THE EFFECT OF TIME ON REVISIONS TO EARNINGS
PER SHARE FORECASTS BY FINANCIAL ANALYSTS

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Title of Study: THE EFFECT OF TIME ON REVISIONS TO
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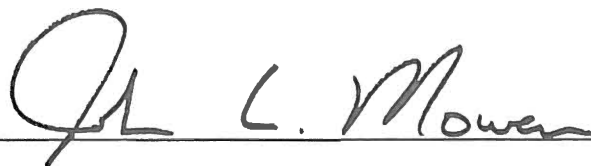Pages in Study: 35   Candidate for Degree of
                                             Master of Business
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Major Field: Business Administration

Scope and Method of Study: This study develops a model that
    tests the decision making theory that as the time for actual
    corporate earnings approaches, financial analysts will make more
    downward adjustments to their earnings forecasts than upward
    adjustments. The period of time encompassed in the study
    includes the early May and early January earnings adjustments
    for the years 1976 through 1987. In order to test for
    statistical significance, two univariate statistical methods
    were used. The first tested the relationship between the total
    number of downward adjustments to the total number of
    adjustments made during the sample period. The second tested
    for a statistically significant difference between observed and
    expected frequency distributions.

Findings and Conclusions: In the test for a significant
    relationship between the number of downward adjustments to the
    total number of adjustments, the null hypothesis is rejected.
    A significant relationship was revealed such that, overall, more
    downward than upward revisions in earnings estimates were made.
    This relationship provides strong support for the organizational
    decision making theory that as the time for an outcome comes
    closer, the decision maker becomes more pessimistic. In the
    test for statistically significant differences between observed
    and expected frequency distributions, the test failed to reject
    the null hypothesis. However, the second test does show
    direction because more downward revisions were observed in
    January than in May which is predicted in the TOV model.

ADVISOR'S APPROVAL _____

THE EFFECT OF TIME ON REVISIONS TO EARNINGS

PER SHARE FORECASTS BY FINANCIAL ANALYSTS

Report Approved:

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Director of Graduate Studies

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"The way to succeed in life is not to spend too much time on an apprenticeship."

                    - Stroker Ace, <u>Stand On It</u>

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Introduction

Decisions, decisions, decisions. People make decisions everyday about things affecting their lives... "where to have lunch, which car to buy, or is this a good investment?" For over forty years, practitioners and professors of decision theory and organizational behavior have been looking into why people make the decisions they do. The actual data is not known, but recent research indicates most of the academic study began in the 1950s.

When individuals encounter a decision dilemma, they frequently employ heuristics to solve the problem. Max Bazerman [1986] defines a heuristic as a rule of thumb individuals develop to reduce the information processing demands required in decision making. Such heuristics enable persons to make complex decisions more efficiently. Much of the time decisions result in good judgments. However, such decision techniques can produce biased results. A bias can be illustrated as when the decision maker bases his or her decision on factors other than the immediate problem. Webster [1985] defines a bias as having a settled and often prejudiced outlook on a situation.

Bazerman also describes one such bias, called the hindsight bias. It can be described as the effect of previous knowledge of an outcome falsely increasing the decision maker's confidence in the accuracy in predicting a particular outcome without previous knowledge.

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Closely related to the hindsight bias is the outcome bias. This bias affects a person's decision based on the outcome of a similar event especially if the previous outcome is readily available from the person's memory. The predictability of the outcome is based on the strong biases applied when one evaluates decisions.

Both of these biases and their associated heuristic are critical to the development of this paper as it relates to decisions financial analysts make regarding adjustments to corporate earnings forecasts.

This research paper is intended to study and test the Time and Outcome Evaluation Model (TOV) [Mowen and Mowen, 1991] as it applies to the adjustment in earnings forecasts by financial analysts over time. Unlike other research on financial earnings forecasts, this paper seeks to determine if the time before an earnings release influences earnings estimates. Specifically, it was expected forecasters would grow more pessimistic as the release of earnings estimates became imminent.

To accomplish this goal, several steps are required. First a review of previously published literature pertaining to financial forecasts and financial analysts will be presented. The literature review will provide a guide as to what, if anything, has been discovered relating to adjustments to earnings forecasts and time.

