SELECTION AMONG ALTERNATIVE CONFIRMATION FORMS

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
CARL STEPHEN WARREN
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This is to certify that the

thesis entitled

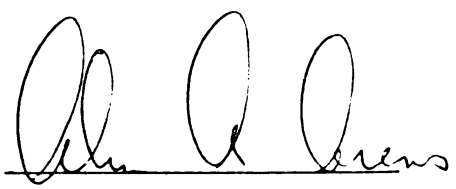
SELECTION AMONG ALTERNATIVE
CONFIRMATION FORMS

presented by

Carl Stephen Warren

has been accepted towards fulfillment
of the requirements for

Ph.D degree in Accounting - Business



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ABSTRACT

SELECTION AMONG ALTERNATIVE
CONFIRMATION FORMS

BY

CARL STEPHEN WARREN

The two basic objectives of an independent audit are (1) the expression of an opinion on the fairness of financial statements, and (2) the presentation of recommendations to management. In expressing an opinion on financial statements, independent auditors strive to obtain sufficient, competent evidential matter. Such evidential matter may be obtained through inspection, observations, inquiries, and confirmations.

The auditing procedure of verifying information through communication with independent third parties is referred to as confirming. The instrument used in communicating with third parties is known as a confirmation.

When an auditor uses the written confirmation procedure he must choose among three types of confirmation forms: (1) the positive confirmation form, (2) the negative confirmation form, and (3) the blank confirmation form. The primary objective of this thesis is to attempt to determine, on the basis of empirical analyses, which confirmation form should be chosen, i.e., does an optimal confirmation form exist?

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In attempting to accomplish the thesis objective, it is assumed that auditors are rational decision makers and choose among confirmations on the basis of benefits derived and benefits foregone. If one accepts this assumption then one must, in order to reach an optimal conclusion, evaluate benefits derived and benefits foregone for alternative confirmation forms. In doing so, benefits derived are equated with information content and benefits foregone with dollar cost.

The methodology employed to evaluate information content is based upon the statistical concept of sufficiency. Sufficiency is related to the statistical properties of information and is dependent upon the likelihoods that correct messages will be received. That is, the likelihood that if an account is, in fact, correct (incorrect) the message generated from the confirmation will indicate the account is correct (incorrect). Because sufficiency is dependent only upon these likelihoods, the informativeness results are independent of individual auditor preferences or prior uncertainties as to degrees of error in accounts being confirmed. Obviously, the use of sufficiency increases the potential impact of generalizations across auditors and auditing situations. In order to examine sufficiency, estimates of the above likelihoods were obtained from a field experiment which utilized actual account balances. The field experiment was designed such that the effects of the following variables upon the likelihoods could be isolated: types of accounts, sizes of accounts, sizes of errors, and directions of errors. The

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The benefits foregone from employing a confirmation form are reflected by the dollar cost of generating messages. Two types of evidence are gathered on the relative cost of alternative confirmation forms. The first type of evidence concerns response rates and reflects the assumption that relatively low response rates are associated with follow-up on nonrespondents and hence, are associated with high dollar costs. Response rates were computed for blank and positive confirmations and the results imply that recipients are more responsive to positive confirmations. In order to obtain relative cost information for negative confirmations, a second type of empirical evidence was gathered through the use of a questionnaire sent to certified public accounting firms. The questionnaire results imply that negative confirmations are least costly. Consolidating the response rate and questionnaire results suggests that negatives are least costly followed by positive and blank confirmations respectively.

Given the informativeness and cost rankings, the empirical results of this thesis suggest that, without further specification of auditor preferences and feelings of uncertainty, an optimal confirmation form does not exist. However, since it was desirable to provide auditors some guidance in selecting among alternative confirmation forms, three less rigorous research methodologies are set forth. These methodologies consist of a survey of practicing

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accountants, a descriptive analysis of relevant likelihoods from the field experiment, and an a priori opinion of the researcher.

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SELECTION AMONG ALTERNATIVE CONFIRMATION FORMS

By

Carl Stephen Warren

A THESIS

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

DOCTOR OF PHILOSOPHY

Department of Accounting and Financial Administration

1973

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ACKNOWLEDGMENTS

This dissertation could never have been completed without the assistance, counsel and guidance of my fellow graduate students, friends, and faculty members at Michigan State University. To these people I am eternally grateful.

I am especially indebted to Mrs. Frances Lesnieski, General Manager of the MSU Employees Credit Union, and to Larry Thompson, certified public accountant, for their cooperation in making the thesis possible.

To my dissertation committee I express my sincere appreciation. Professor A. Arens, Professor R. Marshall, and Professor W. Schmidt not only directed and encouraged me, but conscientiously expedited the completion of the dissertation. The many consultations with my committee members immeasurably improved the quality of the final product.

To my wife, Sharon, I pay tribute. Through crisis after crisis she remained steadfast. She never complained and she was always sympathetic. The completion of this dissertation is due in large measure to her efforts.

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CHAPTER I

PRELIMINARY CONSIDERATIONS

Introduction

The two basic objectives of an independent audit are (1) the expression of an opinion on the fairness of the financial statements, and (2) the presentation of recommendations to management. In expressing an opinion on financial statements the independent auditor must comply with three general auditing standards as set forth by the American Institute of Certified Public Accountants. These three general standards are set forth in Statement on Auditing Procedure No. 33 and are as follows:

1. The examination is to be performed by a person or persons having adequate technical training and proficiency as an auditor.

2. In all matters relating to the assignment, an independence in mental attitude is to be maintained by the auditor or auditors.

3. Due professional care is to be exercised in the performance of the examination and the preparation of the report.[1]

The third general standard, as listed above, requires the independent auditor to perform his work with due care. Due care imposes a responsibility upon each person within an independent auditor's organization to observe basic standards of field work and reporting. Basic standards of field work are concerned with the performance of the audit as carried out in the client's office. The third basic

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standard of field work is defined by the American Institute of Certified Public Accountants as follows:

> Sufficient competent evidential matter is to be obtained through inspection, observation, inquiries, and confirmations to afford a reasonable basis for an opinion regarding the financial statements under examination.[2]

One of the independent auditor's objectives is thus to obtain sufficient, competent, evidential matter so as to provide a reasonable basis for forming an opinion on financial statements. Sufficient, competent, evidential matter may be obtained through inspection, observation, inquiries and confirmations. However, of foremost importance in the gathering evidential matter is its quality.

The quality of evidential matter is dependent on the specific circumstances under which it is obtained, but in general there are several presumptions about the nature of evidence obtained and examined in an audit.

1. When evidential matter can be obtained from independent sources outside an enterprise it provides greater assurance of reliability for the purposes of an independent audit than that secured solely from within the enterprise.

2. When accounting data and financial statements are developed under satisfactory conditions of internal control there is more assurance as to their reliability than when they are developed under unsatisfactory conditions of internal control.

3. Direct personal knowledge of the independent auditor obtained through physical examination, observation, computation, and inspection is more persuasive than information obtained indirectly.[3]

Thus, the auditor, given a satisfactory system of internal control, continually strives to gather knowledge, both direct and indirect, from independent third parties. Because of the practical advantages of obtaining direct knowledge, independent third parties are

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Objective of Thesis

When the auditor uses the written confirmation procedure he must choose among three types of confirmation forms: (1) the positive confirmation form, which requests the third party to state whether the information is correct or incorrect; (2) the negative confirmation form, which requests the third party to reply only if the information is incorrect; and (3) the blank confirmation form, which requests the third party to provide information from his records.[4] The primary objective of this thesis is to attempt to determine, on the basis of empirical analyses, which confirmation form should be chosen.

Plan of Thesis

Introduction

In attempting to attain the objective of this thesis, it is assumed that auditors are rational decision makers and choose among alternative confirmation forms on the basis of benefits derived and benefits foregone. That is, ceteris paribus, it is assumed that auditors will choose that confirmation form from which they can derive the most benefits at the least cost. Conversely, auditors will not choose that confirmation form from which they derive minimum benefits at maximum cost.

If one accepts this assumption then one must, in order to reach an optimal conclusion, evaluate benefits derived and benefits foregone.

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For the purposes of this thesis, the benefits derived is equated with information content while the benefits foregone is equated with dollar cost. Analyzing each of these two components separately may allow for the generation of two preference rankings. If these two preference rankings are consistent, an optimal conclusion may be forthcoming in two instances:[5]

> If the least costly confirmation form is at least as informative as the other two forms, then the least costly form should be chosen.
>
> If two confirmation forms are at least as informative as a third form and the third form is the most costly of the three, then the third form should not be chosen.

In all other cases, an optimal conclusion cannot be reached without further specification of auditors' preferences and feelings of uncertainty as to degrees of error in accounts being confirmed.

Benefits Derived - Information Content

The selection among alternative confirmation forms essentially involves choosing among alternative information systems. That is, each confirmation form may be viewed as an alternative information system (or source) which emits messages (or signals) indicating whether individual accounts, in the opinion of the respondent, are correctly or incorrectly stated. The three confirmation forms considered as part of this thesis may be characterized in terms of information in the following way:

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Blank & Positive Confirmations	Total Information	=	Information Generated by Messages from Respondents to the Confirmations	+ Information Generated by Follow-up Procedures on Nonrespondents
Negative Confirmations	Total Information	=	Information Generated by Messages from Confirmations Sent	

Note that with blank and positive confirmations information is generated not only from the response to the confirmation form, but also from the follow-up on nonrespondents. On the other hand, no follow-up exists with the use of negative confirmations.

Based upon past experience and expertise, auditors have individual preferences as to which confirmation form should be chosen in any given circumstance. For example, some auditors prefer to use negative confirmations when a minimum degree of uncertainty exists as to whether accounts are in error. Other auditors prefer to choose positive confirmations regardless of uncertainty. These types of preferences are often reflected in professional pronouncements. For example, the Study Group on Audit Techniques of the Canadian Institute of Chartered Accounts issued the following recommendation:

> ...Auditors should use only positive confirmation forms for obtaining the audit assurance necessary to express an opinion on accounts receivable. The negative type should not be used for this purpose, but can be used to obtain audit assurance in addition to that required for an opinion.[6]

The Committee on Auditing Procedure of the American Institute of Certified Public Accountants issued the following statement as part of Statement on Auditing Procedure No. 43:

> ...the use of the positive form is preferable when individual account balances are relatively large or when

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> there is reason to believe that there may be a substantial number of accounts in dispute or with inaccuracies or irregularities. The negative form is useful particularly when internal control surrounding accounts receivable is considered to be effective, when a large number of small balances are involved, and when the auditor has no reason to believe the persons receiving the requests are unlikely to give them consideration.[7]

An essential question of this thesis is whether, based upon information content (benefits derived), an optimal ranking among confirmation forms can be generated regardless of individual auditor preferences and prior uncertainties as to errors in accounts. By examining specific messages generated from alternative confirmation forms, such a ranking may be possible.

Benefits Foregone - Cost

The benefits foregone from employing a confirmation form are reflected by the dollar cost of generating messages. Hence, the benefits foregone component reflects the relative cost of each confirmation form. By previous assumption, auditors, as rational decision makers, will attempt, ceteris paribus, to minimize expected cost. That is, ceteris paribus, auditors will choose that confirmation form which is least costly. Hence, given relative cost quantifications, an optimal ranking, based upon expected cost, may be generated for alternative confirmation forms.

Research Methodology

Benefits Derived - Information Content

The informational content of an information system is dependent upon the accuracy of the messages received from that information system. For example, the informational content of a confirmation form

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is dependent upon the likelihood that a correct message will be received. That is, the likelihood that if an account is, in fact, correct (incorrect) the message generated from the confirmation form will indicate the account is correct (incorrect).

The methodology employed in this thesis to evaluate the relative accuracy of messages is based upon the statistical concept of sufficiency. Sufficiency is related to the statistical properties of information and is dependent upon the likelihoods mentioned above, i.e., the likelihood that a specific message will be received given an account is correct or incorrect.[8] The importance of sufficiency to this thesis is that it may allow for the generation of an optimal informativeness ranking regardless of individual auditor preferences and their uncertainties as to degrees of error in the accounts being confirmed. Specifically, if positive confirmations are sufficient for negative confirmations, then one may interpret this as meaning that positive confirmations are at least as informative as negatives independent of individual auditor preferences or uncertainties.[9] Obviously, the use of sufficiency as part of the research methodology of this thesis increases the potential impact of generalizations across auditors and auditing situations.

In order to obtain estimates of the likelihoods upon which sufficiency is based, a field experiment was conducted at the Michigan State University Employees Credit Union. Seven hundred and eighty accounts were randomly selected and sent confirmations - 390 of these accounts were share accounts and 390 were loan accounts. Of the 780 original confirmations sent, 560 were deliberately misstated.

