels), and the new earnings forecast (one level) affect subjects' EPS estimates. The new earnings forecast was 30% higher than the subjects' prior estimates. A more complete design could have treated the earnings forecast as a separate factor and varied the level of the forecast. For example, one-half of the subjects could have been presented with an earnings forecast that was 30% lower than the subjects' prior EPS estimates.

Primarily, there are three ways that a negative earnings forecast could have been introduced. First, the full factorial, between subjects, nonrepeated measures design could have been maintained by exposing one-half of the subjects to the negative information. This would have meant doubling the sample size, an unacceptable alternative given limited subject availability. Second, the design could have been changed to a repeated measures design where subjects were asked to complete two or more cases. Including more cases would have lengthened the instrument. Again, this alternative was rejected. The third method would have been to use a partial factorial design. In a partial factorial design all subjects do not receive exposure to all treatments. Using a partial factorial design causes a researcher not to be able to study some higher order interactions; thus, the use of a partial factorial design was also rejected.

However, it is important to know whether subjects would behave differently in the face of positive and negative information. The first pilot was used to examine this issue. The high expertise group was subdivided into two levels, high positive (an earnings forecast of 3.25 or 10% higher) and high negative (an earnings forecast of 2.66 or 10% lower). Combined with the source manipulation (two levels) a subject receiving the high expertise treatment was placed in one of

four groups. Twenty subjects received the high expertise treatment.

Comparing the subjects' revised EPS estimates to their prior EPS estimates produced mean difference scores. An analysis of the absolute values and the variance of the mean difference scores for the high positive and high negative groups showed absolute values of .18 and .17 and pooled variances of .027 and .017, respectively. Thus, the first pilot provided evidence that subjects were not influenced by the direction of the earnings forecast. Accordingly, only a positive earnings forecast was used in the second pilot and the final study.

The Magnitude of the Earnings Forecast

The first pilot required subjects to report prior EPS estimates before they were exposed to the experimental treatments. The prior estimates were based on five years of EPS data given to the subjects. To ensure that each subject anchored on approximately the same prior estimate, the five years of EPS data had a tightly controlled 5% upward growth trend. A subject picking up on the trend should have anchored on approximately $2.92 as a prior EPS estimate. The subjects participating did in fact pick up on the trend and created an average prior estimate of $2.92 (with a .005 variance).

In order to be considered new information, the forecast should be different enough from prior estimates to cause subjects to revise their estimates. In the first pilot, the earnings forecast was $3.25, 10% above $2.92. It was assumed that a 10% change would be sufficient to cause the subjects to revise their estimates. The 10% level was insufficient to cause the desired reaction by the subjects. Of the 60 participating subjects, 19 (32%) did not revise their estimates. Therefore, a 10% change was abandoned as a parameter. Determining an appropriate percentage change was a primary purpose of the second pilot.

## The Second Pilot Study

The second pilot, conducted in April 1983, was the final attempt to test the instrument before it was administered to the bank analyst subjects. Thirty-eight MBA students in a second year MBA class in investments at Indiana University were the subjects. In addition, an undergraduate class in investments, comprised primarily of seniors, was used to test one particular parameter of interest. Specifically, a major research design question was answered: What should be the magnitude of the new information, the earnings forecast? Only slight changes were made to the final instrument after the pilot study. The rest of this section discusses the major question resolved by the pilot study and analyzes the pilot data.

### The Background Information

The second pilot instrument was almost the same as the final instrument (see Appendix A). Subjects were given certain background information that was constant for all experimental groups. That information included the subject's previous EPS estimate, $2.90, made one week ago; a new earnings forecast of $3.75 (approximately 30% greater than the previous estimate of $2.90); and the fact that the forecast was reported in The Wall Street Journal. Other information was systematically varied across groups. The source was described as a financial analyst or a company official. Descriptions of the source were presented to indicate high, low, or no indication of source expertise.

### The Magnitude of the New Information (the Earnings Forecast)

The major question to be answered in the second pilot was what amount to use for the earnings forecast. The first pilot established

that a 10% difference between subjects' prior estimates and the earnings forecast was not sufficient to cause subjects to revise their estimates (the dependent variable). For the second pilot a class of thirty-eight MBA students was given the complete pilot instrument. The earnings forecast in that instrument was $3.75, approximately 30% higher than the $2.90 subjects' prior estimate.