Earnings forecast adjustment data will be collected, and serve as the basis for statistical analysis. The statistics will

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be used to determine if a significant relationship does exist between time and the adjustment to the earnings forecasts, as the TOV Model suggests. An analysis of the statistical results will follow, and will serve as the basis for the conclusion and recommendations from the study.

The basis for this study is an outgrowth of previous work done in analyzing behavioral decision making and the effects of time by Mowen and Mowen [1991]. Their model called the Time and Outcome Variation (TOV) deals primarily with the issues regarding how persons place value on alternative outcomes and what effect time has on this valuation.

Principally germane to this study is the theory that decision maker's evaluate possible outcomes over a period of time. The TOV model states that when both positive and negative outcomes occur in the future, the tendency is toward optimism. However, when both positive and negative outcomes occur in the present, most decision makers will turn toward risk aversion, rather than risk seeking. It is the primary hypothesis for this study, that as the deadline approaches for corporations to announce actual earnings, financial analysts should make more negative or downward adjustments to their earnings forecasts than upward adjustments.

Chapter II

Survey of the Literature

The purpose of this review is to examine the available publications regarding financial analyst's forecasts, and corporate earnings reports, specifically regarding earnings per share. Unlike the material contained in the following review, this research paper has a goal to be able to predict the behavior of the analysts rather than predict the accuracy of the analyst's forecasts compared with the financial earnings information released by corporate management. For the purposes of this review, a computerized literature search was conducted using key words to identify the existence of published material in journals relating the financial, accounting, and management fields.

The key words utilized in this search include - earnings per share, forecasts, financial forecasts, and financial analyst forecasts. The time frame included for consideration for these articles spanned the years from 1970 to 1990. It was determined that during the twenty year span, most of the currently recognized research regarding financial analyst accuracy and methods was developed. Documents which have provided valuable background information and a good basis for a decision on how to proceed, are included in this review. Those background documents include Organizational Behavior and Human Decision Processes (Coggin & Hunter, 1988), Journal of Accounting Research (Jennings, 1987 & Nichols & Mendenhall, 1988 & Freeman & Tse,

1989 & Collins, & Hopwood, 1980), Management Science (Elton, Gruber, & Gultekin, 1981), The Accounting Review (Hassell & Jennings, 1986 & Waymire, 1986 & Hopwood, McKeown, & Newbold, 1980), The National Association of Accountants (Imhoff, 1980), Institute of Professional Accounting (Brown, Hughes, Roxeff & Vanderweide, 1980).

During this review, the wealth of empirical and professional studies and papers available regarding financial forecasts became very clear. Most of the work found since 1970 dealt primarily with the accuracy of financial analyst's forecasts compared to management forecasts. In the 1950s and early 1960s, the primary method of analysis was the use of univariate time-series tests with the variable being earnings data. Later premier, or hybrid models were developed to provide overall tests of forecast accuracy for a general class of forecasts, rather than develop individual univariate tests. During the 1970s and beyond, multivariate statistical tests, linear and multiple regression methods were used to test the relationship between multiple variables simultaneously. Debate still exists whether the value of the multivariate tests is sufficient to warrant the use of the more sophisticated techniques in predicting forecast accuracy.

For example, the dominant theories during the 1950s and early 1960s were time series theories - meaning theories that make extensive use of extrapolation from historical data. One would then expect the analyst to be strongly influenced by historical earnings growth. The problem was that the analysts

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tended to overestimate the accuracy of the historical data for making their forecasts.

One article stated [Hunter and Coggin, 1988] that most studies of financial analyst's forecasts of earnings growth have considered the forecast as an independent variable with the dependent variable being either forecast accuracy or a combination of accuracy and return on investment. They posed a hypothesis, called the Efficient Market Hypothesis which states that the market almost instantaneously and correctly assimilates all current information and any new information about the economy. This hypothesis correlates with Adam Smith's economic theory of perfect competition where all participants in the market have instantaneous and equal information.

Hunter and Coggin used Kelly's Personal Construct Theory, which emphasizes the role formal and informal theories play in human judgment. This model was pitted against the Efficient Market Hypothesis using two sets of data. The data consisted of professional financial analysts forecasts of company-level earnings in 1963 and from 1979-83. This study was constructed to compare results against other studies [Malkeil and Cragg, 1970]. Their results were very different because they focused on data relating the analyst forecast to historical earnings growth rates rather than analyst accuracy.