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separate analyses of the conditional likelihoods as follows:

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

In estimating this conditional likelihood, the following independent variables were considered:

1. the type of confirmation form, i.e., positive versus negative
2. the size of the account confirmed, i.e., large versus small
3. the direction of the discrepancy, i.e., overstatement versus understatement
4. the type of account confirmed, i.e., asset versus liability
5. the materiality of the discrepancy, i.e., 5% versus 10%

> The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

In estimating this conditional likelihood, the following independent variables were considered:

1. the type of confirmation form, i.e., positive, negative, blank
2. the size of the account confirmed, i.e., large versus small
3. the type of account confirmed, i.e., asset versus liability

All recipients who were sent incorrect confirmations and who responded received a following letter explaining that an error had been made. A correct confirmation was later sent to each recipient who participated in the study.

The primary statistical procedure chosen for analyzing the results of the field experiment is analysis of variance. This procedure allows for an analysis of possible interactions among independent variables. For example, analysis of variance will allow for the

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determination of whether the conditional likelihoods differ significantly for confirmation forms depending upon whether an asset or liability account is being confirmed. If a significant difference does occur then informativeness (sufficiency) must be examined for asset and liability accounts separately. The analysis of the field experiment will also allow for the generation of confidence intervals for the conditional likelihood estimates.

It is worthwhile to note that the likelihood estimates generated from the field experiment reveal only a partial picture of information content. In terms of information content, the three confirmations are characterized as follows:

Blank & Positive Confirmations	Total Information	=	Information Generated by Messages from Respondents to the Confirmations	+	Information Generated by Follow-up Procedures on Nonrespondents
Negative Confirmations	Total Information	=	Information Generated by Messages from Confirmations Sent		

The conditional likelihood estimates generated from the field experiment reflect information content to the left of the vertical line in the above diagram. These likelihood estimates reflect information generated by messages from the confirmation forms and ignore information generated from follow-up on nonrespondents.

As a first step in the examination of information content (benefits derived), sufficiency will be examined employing only the likelihood estimates generated from the field experiment. If from this partial examination of information content, negatives are at least as informative as blanks or positives, additional analyses will have to

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be undertaken to access the information content of follow-up procedures. If on the other hand, the sufficiency examination reveals that positives and blanks are at least as informative as negatives then there would be no need to access any additional information content.

Hence, given estimated conditional likelihoods from the field experiment, an optimal informativeness ranking may be forthcoming through an examination of sufficiency.

Sufficiency

Sufficiency is defined in terms of the conditional likelihoods mentioned above and is therefore independent of individual auditor preferences and their uncertainties as to the degrees of error in accounts being confirmed. The conditional likelihoods upon which sufficiency is dependent are:

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.
>
> and
>
> The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

Sufficiency determination revolves about well defined, but complex statistical conditions. Fortunately, when the information outcomes are binary as in this thesis, the task is relatively simple. For binary outcomes, sufficiency determination can best be illustrated by means of graphic analysis.[10] Essentially, the graphic analysis plots the conditional likelihoods in two dimensions for each confirmation form. The determination of sufficiency is then dependent upon the relative location of the plotted points within an information

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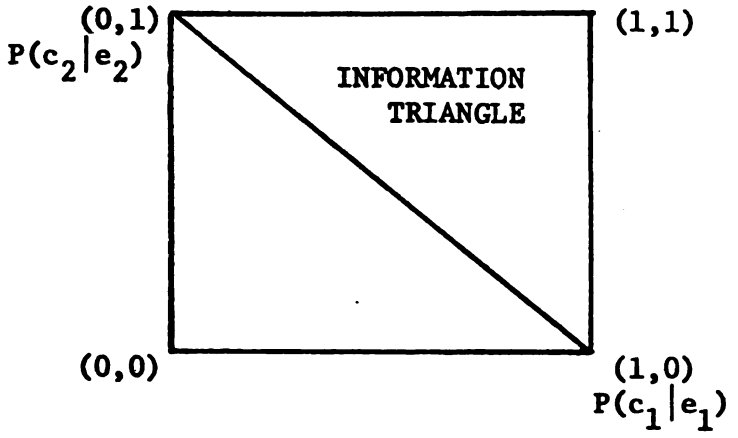

where the notation is as follows:

c_1 = the message received from the recipient indicates the account is incorrect

c_2 = the message received from the recipient indicates the account is correct

e_1 = the account is incorrect

e_2 = the account is correct

$P(c_1|e_1)$ = The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

$P(c_2|e_2)$ = The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

Within this triangle the point (1,1) represents perfect information and points along the diagonal connecting points (0,1) and (1,0) represent null (no) information.[12] For example, the point (1,1) for negative confirmations would imply that negative confirmations are never wrong. That is, if an account is, in fact, correct (incorrect) then the likelihood is one (is certain) that the message received from the negative confirmation will indicate the account is correct (incorrect), i.e., perfect information. Conversely, points along the

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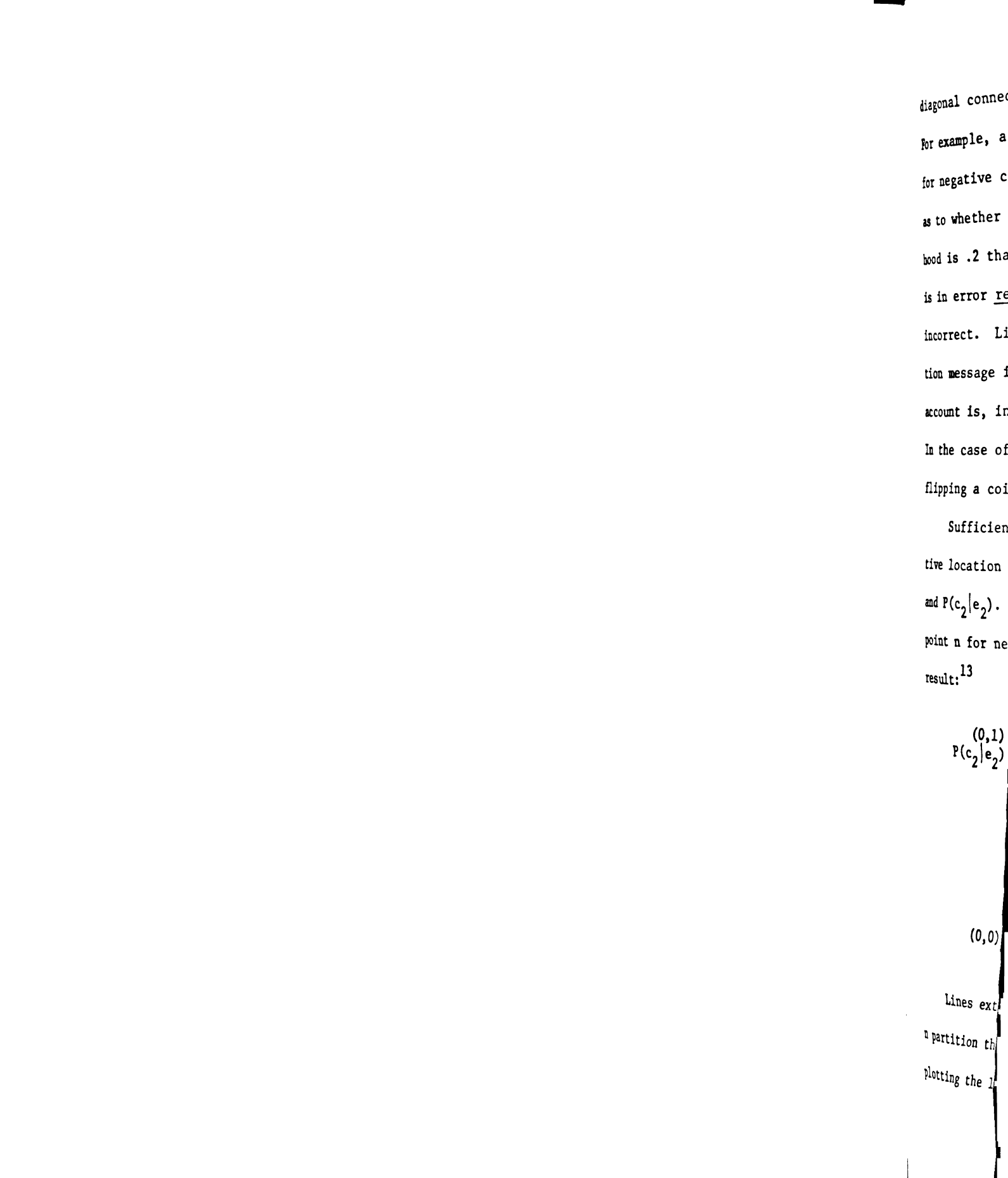

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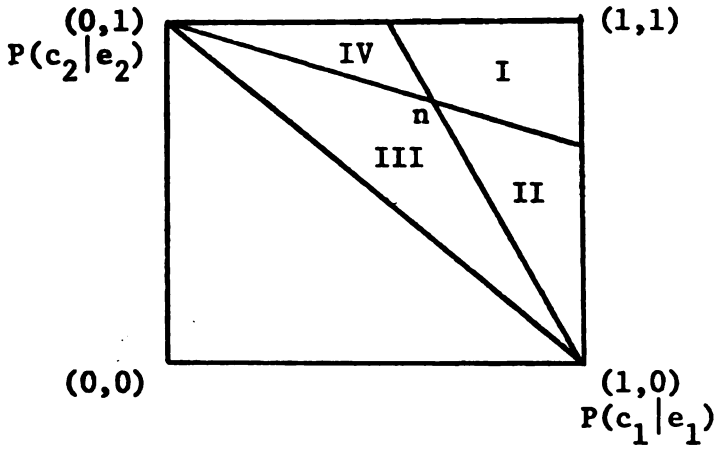
diagonal connecting (0,1) and (1,0) represent null (no) information. For example, a point represented by $P(c_1|e_1) = .2$ and $P(c_2|e_2) = .8$ for negative confirmations would imply that no information is provided as to whether an account is correct or incorrect. That is, the likelihood is .2 that the negative confirmation message indicates an account is in error regardless of whether the account is, in fact, correct or incorrect. Likewise, the likelihood is .8 that the negative confirmation message indicates an account is correct regardless of whether the account is, in fact, correct or incorrect, i.e., null (no) information. In the case of null information, the auditor is just as well off flipping a coin as he is sending a confirmation form.

Sufficiency is determined within the graphic analysis by the relative location of plotted points, i.e., points represented by $P(c_1|e_1)$ and $P(c_2|e_2)$. For example, denoting the likelihood point above as point n for negative confirmations, one could obtain the following result:[13]



Lines extending from the points (1,0) and (0,1) through the point n partition the information triangle into four regions. If when plotting the likelihood point for an alternative confirmation form,

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say positive confirmations, that point falls within region I then positives are sufficient for (at least as informative as) negatives.[14] If, on the other hand, the positive confirmation point falls within region III then negatives are sufficient for (at least as informative as) positives.[15] If the positive confirmation likelihood point falls within regions II or IV then neither confirmation form is sufficient for the other and the sufficiency examination is indeterminant.[16,17] An indeterminant solution implies that without further specification of auditor preferences and prior uncertainties, an optimal ranking of informativeness is impossible.

Benefits Derived - Cost

The cost component is a reflection of the benefits foregone from choosing a particular confirmation form. Auditors will attempt, ceteris paribus, to minimize expected cost. That is, auditors will choose that confirmation form which is least costly.

Two types of empirical evidence are gathered on the relative cost of alternative confirmation forms. The first type of evidence concerns response rates and reflects the assumption that relatively low response rates are associated with follow-up procedures on nonrespondents and hence, are associated with high dollar costs. Although the field experiment described earlier in this chapter was primarily conducted to obtain likelihood estimates needed for sufficiency determination, it is also used to generate response rates. Response rates, however, can only be computed for blank and positive confirmations. Because of this, a second type of empirical evidence is gathered through the use of a questionnaire sent to certified public accounting

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firms. The questionnaire requests recipients to provide time (cost) estimates for each of the three alternative confirmation forms. By analyzing the results of these two empirical studies, a preference ranking based upon expected cost is generated.

Chapter Descriptions

The following chapters are unique in their individual contributions to the attainment of the overall objective of this thesis:

Chapter II - provides a brief perspective into the nature and purpose of confirmations.

Chapter III - provides descriptive analyses of four prior studies within the confirmation area.

Chapter IV - provides a descriptive analysis of a field experiment conducted to obtain conditional likelihood estimates of messages for alternative confirmation forms.

Chapter V - provides an informativeness ranking based upon the conditional likelihood estimates of Chapter IV.

Chapter VI - provides a cost ranking for alternative confirmation forms.