A 30% differential between the earnings forecast and the subjects' prior EPS estimate was used for two reasons. First, the key contact security analysts at each participating bank were asked the question:

> In general, how accurate do you believe an analyst's EPS forecast would be 10 months in advance?

The contact security analysts' responses were approximately 15%-20%. The 20% threshold also was supported by Danos and Imhoff (1982) who conducted a study with auditors who were experienced in working with clients' internal budgets. The auditors reported that they would expect 20% to be a reasonable error rate for net earnings predictions approximately one year in advance. In their experiment Danos and Imhoff used a 30% forecast error rate to indicate that a substantial difference had occurred. For this experiment, a 30% earnings forecast differential seemed appropriate.

However, to make sure that it was necessary to use a 30% differential, the high expertise manipulation was administered to an undergraduate investments class. In that experiment the high expertise source was varied over two levels (financial analyst and company official) and the amount of the earnings forecast was varied over two levels (30% and 20% greater than the subjects' prior EPS estimates).

## The Dependent Variables

The dependent variable in the second pilot was a subject's

estimate, ten months in advance, of a hypothetical company's EPS. Table 7 presents the dependent variable, classified by group, reported by the subjects.

Analysis of the Dependent Variable Data

The technique used to analyze the subjects' revised EPS estimates, the dependent variable, was analysis of variance (ANOVA). Table 8 presents the ANOVA table for the revised EPS estimates. The ANOVA table indicates that two variables were significant. First, the source of the forecast was a significant variable ($F = 4.14$, $p = .05$). Also, the interaction between the source and degree of expertise variable was significant ($F = 3.56$, $p = .04$). The degree of expertise variable was not significant ($F = 1.72$, $p = .20$).[1]

In graph form, Exhibit 8 shows the group means of the management and analyst revised EPS estimates for each of the three levels of expertise. The graphic analysis presents a clear picture of the mean responses. For the high expertise group, the average estimate ($3.16) for the management group was ten cents (3.3%) higher than the average estimate ($3.06) for the financial analyst group. For the low expertise group, the management group estimate ($3.33) was forty cents (13.7%) higher than the financial analyst group estimate ($2.93); and for the no indication expertise group the management group estimate ($2.95) was six cents (2.0%) lower than the financial analyst group ($3.01).

Clearly, the data show that subjects reacted most strongly to the source manipulation when the source had low expertise. When the source had high expertise or when there was no indication of the source's expertise, the subjects produced mean revised EPS estimates that were not very different. When information about the source's expertise was

Table 7

Dependent Variables (EPS Estimates) for the Second Pilot

| Source: | Degree of Expertise | | | | | | |
|---|---|---|---|---|---|---|---|
| | High | | Low | | No Indication | | Total |
| Financial Analyst | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | |
| | 2.90 | 3.25 | 2.90 | 2.90 | 2.90 | 3.00 | |
| | 2.90 | 3.90 | 2.90 | 2.90 | 2.90 | 3.20 | |
| | | | | 3.10 | | 3.25 | |
| | n = 6 Mean=3.06 | | n = 7 Mean=2.93 | | n = 7 Mean=3.01 | | n = 20 Mean=3.00 |
| Manager | 2.90 | 3.33 | 2.90 | 3.25 | 2.90 | 3.00 | |
| | 2.90 | 3.40 | 3.10 | 3.75 | 2.90 | 3.00 | |
| | 2.90 | 3.50 | 3.20 | 3.75 | 2.90 | 3.00 | |
| | n = 6 Mean=3.16 | | n = 6 Mean=3.33 | | n = 6 Mean=2.95 | | n = 18 Mean=3.15 |
| TOTAL | n = 12 Mean=3.11 | | n = 13 Mean=3.11 | | n = 13 Mean=2.98 | | n = 38 Mean=3.07 |