They found the Efficient Market Hypothesis was not supported using either data set, and Personal Construct Theory was supported on the second data set. They assumed their method of

using simple extraction from the data set provided for a more accurate method of predicting future financial forecasts than relying on judgement of historical information.

Another study [Jennings, 1987] found previous studies document a positive correlation between the magnitude of forecast revisions by forecast analysts and abnormal stock returns. However, in 1984, evidence of a significant statistical association between the release of earnings data and subsequent financial analyst revisions contradicted that finding. The extent of the revisions were dependent on the reliability of corporate financial information in the eyes of the analyst.

The source for this study's data came from two sources; the Dow Jones News Retrieval Service, for the management earnings forecast; the Center for Research in Security Prices Daily Return File tape provided the return data. The forecast was issued at least four weeks before fiscal year-end. Of interest to this paper is whether the financial analyst forecast variable has marginal explanatory power (a confirmation effect) when management forecasts and projected earnings are considered together. The "confirmation hypothesis" was tested through multiple regression using both primary variables as independent variables and developing a set of binary variables representing the interaction between management forecast surprises and financial analyst revisions. The results were generally consistent with the confirmation effect when management released favorable information.

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The report concluded financial analyst forecast revisions have significant marginal explanatory power for observed unsystematic returns when considered with deviation of the management forecast from the analyst forecast. The results were not consistent for both favorable and unfavorable news, however, bad news does not seem to have an associated confirmation effect related to analyst revisions.

Another study [Mendenhall and Nichols, 1988] investigated whether the security market reaction to lower than anticipated expected earnings is tied to when the announcement is made. This study shows several previous studies reported a positive association when risk-adjusted security returns are regressed on quarterly earnings forecast errors. The findings show a significantly larger market reaction to bad news when the news is related to non-fourth quarter disclosures. His basic hypothesis stated bad news earnings signals may be partially suppressed and delayed until the fourth quarter. The idea is bad news announcements in earlier quarters will have a larger per-unit affect on risk-adjusted securities than fourth-quarter announcements. This hypothesis is consistent with a security market which perceives managers as having some control over intra-fiscal-year income levels and accordingly reacts more strongly when forecasted earnings are unattainable during earlier quarters.

Freeman and Tse [1989] investigated the hypothesis investors reevaluate earnings announcements in the light of post

announcement information. To study this question, they employed
the following assumptions. 1) The security price reaction to any
earnings announcements reflects the likelihood that the earnings
innovation is permanent. 2) One indicator an earnings innovation
is permanent is whether it is followed by a same-sign or
different-sign innovation in later quarters. 3) The likelihood of
innovation continuations can be estimated from the empirical
earnings-sign matrix. Similarly, Elton, Gruber and Gultekin
[1981] examined how expectations concerning earnings per share
effect share price. They reported a modern central theme in
investment theory is expectations about firm characteristics are
incorporated into security prices. Almost all research that
attempts to measure the impact of expectations utilized not
expectational data but historical extrapolations of past data
these author's hope will serve as a proxy for expectational data.
The purpose of their article was to examine the importance of
expectations concerning one variable, earnings per share, in the
determination of share price.

The sample for their study was restricted to firms having
fiscal years ending in December 31. This method helps assure the
same general economic influences were available to all
forecasters at the time the forecasts are prepared. May is
judged as the earliest date which actual earnings data for the
previous fiscal year is reported for most companies. This method
removes most of the uncertainty surrounding the data collected.
Their study concluded evidence was available to support the

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hypothesis expectations are incorporated into security prices. They also concluded since prices reflect consensus forecasts, the payoff from more accurate forecasts increased greatly as the consensus forecast becomes inaccurate. Finally, they demonstrated the payoff from forecasting the consensus estimate was higher than being able to forecast earnings.

Hassell and Robert Jennings [1986] documented a close association between relative forecast accuracy and the timing of the release of earnings forecasts. Their findings implied management forecasts issued subsequential to or coincidentally with and up to four weeks prior to analysts forecasts are significantly more accurate than the analyst's estimates. They asserted earnings per-share emerge from various studies as the single most important accounting variable in the eyes of investors. By controlling when this information is made public greatly increased the accuracy of the analyst's forecasts.