Chapter VII - provides a summary of conclusions generated by this thesis research.

Chapter VIII - considers the shortcomings of this research and areas for further research.

The above chapters are written and organized so that a minimum of auditing and statistical knowledge is required for a complete understanding. The more mathematical and statistical minded reader is referred to Appendix B.

Summary

In searching for an answer to the specific selection problem posed by this thesis, each of three alternative confirmation forms is

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viewed as an alternative information system. It is assumed that auditors are rational decision makers and choose among alternative confirmation forms (information systems) on the basis of benefits derived and benefits foregone.[18] That is, it is assumed that auditors will choose that confirmation form from which they can derive the most benefits at the least cost. Conversely, auditors will not choose that confirmation form from which they derive minimum benefits at maximum cost. The benefits derived component is equated with information content while the benefits foregone component is equated with dollar cost. Analyzing each of these two components separately allows for the possible generation of two preference rankings. If these two rankings are consistent, an optimal conclusion may be forthcoming in two instances:

> If the least costly confirmation form is sufficient for (at least as informative as) the other two forms, then the least costly form should be chosen.
>
> If two confirmation forms are sufficient for (at least as informative as) a third form and the third form is the most costly of the three, then the third form should not be chosen.

In all other cases, an optimal conclusion cannot be reached and further specification of auditors' preferences and feelings of uncertainty as to degrees of error in accounts being confirmed becomes necessary.

1. Committee
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2. Ibid., p

3. Ibid., p

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6. Study Gro
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7. Committee
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10. Jacob Mars
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11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

15. Ibid.

16. Ibid.

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FOOTNOTES

1. Committee on Auditing Procedure, Statement on Auditing Procedure No. 33, (New York: American Institute of Certified Public Accountants, 1963), p. 15.

2. Ibid., p. 16.

3. Ibid., p. 36.

4. Examples of these confirmation forms are given in Appendix A.

5. An optimal conclusion in the sense of maximizing auditors' expected gross utilities, i.e., see Appendix B.

6. Study Group on Audit Techniques, Confirmation of Accounts Receivable, (Toronto: Canadian Institute of Chartered Accountants, 1969), p. 20.

7. Committee on Auditing Procedure, Statement on Auditing Procedure No. 43, (New York: American Institute of Certified Public Accountants, 1970), paragraph 5.

8. For a precise definition of sufficiency see D. Blackwell and A. Girshick, Theory of Games and Statistical Decisions, (New York: John Wiley & Sons, Inc., 1954), pp. 330-331 and M. H. DeGroot, Optimal Statistical Decisions, (New York: McGraw-Hill Book Co., 1970), pp. 434-435.

9. A formal explanation of this sufficiency interpretation appears in Appendix B.

10. Jacob Marschak, "Economics of Information Systems," Journal of the American Statistical Association, (March, 1971), p. 203.

11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

15. Ibid.

16. Ibid.

17. For a more mathematical specification of sufficiency see Appendices B and D.

18. For an examination of choosing among alternative confirmation forms within a decision theory framework see Appendix B.

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CHAPTER II

CONFIRMATIONS - A BRIEF PERSPECTIVE

Introduction

In the process of gathering a sufficient amount of competent evidential matter upon which to base an opinion, auditors must select among alternative audit techniques. Some such techniques include the following:[1]

Physical examination and count
Confirmation
Examination of authoritative documents and comparison with the record
Recomputation
Retracing bookkeeping procedures
Scanning
Inquiry
Examination of subsidiary records
Correlation with related information
Observation of pertinent activities and conditions

Of the above alternative audit techniques, the auditing procedure of verifying information through communication with independent third parties is referred to as confirming. The instrument used in communicating with third parties is known as a confirmation.

The primary objective of this chapter is to give the reader a brief perspective into the nature and purpose of confirmations. In doing so, this chapter is partitioned into the following topical areas:

I. Acceptance of Confirmations by the Auditing Profession

II. Usefulness of Confirmations

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III. Types of Confirmations

IV. Confirmation of Accounts Receivable and Alternative Procedures

V. Summary

The above partition will provide the basic framework for viewing this chapter.

Acceptance of Confirmations by the Auditing Profession

Confirmations have been recognized as a desirable auditing procedure since the early days of the public accounting profession. For example, in the first edition of Auditing, Lawrence R. Dicksee wrote:

> The only satisfactory verification of customer's accounts is by direct confirmation, and many auditors have advocated the issue of a circular to all customers, requesting a verification of their respective accounts...[2]

Prior to 1939, however, confirmation procedures received limited use because of auditors' widespread beliefs that their clients would object. It was believed that clients would regard confirmations as too costly and debtors would misconstrue confirmations as requests for payments.[3]

The widespread use of confirmations in the United States is largely a result of the 1939 McKesson & Robbins case. Repercusions of this case led the American Institute of Accountants, which later changed its name to the American Institute of Certified Public Accountants, to adopt the following recommendation in October of 1939:

> ...confirmation of notes and accounts receivable by direct communication with debtors shall be regarded as generally accepted auditing procedure in the examination of the accounts of a concern whose financial statements are accompanied by an independent certified public accountant's report.[4]

This position was strengthened when the American Institute of

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Accountants issued Statement on Auditing Procedure No. 12 and later Statement on Auditing Procedure No. 26 which read as follows:

> In all cases in which the extended procedures (i.e., confirmation procedure) are not carried out with respect to ... receivables ... and they are a material factor, the independent certified public accountant should not only disclose, in the general scope section of this report, whether short or long form, the omission of the procedures, regardless of whether or not they are practicable and reasonable, but also should state that he has satisfied himself by means of other auditing procedures if he intends to express an unqualified opinion.[5]

The above recommendation was reaffirmed by the Committee on Auditing Procedure of the American Institute of Certified Public Accountants in Statement on Auditing Procedure No. 33.[6] However, the most recent American Institute statement on confirmations, Statement on Auditing Procedure No. 43, weakened the above reporting requirement. Statement on Auditing Procedure No. 43 concluded that if the auditor is unable to confirm receivables because it is impracticable or impossible to do so, but has satisfied himself by means of other auditing procedures, no comment need be made in the audit report.[7] Nevertheless, Statement on Auditing Procedure No. 43 reaffirmed that confirmations are an important audit procedure, deviations from their use being justifiable only in rare circumstances.[8]

Usefulness of Confirmations

The main objective of the confirmation procedure is to provide the auditor with evidence so that he is better able to access the fairness of financial statements. It is widely accepted that confirmations provide auditors with information as to the following:

1. the genuineness (existence) of accounts

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2. the approximate reliability (accuracy) of account balances
3. the approximate degree of error in the accounts as a measure of internal control effectiveness
4. the type of errors occurring within the accounts.[9]

Because audit evidence gathered by the confirmation procedure is generated from communication with a third party outside the sphere of management, confirmations are considered an objective, reliable source of evidence. For this reason, confirmations are often used in lieu of alternative audit techniques such as examining subsequent payments, correspondence files, shipping lists, billing records, et.al.

Although the most widespread use of confirmations is in the confirmation of accounts receivable, they are used in other instances. For example, confirmations could be used in verifying any or all of the following:[10]

Cash in bank
Securities pledged as collateral
Consignments of inventory
Cash surrender value of life insurance
Loans or advances to employees
Amounts due from subsidiary companies
Accounts payable
Notes payable
Mortgages payable
Sinking fund assets in hands of trustee
Assets in hands of transfer agent
Stock certificates in hands of transfer agent
Purchase and sales commitments
Letters of credit
Percentage of completion on construction contracts
Nontrade sales
Fixed asset disposals
Inventory in public warehouse
Contingent liabilities known to company lawyer
Ownership of property

Thus, the confirmation procedure is an important audit technique whose possible extensions as well as limitations warrant in depth study and review.

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Types of Confirmations

Although confirmations may be either oral or written, the scope of this thesis has been intentionally limited to the examination of three types of written confirmations - positive, negative, and blank confirmations.

The positive confirmation requests a third party to state whether the information as provided on the confirmation request is correct or incorrect (see Appendix A). Because positive confirmations request the recipient to respond regardless of whether the information is correct or incorrect, the auditor will know the magnitude of non-responses. For example, if the auditor sends 200 positive confirmations and 100 are returned, he knows that 100 recipients did not respond. The impact of nonresponses is that they may introduce bias in the auditor's selection process and hence, the confirmation results may not be representative of the population originally sampled.[11] That is, the items included in the sample (the returned confirmations) are determined by recipients rather than the auditor. As a consequence, the auditor does not know whether those recipients who did not respond would exhibit the same characteristics as those who responded.[12] For example, recipients with errors in their accounts may be more likely to respond.[13] In this case, if the results of the returned confirmations are taken as representative of the population, the error rate would be over estimated.[14] Auditors currently deal with the nonresponse problem by sending more than one confirmation request and through the use of alternative audit procedures. Because of the ability of positive confirmations to isolate nonresponses and initiate proper follow-up procedures, positives are generally

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considered more reliable (informative) than negative confirmations.[15]

The negative confirmation requests a third party to reply only if the information as provided on the confirmation request is incorrect (see Appendix A). Since negative confirmations request the recipient to respond only if the information is incorrect, the auditor has no indication of the number of nonresponses and thus has no indication of whether the confirmation results are representative of the population originally sampled. For example, a recipient of a negative confirmation may misinterpret it as an advertisement and promptly throw it away. Since negative confirmations request the recipient to respond only if the confirmation is incorrect, the auditor would interpret the recipient's action as a verification that his account is correct even though it may, in fact, be incorrect. Obviously, the inability of auditors to isolate nonresponses is a major deterent to the use of negative confirmations.

The blank confirmation requests a third party to provide information requested by the confirmation (see Appendix A). Like positive confirmations, blank confirmations allow the auditor to isolate and measure the magnitude of nonresponses. Hence, follow-up procedures are an integral audit step in the use of blank confirmations. Of the confirmation types considered by this thesis, the blank confirmation is used least often.

Confirmation of Accounts Receivable and Alternative Procedures

The primary objective in auditing accounts receivable is to form an opinion on the authenticity (existence) and collectibility (accuracy) of the accounts. There are two methods of determining the authenticity

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of accounts receivable - confirmation and the examination of documentary evidence.

In determining the authenticity of accounts receivable, the reliability of evidence obtained from confirmation is considered superior to that of evidence obtained by documentary examination.[16] That is, evidential matter obtained from an independent source external to the client's organization is more reliable than evidence routed through the client's system.[17] For example, Howard Stettler in his book, Systems Based Independent Audits, states:

> ... the evidence (internal) is likely to be less (reliable) than the classes of evidence (external) previously discussed, for two reasons. First, the employees giving the information or preparing the documents are under the direct control of management, and therefore the evidence may not be fully acceptable in attempting to corroborate the representations of management. Second, if a defalcation has occurred, information given by employees or documents prepared by them may be falsified in an effort to conceal any manipulations relating to the defalcation.[18]

Externally created documents (e.g., confirmations) once they enter the client's system, may also be subject to suppression or manipulation. Because of this, the preparation and mailing of confirmations is normally controlled exclusively by the auditor. In addition, confirmations normally include self-addressed stamped envelopes which return a respondent's confirmation reply directly to the auditor. Thus, confirmations coming directly from debtors can be relied upon more than documentary evidence which may be subject to suppression or manipulation within the client's system.

Confirmations are not, of course, the panacea to the verification of accounts receivable. Two main difficulties arise in the use of confirmations. First, many individuals will not respond to

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confirmation requests and secondly, because of inadequate record systems many individuals cannot respond. The inability to obtain valid responses to confirmation requests implies that alternative procedures - the examination of documentary evidence - must be employed.

Two alternative procedures to confirmations are (1) review of subsequent payments and (2) examination of sales documents. Of these two procedures, analysis of subsequent payments is considered the more reliable.

Subsequent payments analysis provides evidence that a payment was received or made and that it was in satisfaction of a specific account or item. However, subsequent payments are normally routed through the client's system before they are available to auditors and while manipulation of such evidence may be difficult, the possibility exists. Hence, the most effective review of subsequent payments would be to have all incoming payments routed directly to the auditor. To be useful to auditors, subsequent payments must also be accompanied by remittance slips so that payments can be directly traced to outstanding balances. The biggest disadvantage of subsequent payments analysis is that auditors have no control over the selection of test items because they are dependent on actions other than that initiated by the auditor, i.e., subsequent payments by debtors.