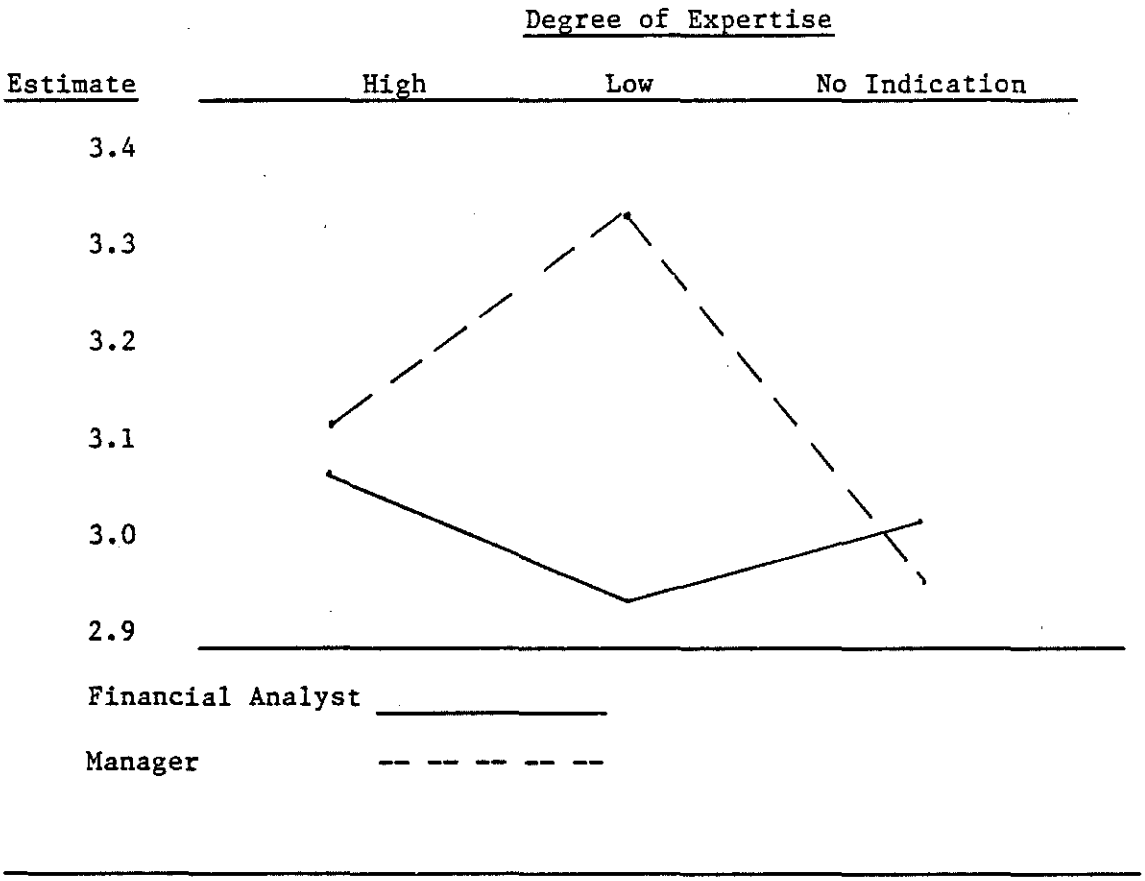
Table 8

ANOVA Results for the Second Pilot

| | Sum of Squares | Degrees of Freedom | Mean Square | F Statistic | P |
|---|---|---|---|---|---|
| Source | .1658 | 2 | .0829 | 1.72 | .20 |
| Degree of Expertise | .1976 | 1 | .1996 | 4.14 | .05 |
| Interaction | .3432 | 2 | .1716 | 3.56 | .04 |
| Error | 1.5420 | 32 | .0482 | | |
| | | 37 | | | |

Exhibit 8

Average Group Mean For Revised EPS Estimates



present, subjects reacted much more strongly to a management forecast than to an analyst forecast. The significant interaction effect occurred because subjects reacted more strongly to the analyst forecast in the no indication source expertise groups.

## The Manipulation Checks

The manipulation check and background questions that were part of the second pilot are not presented here. Several of the questions were changed slightly in the final instrument (see Appendix A). However, the results of the manipulation checks were consistent with the results of the ANOVA.