Using Standard and Poor's *Earnings Forecaster Cumulative Master List* for their data source, they found the management forecasts are significantly more accurate than the analyst's forecasts when the analyst estimates are reported prior to the release of the relevant management forecast.

A previous study [Fried and Givoly, 1982] indicated a similar association between the revision of financial analyst forecasts and stock price movements. A more thorough understanding of the relative accuracy of management and financial analyst forecasts may provide future researchers with

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insights into differential stock price movements around the dates of earnings forecast releases. The Hassell and Jennings study furnished empirical evidence concerning the relative accuracy of analyst and management earnings forecasts as a function of the timing of the reported analyst forecasts. Of particular interest is the period the release of the management earnings estimate. As with other studies, any research employing time-series data of consensus analyst's forecasts must address two issues. The first is the question of whether "out-of-date" individual forecasts are included in the calculation of the reported consensus forecast. The second is whether significant reporting lags exist between the time financial analysts make a forecast and when that forecast appears on the data base.

This study's results supported the conjecture that relative accuracy does depend on the timing of analyst' forecasts relative to the management forecasts. Analyst forecasts reported prior to the release of the management information on average has a significantly higher forecast errors than the management forecasts, as do those analyst forecasts reported up to four weeks subsequent to the manager's announcement.

Another study [Waymire, 1986] stated the results suggest management forecasts are more accurate than prior analyst forecasts and posterior analyst forecasts are no more accurate than management forecasts. Some discussion in this article and others indicated managers have the potential to be privy to earnings information unavailable to financial analysts early in

the fiscal year. However, both parties have equal access to earnings information at the end of the fiscal year. Waymire substantiated this thought, based on the evidence in this study, it seems reasonable to conclude accuracy differences are the likely artifact of inside information held by the manager at the time of forecast disclosure.

Another study [Imhoff, 1980]) stated another element is earnings per share. Imhoff examined the involvement of the Securities and Exchange Commission's involvement with management forecasts. In that study he stated when the SEC becomes involved in management forecasts, it considered the size of the forecast error as a key element of the forecast disclosure policy. Early guidelines suggest an error of plus or minus 10% would be reasonable.

In his article, two important points are made concerning evidence on management forecast accuracy. First, most of the annual average forecasts errors across all firms are less than the plus/minus 10%, deemed acceptable by the SEC, with some tendency toward overestimated earnings. Imhoff goes on to point out these annual average forecast errors are biased downward when computed by using the *sign* (+ or -) of the forecast error. A +25% error and a -25% error result in a zero average error. The bias of this procedure becomes clearer when you compute the average *absolute* error or 25%.

The main point at the end of the article is voluntary reporting of management forecasts could put pressure on

management to meet reported earnings levels. The result is a decrease in the utility of the forecasts.

In 1981, [Hopwood, McKeown, and Newbold], 50 firms were randomly selected from calendar year-end companies whose primary reported earnings per share were available 96 quarters beginning in the first quarter of 1951. This is the study using data going farthest back into history. To compute the empirical results in their analysis, they fitted models to each series using a full Box-Jenkins procedure, in which the data are used to select a specific model from the general ARIMA class. The statement was made, an improvement in forecast accuracy generally results from those early series. The conclusion was made that the use of power transformations in time-series models of quarterly earnings could lead to improved forecasts, it would be appropriate to consider their use in studies comparing "premier" models with one another, and time-series forecasts with financial analysts' forecasts.

An other article [Brown, Hughes, Rozeff and Vanderweide, 1980] reviewed a previous study done by Abdel-khalik and Espejo [1978] examining the predictive content of interim earnings reports in order to ascertain whether analysts "use these signals in revising the predicted portion of annual earnings." According to Brown et. al., the Abdel-khalik report provided strong evidence of the predictive power contained in each of the first three interim reports. It is assumed, they are referring to non-fourth quarter earnings reports. However, the Brown study stated

the test conducted by AE was incapable of discriminating between two contradictory hypothesis. The null hypothesis, H_0: Security analysts do not use the information contained in interim earnings reports to revise the predicted portion of the annual earnings number. and H_1: Security analysts use the information contained in interim earnings reports to revise the predicted portion of the annual earnings number.