Examination of sales documents involves analyzing outstanding balances into individual outstanding charges and examining the documentary support for these charges.[19] The following illustration of the technique of examining sales documents in the verification of accounts receivable is given by the Study Group on Audit Techniques

of the Canadian Institute of Chartered Accountants:

> First, outstanding balances selected for verification must be analyzed into individual outstanding charges. This is necessary to determine which documents to look for. Second, the documents must be obtained, possibly necessitating extensive searching through the client's files. Third, the documents must be examined for apparent authenticity, proper authorization, and arithmetical accuracy. Fourth, to satisfy the auditors as to their authenticity, the documents should be traced through the client's records. Finally, the amounts, customer's names, and dates shown on the documents must be matched to the individual charges, names, and dates on the ledger cards.[20]

In general, analysis of subsequent payments is considered a more reliable source of evidence than the examination of sales documents. The typical reasoning for such an assertion is illustrated by the following quote taken from D. R. Carmichael and John J. Willingham's auditing text, Auditing Concepts and Methods:

> Subsequent payments are a more reliable form of documentary evidence because the check is sent by an independent source, the debtor, to the client, and the debtor expects it to be credited to his account. On the other hand, the sales documents all originate within the client's system and are, therefore, more subject to control and manipulation.[21]

Thus, from most reliable to least reliable the ordering of audit evidence is confirmations, subsequent payments, and sales documents respectively. Hence, in determining the authenticity of accounts receivable auditors normally employ confirmations as an initial audit procedure. The examination of subsequent payments and sales documents is normally reserved for follow-ups on nonresponses and confirmations indicating significant discrepancies.

Although confirmations are useful in determining the authenticity of accounts receivable, they are only of limited use in assessing collectibility. Confirmations are useful in assessing collectibility to the limited extent of bringing possible disputes within the accounts

to the surface. However, collectibility of accounts receivable can best be determined through an analysis of past trends and future projections.

Summary

The primary objective of this chapter was to give the reader a brief perspective into the nature and purpose of confirmations. This was accomplished, in part, through an examination of the acceptance, usefulness, and types of confirmations. In addition, an examination of the confirmation of accounts receivable and alternative procedures revealed that confirmations are the primary information source in determining the authenticity of accounts receivable. The later analysis also revealed, however, that confirmations are not the panacea to the verification of accounts receivable and that alternative procedures serve a useful and essential role.

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2. John C.
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5. Committe
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6. Committe
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8. Ibid.

9. D. R. Car
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10. Floyd W.
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Illinois,

11. Carmichael

12. Ibid.

13. Ibid.

14. Ibid.

FOOTNOTES

1. R. K. Mautz and Hussein A. Sharaf, The Philosophy of Auditing, (Evanston, Ill.: American Accounting Association, 1961), p. 100.

2. John C. Potter, "Confirmation of Receivables," The Journal of Accountancy, (July, 1957), p. 45, quoting Lawrence R. Dicksee, Auditing.

3. Study Group on Audit Techniques, Confirmation of Accounts Receivable, (Toronto: Canadian Institute of Chartered Accountants, 1969), p. 3.

4. Committee on Auditing Procedure, Statement on Auditing Procedure No. 1, (New York: American Institute of Accountants (later became the American Institute of Certified Public Accountants), 1939), p. 7.

5. Committee on Auditing Procedure, Statement on Auditing Procedure No. 26, (New York: American Institute of Accountants (later became the American Institute of Certified Public Accountants), 1956), p. 18.

6. Committee on Auditing Procedure, Statement on Auditing Procedure No. 33, (New York: American Institute of Certified Public Accountants, 1963), p. 38.

7. Committee on Auditing Procedure, Statement on Auditing Procedure No. 43, (New York: American Institute of Certified Public Accountants, 1970), paragraph 16.

8. Ibid.

9. D. R. Carmichael, "Comments on Confirmation of Accounts Receivable," (Unpublished working paper prepared for the Committee on Auditing Procedure of the American Institute of Certified Public Accountants, 1969), p. 16.

10. Floyd W. Windal, An Analysis of the Relative Reliability of the Various Types of Audit Evidence, (Masters Thesis, University of Illinois, 1955), pp. 12-13.

11. Carmichael, op. cit., p. 2.

12. Ibid.

13. Ibid.

14. Ibid.

15. Roger R. Pa
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1967), p.

16. John J. Wil
Methods, (

17. Ibid.

18. Howard F.
Cliffs, N.

19. Willingham

20. Study Grou

21. Willingham

15. Roger R. Palmer, John Neter, and Gordon B. Davis, A Research Study on the Effectiveness of Confirming Personal Checking Accounts, (The Association for Bank Audit, Control, and Operation, 1967), p. 3.

16. John J. Willingham and D. R. Carmichael, Auditing Concepts and Methods, (New York: McGraw-Hill Book Co., 1971), p. 146.

17. Ibid.

18. Howard F. Stettler, Systems Based Independent Audits, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1967), p. 106.

19. Willingham and Carmichael, op. cit., p. 147.

20. Study Group on Audit Techniques, op. cit., p. 7.

21. Willingham and Carmichael, op. cit., p. 147.

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CHAPTER III

PREVIOUS RESEARCH

Introduction

There has been little empirical research in the area of selection among alternative confirmation procedures and forms. This is understandable since the only apparent way to effectively examine this area is to send, under controlled conditions, incorrect confirmations and then measure customer responses. As might be expected, most businesses are reluctant to allow researchers to send incorrect confirmations to their customers. Only four research studies have been published in the area of confirmations. Two of these studies actually sent incorrect confirmations, one opted for a simulation, and one examined blank confirmations.

The primary purpose of this chapter is to describe each of four prior studies adequately enough so that the conclusions and results of this thesis may be compared and contrasted with prior empirical research. In describing each of these prior research studies the following format will be employed:

I. Description of Experiment
   - A. Purpose of the experiment
   - B. Methodology
   - C. Experimental population
   - D. Experimental variables
     1. Independent
     2. Dependent
   - E. Data Matrix

II. Major Conclusions and Findings

III. Evaluation - Contributions and Shortcomings

The use of a standardized format will better enable readers to compare and contrast studies. In addition, the field experiment conducted as part of this thesis research will also be described, in a later chapter, using the same standardized format.

Maynes' Study[1]

I. Description of Experiment

A. Purpose of the experiment

The major purpose of this experiment was:

> ...to establish, by measuring response errors in reports of savings and personal loan accounts, the maximum degree of accuracy which may be expected in sample surveys of a financial character.[2]

B. Methodology

A blank confirmation form was used in this experiment. Recipients of the form were asked to provide the auditor with their loan and/or share account balance as of June 30, 1963. A cover letter accompanied the confirmation request indicating that the confirmation was part of a study of "the accuracy of reporting financial information." Recipients were urged to complete the confirmation, however, no follow-up procedures were employed on nonrespondents. The response rate was 58.5%.

C. Experimental population

This experiment was confined to personal saving and loan accounts existing on the books of the Census Federal Credit Union as of June 30, 1963. Altogether there were about 2900 accounts owned by about 2200 members. The total sample size of 1241 accounts consisted of

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10% of the accounts with balances under $100 and all the accounts with balances of $100 or more. The analyses of the experimental results were based upon 701 accounts for which responses were obtained.

D. Experimental variables

1. Independent variables

The savings account portion of the experimental analyses examined seven independent variables.

Record Consultation

This variable was examined at two levels: Recipients who were asked by the confirmation to consult their records; and those who were asked not to consult their records.

Rounding

This variable was defined by the number of terminal zeros in a reported account balance. Rounding was examined at two levels: Rounded figures, which contained two terminal zerios; and unrounded figures, which did not contain two terminal zeros. For example, an account balance reported as $259.00 or $200 was considered rounded while reported balances such as $259.12 or $260.10 were considered unrounded.

Account Size

This variable was defined at two levels: Small accounts, with balances less than $700; and large accounts, with balances equal to or greater than $700.

Direction of Change

This variable was examined at two levels: Increases, which occurred when the last transaction in an account increased the balance of that account; and decreases, which occurred when the last

transaction decreased the account balance.

Effect of Change

This variable was examined at two levels: Small changes, which occurred when the last transaction in an account affected the account balance by less than 10%; and large changes, which occurred when the last transaction affected the account balance by at least 10%.

Transaction Activity

This variable was examined at two levels: Large number of transactions recorded from January 1 to July 1; and a small number of transactions. The source article did not further clarify what was meant by large and small number of transactions.

Length of Recall

This variable examined the accuracy of respondents' reported balances in comparison to the length of time since the last transaction in an account. The number of levels of this variable was not specified.

Because of small sample sizes, of the above seven independent variables, only three were given consideration in the personal loan portion of the experimental analysis:

1. Record Consultation
2. Rounding
3. Account Size

2. Dependent variables

Two dependent variables were considered in the experiment.

Discretion of Discrepancy

This variable was examined by comparing the number of overstatements, which occurred when a recipient overstated his account

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balance, against the number of understatements.

Accuracy of Reported Balances

The primary dependent variable of this experiment was the accuracy of reported balances. The accuracy of reported balances was measured by the difference between the reported account balance and the balance appearing on the credit union's records.

E. Data matrix

The data matrix for this experiment is as follows:

		Account Size		
		Actual Balance<$700	Actual Balance<$700	Total
Record Consultation	Consulted Records	195	158	317
	Do Not Consult Records	183	155	338
	Respondents who, though asked to consult their records, did not.			46
	Total number of observations.[3]			701

Data for the analysis of the other independent variables was abstracted from the above data matrix. For example, the analysis of the rounding variable reorganized the data in the following manner:

		Rounding Effect		
		Not Rounded	Rounded	Total
Record Consultation	Consulted Records	273	44	417
	Did Not Consult Records	107	231	338
	Respondents who, though asked to consult their records, did not.			46
	Total number of observations			701

II. Major Conclusions and Findings

A. Savings Accounts

1. The accuracy comparisons for those who consulted their records versus those who did not were as follows:

	Consulted Records	Did Not Consult Records
Within 1% of the Acctual Account Balance	85%	49%
Within 5% of the Acctual Account Balance	90%	70%

2. Sixty per cent of the balances were reported exactly for non-rounders (no or one terminal zero) while only 10% of the balances of rounders were reported exactly.

3. Differences between means estimated from respondents' reports and means estimated from the credit union's records were not significantly different (at a .05 level).

4. There was no consistent trend in respondents' reports towards either under or over reporting as size of account balances increased.

5. The results of the experiment did not support the hypothesis that balances which are rising will be over reported and those which are falling will be under reported.

6. Data from the experiment supported the hypothesis that small changes in accounts imply greater accuracy in reported balances than larger changes.

7. The results of the experiment did not support the hypothesis that respondents with more active account balances would report more accurately.

8. The results of the experiment did not support the hypothesis

that the longer the period over which the respondent had to recall his account balance (period from last transaction) the less accurate the reported balance would be.

B. Personal loan accounts

A separate analysis of the personal loan portion of the experiment was not set forth in the source article. The article stated that the results from the three independent variables considered (record consultation, rounding, and account size) did not differ significantly from the savings account results.

III. Evaluation - Contributions and Shortcomings

Maynes' Study was the first empirical work in the confirmation area and as such helped call attention to an area in dire need of empirical research. Unfortunately, Maynes' Study wasn't geared to the study of confirmation techniques. Instead Maynes' work was concerned with gathering data on the maximum degree of accuracy which could be expected in sample surveys of a financial character. Because of this limited objective only blank confirmations were employed. In addition, a cover letter accompanied the confirmations notifying recipients they were taking part in an experiment. Although only one mailing of confirmations was sent, a relatively high response rate of 58.5% was obtained.

Overall, the major contribution of Maynes' Study was that it represents the first empirical work in the confirmation area. The major shortcomings are the use of a cover letter and the use of only blank confirmations.

Davis, Neter, Palmer Study[4]

I. Description of Experiment

A. Purpose of the experiment

The major purpose of this experiment was:

> ...to determine by means of a statistically designed and controlled field experiment, the effectiveness of the confirmation of personal demand account balances.[5]

B. Methodology

The most efficient way of measuring the effectiveness of confirmations is to send, under controlled conditions, incorrect confirmations and then measure customers' responses. Since most businesses and auditors are unwilling to send falsified statement to customers, this study utilized a simulation. The simulated task made use of a code number which was added to both the bank statement and an audit statement. The code number was placed directly below the final account balance and the customer was asked to examine both the bank and audit statements. Thus, the simulated task for the customer was:

1. Compare the final account balance and code number on each of the two statements.

2. If appropriate, report the results of the comparison, noting any discrepancies, to the auditor.

In this study, the researchers altered the code number appearing on the audit statement from the code number appearing on the bank statement. The effectiveness of confirmations was then ascertained by determining the proportion of customers who reported the discrepancy.