## Conclusion

After reviewing the results of the second pilot study, it was decided that it was appropriate to administer the final study to the security analysts. The ANOVA confirmed that the source of an earnings forecast was a significant variable and that subjects' estimates of EPS were affected more by management earnings forecasts than financial analysts' earnings forecasts when information about the source's degree of expertise was available. An earnings forecast that was 30% higher than prior estimates seemed to be sufficiently different to be treated as new information. Chapter IV presents a detailed analysis of the experimental data.

# APPENDIX B ENDNOTES

1. ANOVA is most powerful with equal sample sizes. A second ANOVA was run with equal sample sizes. One observation, the nearest to the average observation, was thrown out of each of the two groups that had a sample size of seven. The source and interaction variables were still significant at the $p = .068$ and .062 levels, respectively.

# APPENDIX C

## ANALYSIS OF BACKGROUND QUESTION SURVEYING SUBJECTS ABOUT WHAT DATA THEY USE WHEN PREDICTING EPS

After the subjects prepared their revised EPS forecasts (the dependent variables), they answered several manipulation check questions and background questions. One specific background question was a survey question that asked the subjects to rank seventeen items regarding how important each item is when the subject prepares an EPS forecast. Appendix A contains the survey question, which is numbered as question VI. The seventeen items are familiar as items that historically have been used to prepare expectational data such as budgets and earnings forecasts. The purpose of question VI was to determine the extent of agreement among the subjects regarding what variables they feel are important when preparing EPS projections. Before being included in the survey, each item was reviewed by key contact security analysts at each bank to ensure that no item routinely used at the analyst's bank was omitted from the list.

The seventeen items were grouped under three headings -- historical data, expectational data, and other data. Subjects were instructed to rank order the items from most important (assigned a rank of 1) to least important. If the subject did not use the item when preparing EPS forecasts, the subject was to so indicate by writing NU (not used) by the item. If the subject used items not found on the list, space was provided for the subject to include the item.

As is well known, survey research has certain limitations. Survey

questions collect responses regarding what information respondents say they use when making judgments. Whether subjects actually use the data in the way they report cannot be determined in a survey. Also, a survey question usually requires a subject to respond to a limited set of alternatives. In a question such as question VI, the subject may be asked to rank items that the subject actually does not use or, conversely, may not find items on the list actually used by the subject.

The construction of the survey question used in this study attempted to minimize the effect of the limitations of survey research. Items only were included in the survey if there was reason to believe the analyst would use them. Most of the items are suggested in textbooks dealing with basic financial analysis. Two of the items were added specifically because security analysts indicated they are widely used. Also, the question was constructed to encourage subjects to add or delete items from the list.

Subjects were asked to rank all seventeen items on the same scale (i.e., across the groupings of historical, expectational, and other data). However, some of the subjects ranked the items within each group. This, of course, makes comparability impossible between responses that were ranked across groupings and those ranked within each grouping. According, the responses are analyzed separately. Forty-one subjects participated in this study. The forty-one subjects produced forty usable responses to question VI. Of the forty responses, thirty were ranked across groupings and ten were ranked within groups.

The results of the survey question were analyzed using BMDP Statistical Software (1981) program BMDP3S. BMDP3S calculates two

nonparametric statistics, Friedman's X statistic (two way analysis of variance for k matched samples) and Kendall's W statistic (coefficient of concordance). Also, a significance level, which assumes a chi square distribution with N-1 degrees of freedom, is printed. Both Friedman's X statistic and Kendall's W statistic are appropriate nonparametric statistical tests when N judges rank order k items. Friedman's X statistic tests the null hypothesis that the average rank for any of the k items is equal to the average rank of the other items. Kendall's W statistic indicates the degree of concordance (agreement or similarity) of judges' rankings of all items. A discussion of Friedman's X statistic and Kendall's W statistic is included in the BMDP reference manual (p. 441). Nonparametric statistical textbooks such as Conover (1971, pp. 264-270) also contain discussions of the statistics.