Crichfield, Dyckman, and Lakonishok [1978] found analysts' forecasts became more accurate as the reporting date was approached and there was no significant systematic bias in the analysts' predictions of earnings changes. Increased accuracy of financial analysts' as the date for end of the year approaches is well documented in most of financial and accounting literature dealing with this area. However, Collins and Hopwood point out in the Crichfield et. al. study, they were unable to sufficiently support an expected decline in forecast variability among analysts as the reporting date approached.

As a final example, an article was introduced stating the Financial Accounting Standards Board has emphasized the importance of forecasted accounting earnings in the formulation of investment decisions [Collins and Hopwood, 1980]. Of the sources for this currently available, the more widely used are univariate time-series models and financial analysis. Management and financial analyst forecasts can be characterized as comprehensive models because they can incorporate numerous variables. Time-series models are characterized as single

variable models incorporating only past earnings. Collins and Hopwood state both models have advantages and disadvantages. One major question they raised is the value of a comprehensive model relative to the univariate model. Another question is whether a univariate model should be prepared for each firm in a study, or would a premier model provide forecasts superior to individual models.

In conclusion, the Collins and Hopwood study stated the results of this study should be considered in relation to certain limitations. First, noncalendar reporting firms, newly formed firms, and firms that went out of business were systematically excluded from the sample. Also their paper was limited to the ability of the five models presented to predict annual earnings figures from forecasted quarterly figures. Their results indicated when the use of univariate time-series models was compared to the financial analyst's model, the comparison favored the financial analysts. Overall, multivariate tests indicated the five methods, viewed simultaneously, are not equal with respect to forecast error. Significant tests and analysis of the profiles indicated this overall difference is largely caused by an interaction between the quarter in which the annual forecast is made and the forecast method used. The results also indicate a premier model performed better than an individually identified univariate model in each of the quarters. For this article, the term "premier model" referred to a model applied almost universally to all types of firms, rather than models which are

developed for individual firms.

Their conclusion also stated a definite pattern appears to emerge from a study of previous research. This pattern can be categorized in four points. 1) Financial analysts provide forecasts more accurate than the statistical models studied. 2) Premier models are a viable alternative to individual identification of models on a firm-by-firm basis. 3) In the event a premier model is used, it should contain a seasonal parameter, to adjust for different firm reporting dates. 4) For all models, forecast accuracy increased linearly as the end of the year approaches.

Chapter III

Theory/Research Design

The document selected as the data source for the research is
Standard & Poor's "Earnings Forecaster Cumulative Master List."
This document was selected because it provides a weekly
adjustment to earnings forecasts by the major investment
brokerage firms. The basis for this research is sampling
adjustments to earnings forecasts over time in order to test the
predictions from the TOV model. The TOV states as the time for
the actual earnings data to be announced comes closer, the
forecasters will become less optimistic and should make more
downward adjustments to their earnings forecasts. In order to
test this theory over time, two samples will be taken, one
occurring early in the reporting year and the other late in the
reporting year.

It is assumed most companies operate under a standard
calendar year and make their final earnings announcements early
in the year, January or February. For this research, an early
sampling date will occur in the first part of the month of May
and a late sampling will occur during the first part of
January. In the original sampling plan, a time frame of twenty
years, 1970 to 1990 was selected. Such a time period encompasses
normal business fluctuations, expansion and recession,
normalizing the data. During the initial discussion concerns
were expressed regarding the effect technological developments

would have on the data samples. The primary effect some companies reported now in the financial media would not exist at the beginning of the sample period, such as Apple Computer. However, since this research is more accurately described as a "snap shot" rather than a longitudinal study, the external phenomenon such as advances in technology should have no disparaging effect on the results.

A partial set of data was found at both Texas Tech University and at the University of Missouri, Columbia. The data selected for the study encompasses both May and January for the years 1976 through 1987. The number of adjustments, positive and negative, for each month of the sample was counted and several statistical tests for significance were performed. Table 1 lists the data collected for the study and the percentage of downward adjustments to the total number of adjustments in both periods.

The reader will notice data in some months is missing. During those months, no copy of the data was available. The missing data should not affect the outcome of the study because those years will be excluded in the first statistical test. An additional univariate statistical test, chi-square or X^2, was used. Zikmund [1988] says a chi-square test allows one to test for significance in the analysis of frequency distributions. For this study, a successful outcome is defined as a negative adjustment to earnings forecasts.