C. Experimental population

This study was confined to personal demand deposit accounts existing on the books of The First National Bank of Saint Paul between

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May and June, 1966. Since the researchers considered it desirable to evaluate confirmation effectiveness for smaller accounts, accounts with balances of $10,000 or more were excluded from the experiment. In addition, accounts of customers not residing in the Metropolitan Minneapolis-St. Paul area were excluded since one of the experimental procedures involved telephone calls by customers and it was desirable to avoid long-distance calls. Given these restrictions, a random sample of 850 accounts was selected from four cycle groups within the personal demand deposit account records.

D. Experimental variables

1. Independent variables

Five independent variables were considered in this experiment.

Type of Confirmation

Positive confirmation - letter: The customer was asked to reply by letter (using a postage paid envelope) whether or not a discrepancy existed in the final account balance or code number. If no reply was received within seven days, a follow-up letter was sent requesting a reply.

Negative confirmation - letter: The customer was asked to reply by letter (using a postage paid envelope) only if a discrepancy existed in the final account balance or code number. No follow-up requests were used with this procedure.

Negative confirmation - telephone: This procedure was the same as the negative confirmation procedure using letter replies, except that the customer was asked to call the auditor if a discrepancy existed.

Direction of Discrepancy

This variable was examined at two levels: Positive changes, which increased code numbers; and negative changes, which decreased code numbers.

Magnitude of Discrepancy

This variable was examined at two levels: Large discrepancies, which changed the number of digits in code numbers by one; and small discrepancies, which left the number of digits in code numbers unchanged.

Size of Account

This variable was examined at three levels: under $100, $100 to $500, and over $500.

Type of Holder of the Account

This variable was examined at two levels: Individual and nonindividual accounts. Nonindividual checking accounts are held by such groups as fraternal organizations and trusts. No business accounts were included in the nonindividual classification.

2. Dependent variables

Two dependent variables were considered in this experiment.

Response Rate

The response rate defined in this study is the proportion of sample accounts for which responses were obtained. The response rate was only calculated for the positive confirmation procedure.

Detection Rate

A detection rate was calculated for confirmations involving discrepancies in the audit statement. The detection rate defined in this study is the proportion of accounts for which the auditors

received a report of a discrepancy.

E. Data matrices

The data matrices for this experiment are as follows:

Experimental Treatments[6]

Type of Confirmation	Size and Direction of Discrepancy: Overstatement Large	Overstatement Small	Understatement Large	Understatement Small	Total
positive	50	50	50	50	200
negative - letter	50(1)	50	50	50	200
negative - phone	50	50	50(1)	50	200
	150	150	150	150	600

Control Groups

Type of Confirmation	Size and Direction of Discrepancy: Overstatement Large	Overstatement Small	Understatement Large	Understatement Small	Total
negative - letter	25	25	25(1)	25	100
Positive Control with no Discrepancy					150
Total Number of Control Observations					250
Total Number of Observations					850

(1) denotes the loss of an observation.

II. Major Conclusions and Findings

1. No significant difference (at .05 level) existed between response rates for discrepant and nondiscrepant audit statements, i.e.,

.915 response rate for discrepant statements

.893 response rate for nondiscrepant statements

2. No significant difference (at .05 level) existed between response rates for different size accounts, i.e.,

.855 response rate for accounts under $100

.908 response rate for accounts $100 to $500

.921 response rate for accounts over $500

3. A significant difference (at .05 level) existed between detection rates for positive versus negative confirmations, i.e.,

.590 detection rate for positive confirmations

.439 detection rate for negative confirmations

4. No significant difference (at .05 level) existed between detection rates for mail and telephone negative confirmation requests, i.e.,

.422 detection rate for negative confirmations - letter

.442 detection rate for negative confirmations - phone

5. No significant different (at .05 level) existed between detection rates for size and direction of discrepancies.

6. A significant difference (at .05 level) existed between detection rates for larger versus small accounts, i.e.,

.391 detection rate for accounts under $100

.472 detection rate for accounts $100 to $500

.528 detection rate for accounts over $500

7. No significant difference (at .05 level) existed between response and detection rates for different types of account holders.

8. The researchers believed, on the basis of ad hoc calculations, that the use of second requests with positive confirmations was primarily responsible for the difference in detection rates for positive and negative confirmations.

9. The researchers believed, on the basis of ad hoc calculations, that imperfect detection rates significantly influence the reliability of audit sampling techniques.

III. Evaluation - Contributions and Shortcomings

The Davis, Neter, Palmer Study was the first empirical work designed explicitedly to study confirmation techniques. If the researchers had employed actual account balances in their experiment, this research could well have become the classic experiment in the area. Unfortunately, the researchers were forced to employ a simulation - the major shortcoming of the study. The only other shortcoming is the failure to include blank confirmations in the experiment. However, regardless of the above shortcomings, the Davis, Neter, Palmer Study should be viewed as a significant research contribution in the area of confirmations.

Sauls' Study[7]

I. Description of Experiment

A. Purpose of the experiment

The major purpose of this experiment was:

> ...to assess the effects of nonresponse and improper response on the evaluation of account balances.[8]

B. Methodology

This experiment was designed to test customer responses to requests for balance confirmation. Two types of confirmation forms were used with two distinct population groups. Accounts in both population groups were deliberately misstated by plus or minus ten per cent. Thus, the experiment was capable of measuring both customer nonresponse and improper response to alternative confirmation forms.

C. Experimental populations

This experiment was unique in utilizing two independent, distinct population groups. The Continental Illinois National Bank and Trust

Company of Chicago participated in the experiment by sending out confirmations on personal loan and automobile loan accounts. The average balances of the accounts sampled were $1200 and $1800 respectively. Accounts were randomly selected and divided into three subsamples. Two of the three subsamples utilized positive confirmations and the third utilized a blank confirmation. Second requests were mailed about two weeks after the first requests except to those accounts whose confirmations were initially misstated.

The Michigan State University Employees Credit Union also participated in the experiment by sending confirmations on time deposit accounts. Of 478 such accounts appearing on the books as of February 29, 1968, 22 were deleted for various reasons. Accounts were randomly selected and divided into four subsamples. Three of the four subsamples utilized positive confirmations and the fourth utilized blank confirmations. Second requests were mailed two weeks after the first requests to all nonrespondents.

D. Experimental variables

1. Independent variables

Three independent variables were considered in this experiment.

Type of Confirmation

Positive confirmation - This confirmation request was of the standard positive format and asked the recipient to indicate his agreement or disagreement with the balance shown.

Blank confirmation - This confirmation request asked the recipient to provide information from his records.

Direction of Discrepancy

This variable was examined at two levels: Overstatements,

which increased account balances as reported on confirmation requests; and understatements, which decreased account balances.

First and Second Requests

A comparison for positive confirmations was made between proper responses of first and second requests.

2. Dependent variables

Two dependent variables were considered in this experiment.

Response Rate

The response rate defined in this experiment is the proportion of sample accounts for which responses were obtained.

Proper Response Rate

The proper response rate defined in this experiment is the proportion of proper responses to the number of confirmations sent.

E. Data matrices

The data matrices for this experiment are as follows:

(1) Continental Illinois National Bank and Trust Company of Chicago

Type of Confirmation	Overstated	Correctly Stated	Total
positive confirmation	30	100	130
blank confirmation			100
Total Number of Observations			230

(2) Michigan State Employees Credit Union[9]

Type of Confirmation	Over-stated	Under-stated	Correctly Stated	Total
positive confirmation	30	30	50	110
blank confirmation				50
Total Number of Observations				160

II. Major Findings and Conclusions

A. Continental Illinois National Bank & Trust of Chicago

1. At a significance level of .05 it was found that proper responses to first requests of misstated confirmations was less than .70.

2. At a significance level of .05 it was found that improper responses to first requests of misstated confirmations was less than or equal to .05.

3. No significant difference (at .05 level) existed between nonresponses to first requests of misstated and correctly stated confirmations.

4. A significant difference (at .05 level) existed between nonresponses to positive versus blank confirmations.

The following interval estimates were generated at the 95% confidence level:

a) $.26 \leq P_1 \leq .61$ where P_1 = the proportion of proper responses to first requests of misstated confirmations.

b) $.39 \leq P_2 \leq .74$ where P_2 = the proportion of nonresponses to first requests of misstated confirmations.

B. Michigan State University Employees Credit Union

1. No significant difference (at .05 level) existed between the proportion of nonresponses to misstated and correctly stated confirmation requests.

2. No significant difference (at .05 level) existed between the proportion of improper responses to overstated and understated confirmation requests.

3. No significant difference (at .05 level) existed between the proportion of nonresponses to overstated and understated confirmation

requests.

4. No significant difference (at .05 level) existed between the proportion of proper responses to first and second positive confirmation requests.

5. A significant difference (at .05 level) existed between the proportion of proper responses to positive versus blank confirmation requests.

The following interval estimates were generated at the 95% confidence level:

a) $.50 \leq P_1 \leq .84$ where P_1 = the proportion of proper responses to overstated confirmation requests.

b) $.66 \leq P_2 \leq .94$ where P_2 = the proportion of proper responses to understated confirmation requests.

c) $.02 \leq P_3 \leq .27$ where P_3 = the proportion of nonresponses to overstated confirmation requests.

d) $.01 \leq P_4 \leq .22$ where P_4 = the proportion of nonresponses to understated confirmation requests.

e) $.08 \leq P_5 \leq .39$ where P_5 = the proportion of improper responses to overstated confirmation requests.

f) $.02 \leq P_6 \leq .26$ where P_6 = the proportion of improper responses to understated confirmation requests.

III. Evaluation - Contributions and Shortcomings

The two most significant contributions of Sauls' Study were the use of two distinct population groupings and the introduction of blank confirmations as an explicit confirmation alternative. The most glaring shortcoming of Sauls' work was the failure to include negative confirmations in the experiment. Sauls' work also ignored two important explanatory variables - size of account balance and size of discrepancy. Sauls' rejection of only three of nine possible hypotheses also implies his statistical tests were low in statistical power. In

addition, Sauls' statistical tests were incapable of exploring possible interactions among explanatory variables. Overall, Sauls' work is interesting, but certainty not overwhelming in coverage.

Hubbard, Bullington Study[10]

I. Description of Experiment

A. Purpose of the experiment

The major purpose of this experiment was:

> "...to gather empirical data related to the relative reliability of positive type confirmation requests as opposed to the negative type.[11]

B. Methodology

This experiment was designed to test customer responses to both positive and negative confirmation requests. Within each confirmation type, approximately one-third of the accounts selected for confirmation were overstated, one-third understated, and one-third correctly stated (as shown by the company's records). The amount of misstatement was established in each case by an officer of the company. The company takes extreme pride in its good customer relations. Therefore, overstatements and understatements were implemented by transpositions or other seemingly possible typographical errors in the account balances. This was done so that the company could explain differences to questioning customers in terms of a clerical error in confirmation request preparation. As a result of following this procedure, the misstatements varied in amount and percentage of account balances. In the interest of getting the best possible response, the company was careful not to admit any mistake until a customer indicated agreement or disagreement with the confirmation request.

C. Experimental population

This experiment was confined to the accounts receivable existing on the books of Consolidated Oil Company of Lynchburg, Virginia as of September 30, 1971. Consolidated Oil Company is a locally owned distributor of heating fuels, gasoline, and other related petroleum products for a nationally known oil company. The company had current assets of approximately $163,000 and total assets of approximately $231,000 at the end of its fiscal year, June 30, 1971. Sales for that fiscal year were approximately $620,000.

The company allowed its accounts receivable of approximately $90,000 to be used in the experiment. All accounts were subject to selection with the exception of those of officers and certain employees. Of the approximately 2000 accounts at September 30, 1971, only the 825 accounts with nonzero balances (total dollar value of $88,187.62) were used in the experiment. From these 825 accounts, two samples of 102 accounts each were randomly selected.

D. Experimental variables

1. Independent variables

Five independent variables were considered in this experiment.

Type of Confirmation

Positive confirmation - This confirmation request was of the standard positive format and asked the recipient to indicate his agreement or disagreement with the balance shown.

Negative confirmation - This confirmation request was of the standard negative format and asked the recipient to reply only if a discrepancy was noted.

Direction of Discrepancy

This variable was examined at two levels: Overstatements, which increased account balances as reported on confirmation requests; and understatements, which decreased account balances.

Monthly Statements

A comparison was made of the effectiveness of confirmations for those customers who received monthly statements versus those who did not.

Type of Customer

A comparison was made of the response rates of commercial versus noncommercial customers.

First and Second Requests

A comparison for positive confirmations was made between the error detection rates of first and second requests.

2. Dependent variables

Two dependent variables were considered in this experiment.

Response Rate

The response rate defined in this study is the proportion of sample accounts for which responses were obtained.