BMDP3S cannot calculate test statistics if there are missing data (i.e., an item is not ranked). Respondents to survey question VI often did not rank all seventeen items. The usual reason for not ranking an item was to indicate that the item was not used. However, sometimes a subject simply left blank the space where the rank was to be placed. In order to format the data so that BMDP3S could analyze the data, ranks were assigned to all items scored as not used or left blank. The items were assigned the average of the unused rankings. For example, if a judge ranked 15 items, indicated that one item was not used, and left one item blank, then the items not used or left blank were each assigned an average rank of 16.5 [(16 + 17)/2].

## Responses Ranked Across Groups

Table 9 presents summary statistics (mean, standard deviation, and the range of values) regarding the thirty responses that ranked all

Table 9

Summary Statistics Regarding Thirty Responses That Ranked Seventeen Data Items Across Groups

| Survey Item* | Mean | Standard Deviation | Range | Number of Times Item Not Ranked |
|---|---|---|---|---|
| HISTORICAL | | | | |
| F/S Info | | | | |
| I/S | 3.7 | 2.7 | 1 -- 10 | -- |
| B/S | 5.7 | 2.6 | 1 -- 9.5 | -- |
| SCIFP | 6.9 | 3.0 | 2 -- 14 | -- |
| Opinion | 12.4 | 4.1 | 3.5 -- 17 | 6 |
| F/N | 7.0 | 3.5 | 2 -- 16 | -- |
| ROE/etc. | 6.4 | 3.4 | 2 -- 14 | 1 |
| S&P 500 Earn | 12.2 | 3.4 | 1 -- 16 | 8 |
| S&P 500 Divid | 14.2 | 1.3 | 11 -- 16 | 13 |
| Divid Payout | 13.4 | 2.6 | 5 -- 16 | 9 |
| Beta | 13.5 | 2.3 | 5 -- 16 | 12 |
| EXPECTATIONAL | | | | |
| AF | 8.1 | 4.3 | 1 -- 17 | 1 |
| MF | 6.9 | 4.1 | 1.5 -- 16 | -- |
| Mec F | 13.7 | 2.7 | 8 --17 | 11 |
| Econ F | 5.9 | 3.6 | 1 -- 13 | -- |
| Ind F | 5.4 | 3.3 | 1 -- 13 | -- |
| Budget | 10.4 | 5.1 | 1 -- 17 | 8 |
| DIRECT CONTACT | 7.6 | 5.4 | 1 -- 17 | 1 |

*For a complete description of the abbreviated items in this column, see Appendix A, Question VI.

where lower numbers indicate more importance

seventeen data items across groups. As discussed previously, items that were not ranked (left blank or scored as not used) were assigned the average of all unused ranks. Also, Table 9 indicates the number of times a particular item was not scored (left blank or marked as not used). The results of Table 9 are striking for the heterogeneity of the responses. The obvious heterogeneity is underscored by the outcome of the statistical test on the null hypothesis that the average rank of each item is equal. The null hypothesis of equal average ranks is rejected at the $p < .0001$ level. The significance test is based upon a chi square distribution with N-1 degrees of freedom (where N equals the number of items being ranked).

Another statistical way of analyzing the data is simply to count the number of times an item is listed as relatively important or relatively unimportant. Table 10 presents an analysis of the responses that lists the number of times an item was listed as one of the three <u>most</u> important items and the number of times that an item was listed as one of the three <u>least</u> important items. The use of the number three was an arbitrary choice on the part of this researcher.

The heterogeneity of the thirty responses is emphasized by the fact that eight of the seventeen items are listed in both columns in Table 10. An item being listed in both columns means that at least one analyst scored the item as one of the three most important variables while at least one other analyst ranked the item as one of the three least important items (or failed to rank the item).