Table 1.
Original Data Collected for Study
Standard & Poor's "Earnings Forecaster Cumulative Master List

Year	January				May		
	Number Up	Number Down	Percent Down		Number Up	Number Down	Percent Down
1976	67	48	42%		88	14	14%
1977	55	51	48%		43	18	30%
1978	30	38	56%		93	94	50%
1979	53	43	45%		0	0	
1980	0	0			52	118	69%
1981	136	137	50%		94	115	55%
1982	128	224	64%		20	97	83%
1983	42	108	72%		35	78	69%
1984	113	220	66%		36	67	65%
1985	72	157	69%		32	111	78%
1986	54	99	65%		72	101	58%
1987	173	341	66%		0	0	

Remember, the early period for this study consists of the reported changes in financial analyst's forecasts in early May of the previous year. This is the case because we are assuming most corporations operate on a standard year-end calendar with a early earnings forecast occurring in May just after the previous year's actual earnings report.

The TOV, previously described, predicted the number of downward adjustments to earnings forecasts in January should be significantly higher than the number of downward adjustments in May.

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Table 2 illustrates the data used in the first part of the analysis. For this analysis, those years with missing data will be excluded because we are comparing the number of downward revisions to the total number of revisions rather than comparing between the months of May and January.

Table 2.
Original Data Used In the First Statistical Analysis
Standard & Poor's "Earnings Forecaster Cumulative Master List

Year	Number of Observations Down		Total Number of Observations
1976	62		217
1977	69		167
1978	132		255
1981	252		482
1982	321		469
1983	186		263
1984	287		436
1985	268		372
1986	200		326
	x_1		n_1
Total	1777		2987

Appendix I illustrates the null and alternate hypothesis as well as the statistical summary for this portion of the analysis.

In the first part of the analysis the null hypothesis states the probability of the difference between the number of downward revisions and the total number of revisions is 50-50 or 50%, or:

$$H_0: p = .5$$

The alternate hypothesis then states the difference between the two differences would be greater than 50%, or:

$$H_1: p > .5$$

The first test for significance to be used in this study will be represented by the equation:

$$Z_1 = \frac{p_1 - p_0}{\sqrt{\dfrac{p_1 q_1}{n_1}}}$$

The second statistical analysis used in this study is the chi-square test. This test allows the comparison of the observed frequencies with the expected frequencies based on the theoretical ideas about the population distribution. This calculation allows one to determine if the differences between the observed frequency distribution and the expected frequency distribution can be attributed to chance.

In order to calculate this statistic, several steps must be followed. First, a null hypothesis must be derived and the expected frequency must be determined for each answer or cell. Next, the appropriate statistical significance level must be determined and the chi-square statistic must be calculated using both the observed frequencies and expected frequencies from the

sample. Finally, a decision must be made regarding the statistical significance of the findings by comparing the calculated chi-square score with the critical chi-square value. (Critical values can be found in tabular format in the appendix of most statistical textbooks).

For this portion of the analysis the null hypothesis states time will have no affect on the change in downward revisions to analyst's forecasts. In other words, the probability time will have an affect on analyst's forecasts is 50-50, or .50. This indicates differences between observed and expected frequencies can be attributed to chance.

$$H_0 : p = .50$$

Accordingly, the alternate hypothesis states the probability time will have an affect on analyst's forecasts will be greater than 50%. A probability greater than .50 indicates differences between the two frequencies cannot be attributed entirely to chance. In this study, such an outcome indicates time has had an effect on financial analyst's revisions to earnings forecasts. The question still remains whether or not such differences in frequencies are statistically significant.

$$H_1 : p > .50$$

In order to calculate the chi-square statistic, the following formula is used:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where

O_i = observed frequency in the ith cell
E_i = expected frequency in the ith cell

Table 3 illustrates the initial data used to calculate the chi-square statistic. The reader will notice for each of the reporting months, January and May, the total number of upward and downward revisions, plus totals are given. These revisions are considered the observed frequencies used in the statistical procedure. The totals are used to derive the expected frequencies. Table 4 gives both the observed and expected frequencies used in calculating the chi-square test.