Error Detection Rate

The respondent error detection rate is defined in this study as the following proportion:

$$\text{Error Detection Rate} = \frac{\text{Incorrect Balances Identified}}{\text{Number of Incorrect Balances}}$$

E. Data matrix

Type of Confirmation	Over-stated	Under-stated	Correctly Stated	Total
positive confirmation	34	34	34	102
negative confirmation	34	34	34	102
Total Number of Observations				204

Data for the analysis of the following independent variables was abstracted from the above data matrix:

1. Monthly Statements
2. Type of Customer
3. First and Second Requests.

II. Major Findings and Conclusions

1. No significant difference (at .05 level) existed between response rates for overstated versus understated negative confirmations.

2. No significant difference (at .05 level) existed between error detection rates for overstated versus understated negative confirmations.

3. No significant difference (at .05 level) existed between error detection rates for negative versus positive confirmations, i.e.,

.397 error detection rate for negative confirmations

.485 error detection rate for positive confirmations

4. No significant difference (at .05 level) existed between error detection rates for first versus second positive confirmation requests.

5. A significant difference (at .05 level) existed between error detection rates for those customers who received monthly

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statements versus those who did not. The significantly higher detection rate occurred with those accounts which did not receive monthly statements.

6. A significant difference (at .05 level) existed between response rates for commercial versus noncommercial customers, i.e.,

.714 response rate for commercial customers

.874 response rate for noncommercial customers

III. Evaluation - Contributions and Shortcomings

Of the studies examined in this chapter the Hubbard, Bullington Study is the most significant. Nevertheless, the Hubbard, Bullington Study also has several important shortcomings. Like the Davis, Neter, Palmer Study, Hubbard and Bullington ignored blank confirmations. Hubbard and Bullington also ignored an important explanatory variable - size of discrepancy - as well as the importance of possible interactions among explanatory variables. The chi-square nonparametric test was employed in statistically analyzing the results of the field experiment. This test has relatively low statistical power and as a result only two significant findings were reported. The study also did not report interval estimates of the detection and response rates, but only furnished point estimates.

The Hubbard, Bullington Study represents the most significant empirical contribution in the study of confirmations to date. However, the primary reason for ranking this work above the Davis, Neter, Palmer Study was the employment of a simulation by the later. By far the Davis, Neter, Palmer Study is more complete, but unfortunately, less realistic than the Hubbard, Bullington Study.

Summary

Each of the four studies examined in this chapter dealt with a specific area of concern within the confirmation framework. However, none of these studies was exhaustive. For example, the Davis, Neter, Palmer Study's primary limitation is its use of a simulation. Maynes' Study examined only blank confirmations and, in addition, the recipients were notified that they were participating in an experiment. Sauls' Study was excellent in its utilization of two distinct population groups, however, Sauls did not consider at least two important explanatory variables - size of discrepancy and size of account balance. Sauls also ignored negative confirmations. The Hubbard, Bullington Study ignored an important explanatory variable, size of discrepancy, however, it overcame the simulation limitation by utilizing actual account balances.

Unlike the above studies, this thesis research attempts to be comprehensive in its examination. For example, while none of the previous studies have examined all three confirmation forms (positive, negative, blank) within the same experimental framework, this thesis research does. In addition, this thesis research examines more explanatory variables than any previous research attempt. By employing larger sample sizes and an analysis of variance statistical design, this thesis research also allows for the examination of possible interactions among explanatory variables.

Perhaps the biggest distinction between this thesis research and prior studies is that the prior works have been essentially descriptive in nature. That is, prior works have only reported what results auditors might expect using a specific confirmation form in specific

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circumstances. Little attempt has been made at answering the question, which confirmation form should be chosen? Hence, one of the unique characteristics of this research effort will be its attempt to arrive at a normative conclusion. This attempt will be made through an examination of information content and of alternative confirmation cost.

FOOTNOTES

1. The primary information source for the descriptive analysis of Maynes' Study was an article which appeared in the Journal of the American Statistical Association, i.e., E. Scott Maynes, "Minimizing Response Errors in Financial Data: The Possibilities," Journal of the American Statistical Association, (March, 1968).

2. E. Scott Maynes, "Minimizing Response Errors in Financial Data: The Possibilities," Journal of the American Statistical Association, (March, 1968), p. 214.

3. Of the 701 responses received, 472 represented savings account balances and 229 represented savings and loan account balances. The credit union was organized such that individuals may not obtain loans without first maintaining a minimum savings balance.

4. The primary information source for the descriptive analysis of the Davis, Neter, Palmer Study was a publication by the Association for Bank Audit, Control, and Operation, i.e., Roger R. Palmer, John Neter, and Gordon B. Davis, A Research Study on the Effectiveness of Confirming Personal Checking Accounts, (The Association for Bank Audit, Control, and Operation, 1967).

5. Roger R. Palmer, John Neter, and Gordon B. Davis, A Research Study on the Effectiveness of Confirming Personal Checking Accounts, (The Association for Bank Audit, Control, and Operation, 1967), p. 6.

6. The data for the analysis of the independent variable, type of account holder, was abstracted from the following data matrices.

7. The primary information sources for the descriptive analysis of Sauls' Study were two articles published in The Accounting Review and Empirical Research in Accounting: Selected Studies, 1970, i.e., Eugene H. Sauls, "An Experiment on Nonsampling Errors," Empirical Research in Accounting: Selected Studies, 1970, (Chicago: University of Chicago Press, 1971), and Eugene H. Sauls, "Nonsampling Errors in Accounts Receivable Confirmation," The Accounting Review, (January, 1972).

8. Eugene H. Sauls, "An Experiment on Nonsampling Errors," Empirical Research in Accounting: Selected Studies, 1970, (Chicago: University of Chicago Press, 1971), p. 158.

9. Data for the analysis of the independent variable involving first and second requests of positive confirmations was abstracted from the following data matrix.

10. The primary information source for the descriptive analysis of the Hubbard, Bullington Study was an article which appeared in the March, 1972 Journal of Accountancy, i.e., Thomas D. Hubbard

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11. Thomas D. Hubbard and Jerry B. Bullington, "Positive and Negative Confirmation Requests - A Test," The Journal of Accountancy, (March, 1972), p. 48.

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CHAPTER IV

A FIELD EXPERIMENT

Introduction

The objective of this chapter is to apply the descriptive analysis of Chapter III to the field experiment conducted as part of this thesis research. This chapter and Chapter III will be reference points in comparing and contrasting the results of this research with that of prior studies.

The Field Experiment

The descriptive analysis employed in this chapter will take the following form:

I. Description of the Experiment
   A. Purpose of the experiment
   B. Methodology
   C. Experimental population
   D. Experimental variables
      1. Independent variables
      2. Dependent variables
   E. Data matrices
II. Major Conclusions and Findings
   A. Statistical tests
   B. The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.
      1. Nonproportional data matrix
      2. Proportional data matrix
      3. Power estimates
      4. Results of analysis of variance
      5. Conclusions
   C. The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.
      1. Nonproportional data matrix
      2. Proportional data matrix
      3. Power estimates

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4. Results of analysis of variance
5. Conclusions

D. Response rates

III. Evaluation - Contributions and Shortcomings

The essence of the field experiment will be communicated through the use of the above descriptive analysis and, in addition, will aid the reader in assimilating the similarities and differences between this and previous research efforts.

I. Description of the Experiment

A. Purpose of the experiment

The normative question to which this thesis research addresses itself is which of three confirmation forms (negative, positive, or blank) should be chosen. In searching for an answer to this normative question, two factors are given consideration, informativeness and cost. Estimates of specific conditional likelihoods are an essential part of the informativeness (sufficiency) determination. The primary purpose of the field experiment is to supply estimates of these likelihoods. In addition, the cost of confirmations is dependent, in part, upon response rates. Low response rates imply additional follow-up procedures will be necessary and hence, additional costs will be incurred. A secondary purpose of this field experiment is to supply estimates of response rates for the three alternative confirmation forms. Thus, the purpose of the field experiment is twofold: first, to supply estimates of the conditional likelihoods needed for the informativeness (sufficiency) examination; and secondly, to supply estimates of the response rates needed for the cost analyses.

B. Methodology

Two conditional likelihoods are needed for the sufficiency

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examination. These likelihoods are:

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.
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> The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

In order to estimate these likelihoods for each of the three alternative confirmation forms, correct confirmations and confirmations with deliberately misstated account balances (as appearing on the company's records) were sent to members of the Michigan State University Employees Credit Union. In addition, it was desirable to determine whether the conditional likelihoods varied depending upon the specific circumstances in which confirmations are employed. For example, it is desriable to determine whether the likelihoods differ with large versus small accounts and with over versus understatements. Within limits, as many of these variables as possible are incorporated into the field experiment (see the following section on experimental variables).

The field experiment was conducted in conjunction with an audit of the Michigan State University Employees Credit Union by Larry Thompson, a Detroit area certified public accountant. The confirmation requests employed in the experiment were those of Larry Thompson and all correspondence was directed through Larry Thompson's office.

Specific experimental procedures included the mailing of both first and second requests.[1] First requests were mailed April 25, 1972

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confirming account balances as of March 31, 1972. The three week time lapse between the confirmation date and the first mailing was a result of delays encountered by the Credit Union's service bureau in preparing quarterly statements.

Seven hundred eighty accounts (three hundred ninty share and three hundred ninty loan accounts) were randomly selected for inclusion in the experiment. Since one of the objectives of the experiment was to determine whether individuals could confirm account balances based upon their <u>own</u> records, quarterly statements for each of the seven hundred eighty accounts were withheld from members until after the completion of the experiment. Second requests, clearly marked as such, were mailed May 20, 1972, approximately three weeks after the first requests, for both positive and blank confirmations. The experiment was terminated as of June 6, 1972 and all quarterly statements previously withheld were mailed.

All confirmation requests included self-addressed stamped envelopes to expedite returns. In addition, those individuals who received incorrect confirmations and responded, received a following cover letter explaining an error had been made. A correct confirmation was later sent to each recipient who participated in the study.

Of the seven hundred eighty accounts originally selected, fifty six were eliminated from the experimental analyses. Five of these were eliminated because of incorrect addresses and fifty one were eliminated because the recipient contacted (e.g., telephoned) the Credit Union and requested the balance of their account. Because one of the objectives of this study was to see whether recipients could

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confirm their account balances independent of Credit Union records, the inclusion of these fifty one accounts would have biased the experimental results.

C. Experimental population

The field experiment was confined to loan and share accounts existing on the books of the Michigan State University Employees Credit Union as of March 31, 1972. The Michigan State University Employees Credit Union is a non-profit cooperative first organized in November of 1937. Since its early beginnings in 1937 the Credit Union has grown at a phenomenal rate and is currently one of the ten largest credit unions in Michigan, 51st largest credit union in the world, and largest university credit union. The Credit Union's size is reflected by its financial statements which show as of December 31, 1971 almost $ 20 million in assets, $ 14 million in loans, and 15,000 members (see Appendix C). The Credit Union's membership consists primarily of professional, university connected employees with an average age of approximately 36 years.

A random sample of seven hundred eighty accounts was taken from the Credit Union as of March 31, 1972. Three hundred ninty of the seven hundred eighty were share accounts and three hundred ninty were loan accounts. At the request of the Credit Union management, these accounts were confined to balances of $ 1000 or less. As stated previously, fifty six of the seven hundred eighty accounts originally selected were later eliminated either because of potentially biased results or incorrect addresses. The elimination of these accounts left three hundred sixty one loan and three hundred sixty three share

accounts.

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accounts. Both the loan and share accounts selected are described in Tables I through VII.

TABLE I

LOAN ACCOUNTS - SUMMARY DATA

Total Number Sampled	361
Total Dollar Value Sampled	$ 161,671.77
Mean Dollar Value Sampled	$ 447.84
Median Dollar Value Sampled	$ 400.00

TABLE II

LOAN TYPES

	Number	Dollar Value
Mobile Home	1	$ 723.72
FHA	1	681.76
Educational	3	1,700.00
Consolidation	10	6,376.44
Miscellaneous	108	45,678.49
Automobile	34	15,382.26
Instant Cash	204	91,129.10
Totals	361	$ 161,671.77

TABLE III

LOANS - FREQUENCY INFORMATION

Dollar Value	Number
$ 0 - 100.99	31
101 - 200.99	51
201 - 300.99	50
301 - 400.99	54
401 - 500.99	38
501 - 600.99	30
601 - 700.99	24
701 - 800.99	25
801 - 900.99	29
901 & over	29
Total	361

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TABLE IV

LOANS - MEAN DOLLAR AMOUNTS
BY SIZE AND CONFIRMATION TYPE*

	Large	Small
Positive	$ 703.62	$ 219.58
Negative	$ 676.66	$ 209.87
Blank	$ 603.04	$ 244.37

* Large loan accounts were defined as all accounts greater than the median loan value ($ 400.00). Small loan accounts were those accounts less than the median value.