It is possible to use the results of both Tables 9 and 10 to create lists of how the respondents ranked the seventeen items in order of importance. Of course, since Tables 9 and 10 were created using

Table 10

Number of Times an Item Was Scored As One of the Three Most and Three Least Important Items

| Survey Item | Most Important | Least Important |
|---|---|---|
| HISTORICAL | | |
| F/S Info | | |
| I/S | 16 | 0 |
| B/S | 6 | 0 |
| SCIFP | 3 | 0 |
| Opinion | 0 | 14 |
| F/N | 5 | 2 |
| ROE/etc. | 6 | 1 |
| S&P 500 Earn | 1 | 8 |
| S&P 500 Divid | 0 | 16 |
| Divid Payout | 0 | 15 |
| Beta | 0 | 16 |
| EXPECTATIONAL | | |
| AF | 3 | 3 |
| MF | 6 | 1 |
| Mec F | 1 | 18 |
| Econ F | 10 | 0 |
| Ind F | 10 | 0 |
| Budget | 4 | 9 |
| DIRECT CONTACT | 9 | 5 |
| Number of Surveys Used | 27 | 28 |

different methodologies, the lists do not correspond exactly. However, overall the lists rank items relatively similarly.

Table 11 presents two lists ranking each item in importance. One list is based on Table 9 and one list is based on Table 10.

## Responses Ranked Within Groups

Ten subjects ranked the seventeen items within groups rather than across groups. Table 12 presents an analysis of the rankings of the items within groups. The BMDP3S program was used to analyze the data. Table 12 reflects heterogeneous rankings, especially in the expectational data group. The null hypothesis that any item's average rank is equal to the average rank of other items was rejected at the $p < .0000$ level and the $p = .0075$ level for the historical data and expectational data groups, respectively.

## Conclusions

The information gathered in survey question VI indicates that subjects produced heterogeneous rankings when selecting items in order of importance to the problem of forecasting EPS. Subjects indicated that both historical data, primarily income statements and balance sheets, and expectational data, primarily forecasts of economy and industry information, play prominent roles in their decision processes when they forecast EPS. However, due to the heterogeneity of the subjects' responses, it is not possible to create a model that describes how security analysts say that they use selected data when predicting EPS. Of particular interest to this study is the fact that subjects indicated they do use earnings forecasts prepared by management and financial analysts with more emphasis placed on management earnings forecasts.

Table 11

Lists of How Subjects Ranked the Seventeen Data Items

| | Ranks Based on Data In | |
|---|---|---|
| | Table 9 | Table 10 |
| HISTORICAL | | |
| F/S Info | | |
| I/S | 1 | 1* |
| B/S | 3 | 6* |
| SCIFP | 6.5 | 9.5* |
| Opinion | 13 | 13** |
| F/N | 8 | 7* |
| ROE/etc. | 5 | 6* |
| S&P 500 Earn | 12 | 11** |
| S&P 500 Divid | 17 | 15.5** |
| Divid Payout | 14 | 14** |
| Beta | 15 | 15.5** |
| EXPECTATIONAL | | |
| AF | 10 | 9.5* |
| MF | 6.5 | 6* |
| Mec F | 16 | 17** |
| Econ F | 4 | 2.5* |
| Ind F | 2 | 2.5* |
| Budget | 11 | 8*/12** |
| DIRECT CONTACT | 9 | 4*/10** |

*Based on items listed as most important
**Based on items listed as least important

Table 12

Analysis of Responses Ranked Within Groups

| Survey Item | Mean | Relative Rank* | Standard Deviation | Range | Number of Times Item Not Ranked |
|---|---|---|---|---|---|
| HISTORICAL | | | | | |
| F/S Info | | | | | |
| I/S | 1.7 | 1 | 1.1 | 1 -- 4 | 0 |
| B/S | 3.1 | 2 | 1.1 | 2 -- 5 | 1 |
| SCIFP | 3.3 | 3 | 2.0 | 1 -- 7 | 1 |
| Opinion | 7.8 | 7 | 1.5 | 5 -- 10 | 5 |
| F/N | 5.1 | 5 | 1.8 | 3 -- 9 | 1 |
| ROE/etc. | 3.4 | 4 | 2.1 | 1 -- 7 | 0 |
| S&P 500 Earn | 5.9 | 6 | 2.1 | 3 -- 9 | 3 |
| S&P 500 Divid | 8.9 | 10 | 1.1 | 7 -- 10 | 6 |
| Divid Payout | 7.9 | 9 | 1.1 | 6 -- 9 | 5 |
| Beta | 7.7 | 8 | 1.1 | 5 -- 9 | 4 |
| EXPECTATIONAL | | | | | |
| AF | 2.7 | 2 | 1.3 | 1 -- 4.5 | 0 |
| MF | 2.3 | 1 | 1.3 | 1 -- 5 | 0 |
| Mec F | 4.9 | 6 | 1.3 | 2 -- 6 | 2 |
| Econ F | 3.1 | 3.5 | 1.8 | 1 -- 5 | 0 |
| Ind F | 3.1 | 3.5 | 1.1 | 2 -- 5 | 0 |
| Budget | 4.6 | 5 | 1.8 | 1.5 -- 6 | 2 |
| DIRECT CONTACT | 1 | 1 | 1 | 1 -- 1 | 3 |