Table 3.
Original Data Used to Calculate Chi-Square Statistic
Standard & Poor's "Earnings Forecaster Cumulative Master List

	January		May		
					Totals
Number of Upward Revisions	923		565		1488
Number of Downward Revisions	1466		813		2279
Totals	2389		1378		3767

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Table 4.
Observed and Expected Frequencies Used to Calculated Chi-Square
<u>Standard & Poor's</u> "Earnings Forecaster Cumulative Master List

	January			May	
	Observed	Expected		Observed	Expected
Number of Upward Revisions	923	943.68		565	544.32
Number of Downward Revisions	1466	1445.32		813	833.68

The full equation used to calculate the chi-square statistic
for this analysis is as follows:

$$\chi^2 = \frac{(O_1 - E_1)^2}{E_1} + \frac{(O_2 - E_2)^2}{E_2} + \frac{(O_3 - E_3)^2}{E_3} + \frac{(O_4 - E_4)^2}{E_4}$$

Appendix II illustrates both the null and alternate hypothesis
used in this analysis, as well as, the complete statistical to
assist the reader in understanding the results.

Chapter IV

Results and Analysis

The first part of the analysis tests the relationship between the total number of downward revisions to earnings forecasts and the total number of revisions. This test also used univariate statistics and a Z test for significance (See Appendix I for a complete summary of the statistical procedure).

The results from the first set of tests was very different from the second. In this procedure the null hypothesis is defined as the probability the difference between the two data sets would be 50% or .5. Accordingly, the alternate hypothesis states the difference would be greater than .5. The result was a Z test of 10.3732, much larger than .5. The meaning is the null hypothesis is Rejected. A p value calculation was performed to test the strength of this rejection. Following the previously described procedure, the Z score was placed on the standard distribution table in order to find the associated statistic. The Z score was completely off the table, which indicates the associated p value was 0. This means there is a zero percent chance the data used in this test lies between the test statistic and 0, or the mean of the standard distribution. This result is a _very_ strong indicator of the relationship between the number of downward revisions to earnings forecasts and the total number of revisions during the same period, and _strongly_ supports the decision theory being tested.

The second portion of the analysis also used a univariate

statistical procedure known as the chi-square (X^2) test. This
procedure tests for significant differences between observed
frequency distribution and expected frequency distribution. For
this study, this null hypothesis states time will have no
significant affect on differences in observed and expected
frequencies. Any differences noted can be attributed to chance.
The chi-square is calculated by subtracting the expected
frequency value from the observed frequency value and then
dividing the result by the expected frequency value for each
cell. Then the remainder is summed. Appendix II illustrates the
complete calculation procedure. The result is compared to a
value on an appropriate statistical table at the intersection of
the assumed probability level and degrees of freedom. Degrees of
freedom is derived by the formula, (k-1), where k represents the
number of cells in either the columns or the rows of the chi-
square observed frequency table. In this case, the number of
cells in the rows and columns is equal to two (2), therefore
degrees of freedom equal one (1). Under these assumptions, the
critical chi-square value is 3.841. The calculated chi-square
value is 2.05, meaning we Fail to Reject the null hypothesis. At
this level of probability, .05, the differences between observed
and expected frequencies can be attributed to chance. However,
this result shows some direction because there were more downward
revisions in January than May as predicted in the TOV model.

Chapter V

Summary and Conclusions

The purpose of this study was to test predictions from the Time and Outcome Valuation Model [Mowen and Mowen, 1991], to the effects of earnings forecasts by financial analysts. The TOV predicts as the time when outcomes are expected grows imminent, persons become more pessimistic in their decision making. In this case, the theory states as the date of actual earnings reports from corporations draws closer, financial analysts should make more downward adjustments to their earnings forecasts than upward adjustments.

A review of the existing financial literature was conducted and the result is included in the study. Most of the literature found relating to earnings forecasts and financial analysts dealt with the accuracy of analyst's forecasts in relation to actual earnings data supplied by corporations. With the exception of the article by Mendenhall and Nichols [1988], very little was found discussing analyst's adjustments to earnings forecasts as it related to the passage of time. Their study showed a significantly larger market reaction to bad news, lower than expected earnings, when the news is related to non-fourth quarter reports. In other words, the reaction was greater if lower than expected results are reported earlier in the year. This could be an alternative explanation of the effect found in the TOV model. Remember the TOV states when both positive and negative outcomes

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are in the future, the tendency is toward optimism. However, when both positive and negative outcomes occur in the present, most decision makers will turn toward risk aversion. This explains the increasing number of downward revisions as the time for final earnings reports becomes closer. In the Mendenhall study, a greater negative or risk averse reaction occurred when the negative result, lower than expected earnings, were reported early.