TABLE V

SHARE ACCOUNTS - SUMMARY DATA

Total Number Sampled	363
Total Dollar Value Sampled	$ 64,107.18
Mean Dollar Value Sampled	$ 176.60
Median Dollar Value Sampled	$ 65.00

TABLE VI

SHARE ACCOUNTS - FREQUENCY INFORMATION

Dollar Value	Number
$ 0 - 10.99	87
11 - 20.99	28
21 - 40.99	38
41 - 60.99	27
61 - 80.99	14
81 - 100.99	25
101 - 120.99	12
121 - 140.99	12
141 - 200.99	21
201 - 300.99	20
301 - 500.99	31
501 - 700.99	28
701 & over	20
Total	363

TABLE VII

SHARE ACCOUNTS - MEAN DOLLAR AMOUNTS BY SIZE AND CONFIRMATION TYPE*

	Large	Small
Positive	$ 346.50	$ 23.35
Negative	$ 313.52	$ 18.68
Blank	$ 383.81	$ 14.52

* Large share accounts were defined as all accounts greater than the median share account value ($ 65.00). Small share accounts were those accounts less than the median value.

The above tables reflect the mix of accounts sampled in the field experiment.

D. Experimental variables

1. Independent variables

The independent variables employed in the field experiment are discussed by type of conditional likelihood being estimated.

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

In estimating the above likelihood the following indpendent variables were considered:

Type of Confirmation Form

Positive confirmation - This confirmation request was of the standard positive format (see Appendix A) and asked the recipient to indicate his agreement or disagreement with the account balance shown on the confirmation request.

Negative confirmation - This confirmation request was of the standard negative format (see Appendix A) and asked the recipient

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to reply only if a discrepancy existed with the account balance shown on the confirmation request.

Size of Account

This variable was examined at two levels: large versus small accounts. The operational definition utilized in the field experiment for distinguishing large from small was based upon the median statistic. That is, large accounts included all accounts falling above the median value for the random sample and samll accounts included all those falling below the median.

Type of Account Confirmed

This variable was examined at two levels: asset versus liability accounts. Asset accounts consisted of loan accounts appearing on the Credit Union's books and liability accounts consisted of members' share accounts.

Direction of Discrepancy

This variable was examined at two levels: overstatements, which increased account balances appearing on the confirmation request; and understatements, which decreased account balances.

Materiality of Discrepancy

This variable was examined at two levels: a 5% level, which increased/decreased account balances appearing on the confirmation request by 5%; and a 10% level, which increased/decreased account balances by 10%.

> The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

In estimating the above likelihood the first three independent

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variables described above were employed. That is, the following independent variables were examined: type of confirmation form; size of account; and type of account confirmed. In addition, the blank confirmation form was considered as a level of the independent variable type of confirmation form.[2]

Blank confirmation - This confirmation type asked the recipient to provide information from his records (see Appendix A).

2. Dependent variables

Three dependent variables are examined in this field experiment. In order to better illustrate the nature and implications of the dependent variables the following schematic representation will be a basic point of reference.

			THE ACCOUNT IS correct	THE ACCOUNT IS incorrect
RESPONSES	Recipient Indicates the Information is	correct	A	B
		incorrect	C	D
NONRESPONSES			E	F

Total Number of Misstated Confirmations Sent = B + D + F
Total Number of Correct Confirmations Sent = A + C + E
Total Number of Respondents Indicating the Confirmation is Correct = A + B
Total Number of Respondents Indicating the Confirmation is Incorrect = C + D
Total Number of Nonrespondents = E + F

A. The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

Consistent with the law of large numbers and the notion of probability, the above conditional likelihood was estimated in terms of relative frequencies.[3]

For positive confirmations this likelihood was estimated as:

$$\frac{D}{B + D} .$$

For negative confirmations this likelihood was estimated as:

$$\frac{D}{B + D + F} .$$

The addition of F to the denominator of the negative confirmation estimator is due to the fact that a nonresponse to a negative confirmation is an implicit indication that the account is correct.

The above likelihood was not estimated for blank confirmations because the recipient provides information from his own records and hence, the confirmation could not be misstated by the researcher. This likelihood was assumed equal to one for blanks because if an individual's account was in error there would be a very good chance that the amount provided by the recipient would not correspond to the erroneous balance.

B. The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

For positive and blank confirmations this likelihood was estimated as:

$$\frac{A}{A + C} .$$

For negative confirmations this likelihood was estimated as:

$$\frac{A + E}{A + C + E} .$$

The addition of E to both the numerator and denominator of the negative confirmation estimator is due to the fact that a nonresponse to a negative confirmation is an implicit indication

that the account is correct.

C. Response rate

The response rate defined in this experiment was the proportion of sample accounts for which responses were obtained. Response rates were calculated for both positive and blank confirmations.

E. Data matrices

The data matrices for the field experiment are shown below:

Correct Confirmations
Data Matrix

	Share Accounts			Loan Accounts		
	Blank	Positive	Negative	Blank	Positive	Negative
Small Accounts	20 1*	20	15	20	20 1*	15 2*
Large Accounts	20 2*	20 3*	15	20 3*	20 3*	15

Total Number of Correct Confirmations Sent	220
Number of Accounts Eliminated Because of Bad Addresses or Potentially Biasing Results	15*
Total Number of Useable Correct Confirmations	205

Misstated Confirmations Data Matrix

		Share Accounts				Loan Accounts			
		Positive		Negative		Positive		Negative	
		Small	Large	Small	Large	Small	Large	Small	Large
Overstated Accounts	5%	20	20 1*	15	15	20 2*	20 1*	15	15
	10%	20 2*	20 7*	15	15	20 4*	20 3*	15 1*	15 1*
Understated Accounts	5%	20	20 1*	15 1*	15 1*	20	20 2*	15	15 1*
	10%	20 3*	20 1*	15 3*	15 1*	20 2*	20 2*	15	15 1*

Total Number of Misstated Confirmations Sent	560
Number of Accounts Eliminated Because of Bad Addresses or Potentially Biasing Results	41*
Total Number of Useable Misstated Confirmations	519

II. Major Conclusions and Findings

A. Statistical tests

The statistical procedure chosen for analyzing the results of the field experiment was analysis of variance. One of the objectives of the field experiment was to examine the effects of various independent variables upon the estimated conditional likelihoods described earlier. Analysis of variance is capable of testing for main effects as well as possible interactive effects among independent variables. Since interactive effects have not as yet been examined within the confirmation context, one of the research contributions of this thesis is the examination of potential interactions. An additional reason for choosing the analysis of variance procedure is because of power implications. The power of a statistical test is the probability that the test will reject a null hypothesis when the null hypothesis is, in fact, false.[4] Analysis of variance is a parametric test and is considered more powerful than nonparametric ones. However, for a parametric test to be more powerful than a nonparametric certain statistical assumptions must be satisfied. In the case of analysis of variance three assumptions are made as follows:[5]

1. The observations are randomly chosen and hence are independent of one another, i.e., independence.
2. The distributions of the observations chosen within cells are normal, i.e., normality.
3. The variances of these distributions within cells from which the observations are chosen are equal, i.e., homoscedasticity.

The validity of the results of analysis of variance is dependent upon the extent to which the above assumptions are satisfied. For the purposes of this experiment, the independence and normality assumptions may be considered reasonably satisfied.[6] The homoscedasticity (i.e., equality of variance) assumption, however, presents a dilemma. In the case of dichotomous scored data, such as employed in this experiment, the homoscedasticity assumption is usually violated. This is the case with such data because the means of the treatment cells are proportions and the variances within cells are given by the formula $np(1-p)$, where p is the proportion for any cell. Analysis of variance tests whether the proportions differ across cells, but if the proportions differ, then by definition the variances will differ across cells, i.e., a violation of the homoscedasticity assumption.

Two researchers have examined the problem of using analysis of variance with binomial data. G.H. Lunney reported in the Journal of Educational Measurement that as long as the proportions ranged within a prescribed limit and there exists a sufficient number of degrees of freedom, analysis of variance could be appropriately employed with binomial data, i.e., analysis of variance was robust to violations of the assumption of homoscedasticity.[7] In a related article, however, Ralph B. D'Agostino discussed the usefulness of analyzing transformed data as opposed to the direct analysis of binomial information.[8] In order to optimize on the statistical interpretation of the experimental results, analysis of variance was

applied to both the original data and to the transformed data where the arcsin transformation as suggested by M.S. Bartlett was employed to examine possible effects of the homoscedasticity assumption violation.[9] If the results between the original and the transformed data are consistent, the interpretations would be simpler and not have to be concerned with the probelms suggested above.

Since unequal sample sizes existed in the design (after elimination of the fifty six accounts mentioned previously), proportional designs were obtained by randomly deleting observations from the necessary cells.

For the purposes of statistical interpretation, the researcher believes that the statistical methods described above will adequately reflect the observations generated from the field experiment.

B. The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

1. Nonproportional data matrix[10]

Share Accounts				Loan Accounts					
Positive		Negative		Positive		Negative			
Small	Large	Small	Large	Small	Large	Small	Large		
15	15	14	15	15	15	14	14	5%	Overstated Accounts
14	14	14	15	15	15	14	12	10%	
16	15	10	14	14	13	13	14	5%	Understated Accounts
12	11	14	15	11	11	14	14	10%	

2. Proportional data matrix

Share Accounts				Loan Accounts					
Positive		Negative		Positive		Negative			
Small	Large	Small	Large	Small	Large	Small	Large		
14	14	14	14	14	14	14	14	5%	Overstated Accounts
12	12	12	12	12	12	12	12	10%	
10	10	10	10	10	10	10	10	5%	Understated Accounts
11	11	11	11	11	11	11	11	10%	

3. Power estimates

Statistical tests are normally characterized by the following two error probabilities:

α = the probability of rejecting a true null hypothesis

β = the probability of accepting a false null hypothesis

For the purposes of this experiment an α level of .05 is utilized. The β probability is normally expressed in terms of $1 - \beta$ which is termed the power of a statistical test. Power is simply the probability of rejecting a false null hypothesis. The purpose of this section is to obtain estimates of the power of the tests employed in analyzing the field experimental results. The power of a statistical test is dependent upon the α level chosen, $\alpha = .05$, the number of degrees of freedom for the test, and a factor ϕ.

The power estimates for all independent variables tested with

respect to the first conditional likelihood are as follows: [11]

Degrees of Freedom	1, 344	
Meaningful Difference	.10	.05
ϕ	3.29	1.65
Power of Test	.99	.65

4. Results of analysis of variance

The results of the analysis of variance with respect to the first conditional likelihood are given in Table VIII.

5. Conclusions

Based upon the analysis presented in Table VIII, three independent variables are statistically significant (at the .05 level) - the main effect of confirmation type and two interactions, AD and ASC. The AD (Account Type by Direction of Discrepancy) interaction does not influence sufficiency since it does not distinguish between confirmation forms, i.e., it is independent of the confirmation form utilized. Hence, with respect ot the first conditional likelihood, the two significant differences with implications for sufficiency are the main effect of confirmation type and the ASC (Account Type by Size of Account by Confirmation Type) interaction.

First, considering the main effect of confirmation type, point and interval estimates have been computed and are presented in Table IX.

Analysis of the ASC interaction is more complex than the descriptive analysis of confirmation type. Point and interval estimates for this interaction are presented in Table X.

TABLE VIII

ANOVA RESULTS - FIRST LIKELIHOOD

Source	P Values[12] Original Data- Proportional	Transformed Data[13]
A - Account Type	.3868	.2478
D - Direction of Discrepancy	.2660	.1450
S - Size of Account	.3868	.2617
E - Error Size	.9204	.9653
C - Confirmation Type	.0064*	.0119*
Interactions:		
AD	.0193*	.0145*
AS	.3868	.1892
AE	.3969	.2600
AC	.6036	.4961
DS	.7106	.5323
DE	.5520	.3395
DC	.2018	.1972
SE	.7243	.5853
SC	.3239	.1931
EC	.4427	.4061
ADS	.7106	.6947
ADE	.5039	.3904
ADC	.9317	.8879
ASE	.8870	.9371
ASC	.0147*	.0128*
AEC	.6298	.4437
DSE	.8953	.9075
DSC	.1613	.0869
DEC	.4550	.3390
SEC	.6463	.5859
ADSE	.7164	******
ASEC	.1646	.0885
ADEC	.3413	******
ADSC	.9504	******
DSEC	.8997	******
ADSEC	.2900	******

* Indicates significance at the .05 level.

****** For the analysis involving the transformed variable these terms were not tested statistically since they were pooled to estimate the error term, i.e., MS_{within}.