*Items ranked within each category are based on mean scores. where lower numbers indicate more importance

# APPENDIX D

## DATA COLLECTED

Table 13 contains all the raw data collected in the field experiment except for the responses to Question VI, which are discussed in Appendix C. The instrument used to collect the data is contained in Appendix A.

Table 13

Raw Data Collected in the Field Experiment

| Item | Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Source(*) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Degree(**) | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Estimate | 2.90 | 3.05 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 |
| I | 3 | 5 | 3 | 1 | 6.5 | 8 | 3 | 3 |
| IIA | 7 | 7 | 6 | 5 | 7.5 | 7 | 4 | 4 |
| IIB | 6 | 5 | 7 | 7 | 7.5 | 5 | 7 | 5 |
| IIIA | 6 | 5 | 6 | 4 | 7.5 | 8 | 7 | 4 |
| IIIB | 7 | 7 | 6 | 6 | 2.5 | 7 | 7 | 6 |
| IV | 4 | 4 | 5 | 3 | 4.5 | 8 | 5 | 5 |
| V | 7 | 5 | 4 | 6 | 4.5 | 6 | 5 | 5 |
| VII | 6 | 9 | 7 | 8 | 8.5 | 9 | 8 | 8 |
| VIII | 10 | 20 | 15 | -- | 25 | 15 | 33.3 | 20 |
| IX: Age | 25 | 26 | 32 | 38 | 25 | 28 | 21 | 24 |
| Sex(#) | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 |
| Experience | 2 | 2.5 | 6.5 | 5 | 1 | 6 | .15 | 2 |
| X | 15 | 10 | 10 | 8 | 20 | 20 | 12 | 18 |
| Bank(##) | 1 | 1 | 2 | 2 | 3 | 4 | 1 | 1 |

(*) 1 = financial analyst, 2 = manager
(**) 1 = high, 2 = low, 3 = no indication
(#) 1 = male, 2 = female
(##) 1-5 designates banks 1-5

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Table 13 (Continued)

| Item | Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Source(*) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Degree(**) | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| Estimate | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 |
| I | 6 | 7 | 2 | 1 | 9 | 5 | 7 | 6 |
| IIA | 4 | 3 | 4 | 4 | 5 | 5 | 5 | 3 |
| IIB | 6 | 7 | 5 | 5 | 5 | 6 | 6 | 5 |
| IIIA | 6 | 8 | 2 | 6 | 5 | 4 | 5 | 5 |
| IIIB | 7 | 8 | 8 | 7 | 5 | 8 | 8 | 6 |
| IV | 8 | 6 | 5 | 9 | 5 | 5 | 6 | 3 |
| V | 6 | 6 | 3 | 5 | 8 | 5 | 3 | 3 |
| VII | 9 | 6 | 9 | 9 | 8 | 7 | 9 | 8 |
| VIII | 20 | 10 | 10 | 15 | -- | 20 | 20 | -- |
| IX: Age | 30 | 23 | 28 | 48 | 26 | 22 | 25 | 31 |
| Sex(#) | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| Exper | 6 | .25 | 2.5 | 16 | 2 | .15 | 1.5 | 7 |
| X | 20 | 10 | 20 | 20 | 10 | 10 | 15 | 15 |
| Bank(##) | 1 | 2 | 2 | 3 | 3 | 1 | 1 | 1 |