Data for the study came from the <u>Standard & Poor's</u> "Earnings Forecaster Cumulative Master List". This document lists both upward and downward adjustments to earnings forecasts by the major financial analyst companies. The data collected was to include a period spanning the years 1970 to 1990. An incomplete, but sufficient data set, was found and used which spanned the years 1976 to 1987. The data to be collected is the number of earnings adjustments during the months of May and January for each year in the study. The May reading is felt to reflect an early forecast date closely following the actual earnings reports, while the January adjustment would be considered a late forecast.

Two statistical procedures were performed on the data to test the decision theory as the time for the actual earnings data to be announced drew closer, financial analysts should make more downward revisions to earnings forecasts than upward revisions.

The first statistical procedure compared the total number of downward revisions to the total number of revisions. The result

was a very strong Rejection of the Null hypothesis. The secondary *p* value test indicated a zero percent chance the sample data fell close to the normal distribution mean. This result provides very strong support for the TOV model.

The second procedure calculated a chi-square statistic to test for significant differences between observed and expected frequencies. In this case, the test Failed to Reject the null hypothesis. However, the results did indicate some direction because more downward revisions were observed in January than in May. This is the result predicted by the TOV model.

Some problems were encountered with the design of this research study. The determination was made most corporations release their late earnings reports for the previous year during the early part of January, and preliminary earnings reports are released in May. The problem lies in the fact some corporations may not release their earnings figures during these dates. Hence, the actual early and late releases might not have been used for some of the companies sampled during this period. In order to eliminate this problem, a greatly expanded study is needed using earnings estimates at the actual release dates for those corporations used in the sample.

Even with somewhat contradictory results in the two statistical tests used in this study, it can be said the results indicate good support for the TOV. Of course, additional research should be conducted to test for any changes in significant outcomes in modified tests, such as utilizing

different alpha levels in the statistical tests, by comparing the number of downward revisions between industries over time, or by using actual earnings report dates for the companies in the study.

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Statistical Summary of the Comparison Between the Total Number of Downward Revisions to the Total Number of Revisions

1) $H_0: p = .5$

2) $H_1: p > .5$

3) $p_0 = .5$

4) $q_0 = .5$

5) $Z_0 \geq 1.65; \alpha = .05$

6) $x_1 = 1777$

7) $n_1 = 2987$

8) $p_1 = \dfrac{x_1}{n_1} = .5949$

9) $Z_1 = \dfrac{p_1 - p_0}{\sqrt{\dfrac{p_1 q_0}{n_1}}} = \dfrac{.5949 - .5}{\sqrt{\dfrac{.5(.5)}{2987}}} = 10.3732$

Therefore: Reject H_0

Statisitical Summary of the Chi-Square Test Used to Determine
the Effect of Time on Revisions to Analyst's Forecasts.

1) $d.f.=1$

2) $\chi_{critical}=3.841$

3) $\chi^2=\sum \dfrac{(O_i-E_i)^2}{E_i}$

4) $\chi^2=\dfrac{(O_1-E_1)^2}{E_1}+\dfrac{(O_2-E_2)^2}{E_2}+\dfrac{(O_3-E_3)^2}{E_3}+\dfrac{(O_4-E_4)^2}{E_4}$

5) $\chi^2=\dfrac{(923-943.68)^2}{943.68}+\dfrac{(1466-1445.32)^2}{1445.32}+\dfrac{(565-544.32)^2}{544.32}+\dfrac{(813-833.68)^2}{833.68}$

6) $\chi^2=.45+.30+.79+.51$

7) $\chi^2=2.05$

The calculated chi-square (X^2) statistic is less than the
critical chi-square ($X^2_{critical}$) value indicated in the frequency
distribution table. The result is that the difference between the
observed frequencies and derived expected frequencies of downward
revisions to analyst's forecasts is not statistically significant.
This indicates that the differences between the two frequency
distributions could be attributed to chance or random variation.

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