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Table 13 (Continued)

| Item | Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Source(*) | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Degree(**) | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 |
| Estimate | 3.50 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 | 2.90 |
| I | 1 | 8 | 5 | 6 | 4 | 3 | 6 | 3 |
| IIA | 5 | 5 | 3 | 5 | 5 | 3 | 6 | 6 |
| IIB | 7 | 5 | 7 | 5 | 5 | 7 | 7 | 6 |
| IIIA | 7 | 6 | 4 | 7 | 2 | 5 | 5 | 7 |
| IIIB | 8 | 7 | 7 | 6 | 5 | 8 | 8 | 5 |
| IV | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 5 |
| V | 5 | 4 | 5 | 3 | 5 | 3 | 5 | 7 |
| VII | 9 | 8 | 7 | 9 | 5 | 8 | 9 | 7 |
| VIII | 20 | 25 | 15 | 20 | 15 | -- | 10 | -- |
| IX: Age | 35 | 30 | 38 | 27 | 29 | 35 | 28 | 31 |
| Sex | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| Exper | 11 | 3.25 | 15 | 3 | 1 | 10 | 4 | 1.5 |
| X | 7 | 24 | 5 | 5 | 15 | 10 | 10 | 16 |
| Bank(##) | 2 | 2 | 3 | 3 | 3 | 4 | 1 | 1 |

CONTINUED ON NEXT PAGE

Table 13 (Continued)

| Item | Data | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Subject | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| Source(*) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Degree(**) | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| Estimate | 2.90 | 2.90 | 3.57 | 3.05 | 3.50 | 3.70 | 3.35 | 2.90 |
| I | 3 | 3 | 7 | 2 | 1 | 5 | 5 | 2 |
| IIA | 7 | 5 | 9 | 3 | 5 | 3 | 3 | 5 |
| IIB | 5 | 7 | 7 | 6 | 6 | 5 | 7 | 5 |
| IIIA | 7 | 3 | 7 | 5 | 4 | 2 | 7 | 3 |
| IIIB | 6 | 3 | 8 | 6 | 6 | 4 | 7 | 3 |
| IV | 5 | 3 | 8 | 4 | 5 | 5 | 5 | 3 |
| V | 5 | 3 | 5 | 3 | 6 | 3 | 6 | 5 |
| VII | 7 | 8 | 1 | 6 | 4 | 9 | 8 | 9 |
| VIII | 20 | 25 | 10 | 20 | 23 | 5 | 10 | 25 |
| IX: Age | 53 | 27 | 35 | 31 | 35 | 29 | 35 | 34 |
| Sex(#) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| Exper | 25 | 3 | 2 | 4 | 5 | 5 | 10 | .5 |
| X | 10 | 10 | 18 | 5 | 10 | 20 | 20 | 10 |
| Bank(##) | 3 | 5 | 5 | 1 | 1 | 2 | 2 | 3 |

CONTINUED ON NEXT PAGE

Table 13 (Concluded)

| Item | Data | | | | |
|---|---|---|---|---|---|
| Subject | 33 | 34 | 35 | 36 | 37 |
| Source(*) | 2 | 2 | 2 | 2 | 2 |
| Degree(**) | 3 | 3 | 3 | 3 | 3 |
| Estimate | 3.20 | 2.90 | 3.00 | 3.25 | 2.90 |
| I | 6 | 7 | 3 | 6 | 6 |
| IIA | 5 | 3 | 3 | 6 | 4 |
| IIB | 5 | 5 | 5 | 6 | 5 |
| IIIA | 6 | 1 | 5 | 3 | 3 |
| IIIB | 7 | 6 | 8 | 7 | 6 |
| IV | 4 | 4 | 5 | 6 | 6 |
| V | 5 | 4 | 3 | 6 | 3 |
| VII | 9 | 8 | 9 | 9 | 7 |
| VIII | 15 | 25 | 25 | 20 | 10 |
| IX: Age | 32 | 35 | 24 | 28 | 30 |
| Sex(#) | 1 | 1 | 1 | 1 | 2 |
| Exper | 2 | 6 | 1 | 1 | 5 |
| X | 10 | 10 | 10 | 25 | 17 |
| Bank(##) | 1 | 1 | 3 | 3 | 5 |

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PUBLICATIONS:

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