TABLE IX

FIRST LIKELIHOOD
MAIN EFFECT OF CONFIRMATION TYPE

The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

	Point Estimate [14]	Interval Estimate *
Positive Confirmations	.29	$.23 \leq p \leq .35$
Negative Confirmations	.17	$.11 \leq p \leq .23$
Blank Confirmations	(Assumed Equal to One)	

* Generated at a 95% Confidence Level

TABLE X

FIRST LIKELIHOOD
ASC INTERACTION

The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

	Point Estimate [15]	Interval Estimate *
Loan Accounts		
Small-Positive	.36	$.23 \leq p \leq .49$
Large-Positive	.29	$.16 \leq p \leq .42$
Small-Negative	.15	$.02 \leq p \leq .28$
Large-Negative	.21	$.10 \leq p \leq .32$
Share Accounts		
Small-Positive	.14	$.01 \leq p \leq .27$
Large-Positive	.38	$.25 \leq p \leq .51$
Small-Negative	.19	$.08 \leq p \leq .30$
Large-Negative	.13	$.02 \leq p \leq .24$

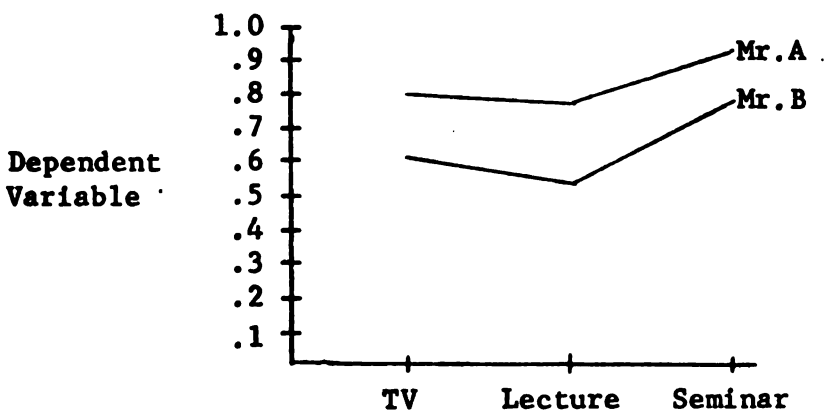
* Generated at a 95% Confidence Level

When examining interactions within an analysis of variance

framework a useful distinction is made between two types of interaction: ordinal and disordinal. In the ordinal case, the rank order of categories of one variable on the basis of their dependent variable scores is the same within each category of the second independent variable. For example, suppose we designed an experiment to examine the effectiveness of three types of teaching methods on accounting students. Assume that we used two instructors, Mr.A and Mr.B, each of whom taught advanced accounting on television, in a seminar, and in a large lecture. The objective was to see which teaching method was most effective as measured by a final exam at the end of the term. Suppose that we employed analysis of variance with the following results:

	TV	Lecture	Seminar
Mr.A	.80	.77	.90
Mr.B	.60	.53	.78

Assuming the instructor by teaching method interaction was significant, one could determine whether it is ordinal or disordinal by plotting cell means. Since two independent variables were employed the cell means would be plotted in two dimensions.

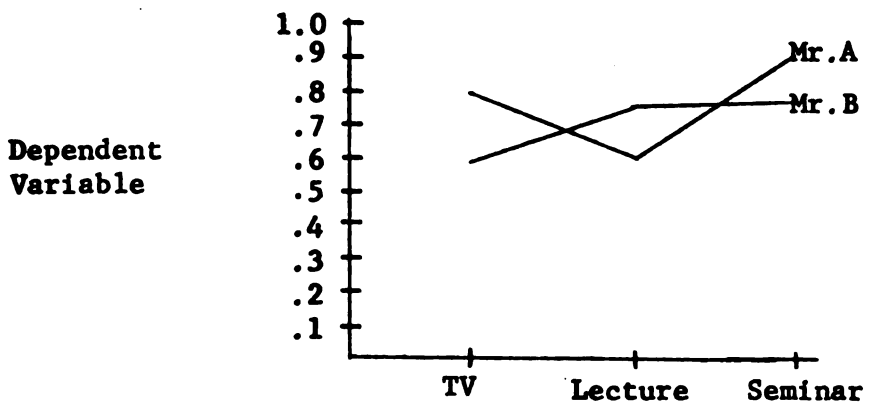


By examining the graph we see that Mr.A is ranked above Mr.B for each type of teaching method and hence, by previous definition the interaction is ordinal. The importance of ordinal interactions is that they allow us to generalize across levels of independent variables. For example, in the above case we can generalize that no matter which teaching method we employ Mr.A is a better instructor.

Now assume that the results would have been as follows:

	TV	Lecture	Seminar
Mr.A	.80	.60	.90
Mr.B	.60	.75	.78

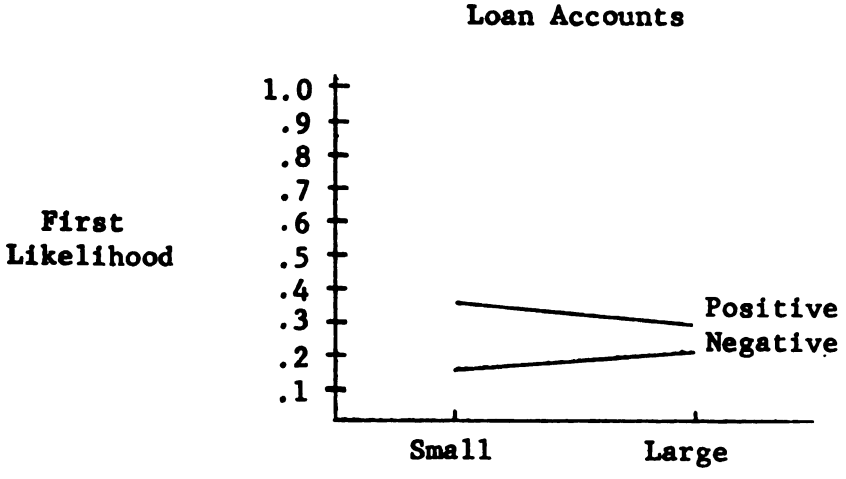
Plotting in two dimensions yields:



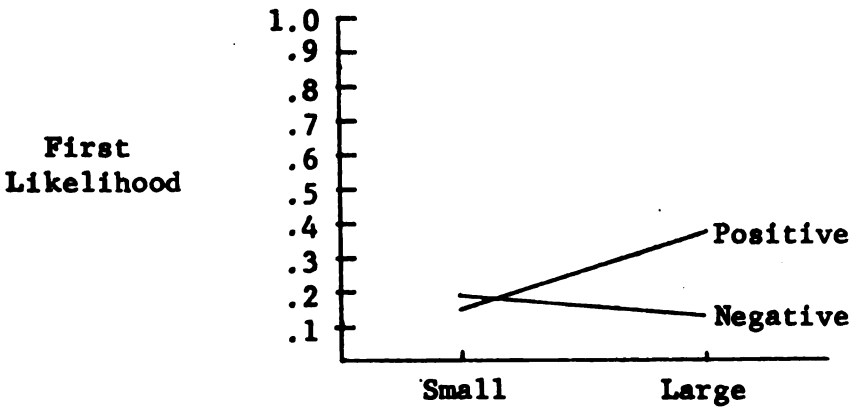
By examining the graph we see that the lines intersect and hence, the interaction by definition is disordinal. Disordinal interactions do not allow us to generalize across levels of independent variables. For example, in the above case we cannot say that Mr.A is a better instructor because for a lecture approach Mr.B is the superior instructor as measured by the dependent variable.[16]

Since analysis of variance was employed in this thesis and since there was a significant interaction, ASC (Account Type by Size of Account by Confirmation Type), ordinality must be examined. We may find, for example, that positive confirmations are superior to negatives regardless of the account type or size of account, i.e., an ordinal interaction. On the other hand, the interaction may be disordinal.

Note that in the above examples there were two independent variables and that the graphs were plotted in two dimensions. Technically, for three way interactions, such as the ASC interaction, the graph should be plotted in three dimensions. Practically, the likelihoods are plotted by account type separately in two dimensions and then the separate graphs are artificially superimposed upon one another. The graphs in two dimensions are as follows:



Share Accounts



The ASC interaction is not ordinal since one of the interactions in two dimensions is disordinal. Hence, generalizations cannot be made beyond the individual components of the interaction.

Point and interval estimates for the nonsignificant main effects of the first likelihood are given in Table XI.

TABLE XI

FIRST LIKELIHOOD
NONSIGNIFICANT MAIN EFFECTS

	Estimates for Levels of Variables		Least Squares Estimates of Effects of Variable	
Main Effect	Point #	Interval *	Point	Interval *
Error Size			-.01	$-.09 \leq e \leq .08$
5%	.22	$.16 \leq p \leq .28$		
10%	.23	$.17 \leq p \leq .29$		
Direction of Discrepancy			-.06	$-.14 \leq e \leq .03$
Overstated	.25	$.19 \leq p \leq .31$		
Understated	.20	$.14 \leq p \leq .26$		
Type of Account			-.04	$-.12 \leq e \leq .05$
Share	.21	$.15 \leq p \leq .27$		
Loan	.24	$.18 \leq p \leq .30$		
Size of Account			-.04	$-.13 \leq e \leq .04$
Large	.24	$.18 \leq p \leq .30$		
Small	.21	$.15 \leq p \leq .27$		

Obtained from observed, proportionate cell frequencies
* Generated at a 95% Confidence Level

C. The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

1. Nonproportional data matrix[17]

Positive		Negative		Blank		
Share	Loan	Share	Loan	Share	Loan	
13	13	15	15	12	12	Large Accounts
15	14	15	13	7	8	Small Accounts

2. Proportional data matrix

Positive		Negative		Blank		
Share	Loan	Share	Loan	Share	Loan	
13	13	15	13	7	8	Large Accounts
13	13	15	13	7	8	Small Accounts

3. Power estimates

The power estimates for all independent variables tested with respect to the second conditional likelihood are as follows:

Independent Variables:	C, CA, CS, CAS	
Degrees of Freedom	2, 126	
Meaningful Difference	.10	.05
ϕ	1.97	.96
Power of Test	.88	.35

Independent Variables:	A,S, AS	
Degrees of Freedom	1, 126	
Meaningful Difference	.10	.05
ϕ	2.36	1.18
Power of Test	.91	.35

4. Results of analysis of variance

The results of analysis of variance with respect ot the second conditional likelihood are given in Table XII.

TABLE XII

ANOVA RESULTS - SECOND LIKELIHOOD

	P Values	
	Original Data-	
Source	Proportional	Transformed Data
C - Confirmation Type	.0001*	.0091*
A - Account Type	.0714	.0599
S - Size of Account	.6296	.5078
Interactions:		
CA	.4208	.5006
CS	.3152	.4098
AS	.6763	******
CAS	.3515	******

* Indicates significance at the .05 level.
****** For the analysis involving the transformed variable these terms were not tested statistically since they were pooled to estimate the error term, i.e., MS_{within}.

5. Conclusions

Based upon the analysis presented in Table XII only one independent variable (confirmation type) was statistically significant (at the .05 level). Point and interval estimates for the confirmation type main effect are given in Table XIII.

Point and interval estimates for the nonsignificant main effects are given in Table XIV.

TABLE XIII

SECOND LIKELIHOOD
MAIN EFFECT OF CONFIRMATION TYPE

The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

	Point Estimate [18]	Interval Estimate *
Positive Confirmations	.95	$.85 \leq p \leq 1.0$
Negative Confirmations	.79	$.70 \leq p \leq .88$
Blank Confirmations	.47	$.34 \leq p \leq .60$

* Generated at a 95% Confidence Level

TABLE XIV

SECOND LIKELIHOOD
NONSIGNIFICANT MAIN EFFECTS

	Estimates for Levels of Variables		Least Squares Estimates of Effects of Variable	
Main Effect	Point #	Interval *	Point	Interval *
Type of Account			-.13	$-.25 \leq e \leq -.01$
Share	.86	$.80 \leq p \leq .92$		
Loan	.74	$.66 \leq p \leq .82$		
Size of Account			-.05	$-.17 \leq e \leq .07$
Large	.81	$.73 \leq p \leq .89$		
Small	.78	$.70 \leq p \leq .86$		

\# Obtained from observed, proportionate cell frequencies
* Generated at a 95% Confidence Level

D. Response rates

An important input to the cost analysis portion of this research project is the response rate analyses. Because of the potential impact upon the cost analysis, the response rate analyses will be temporarily differed until Chapter VI. At that point, the same

descriptive analysis presented above will be applied to the response rate results.

III. Evaluation - Contributions and Shortcomings

The main contribution of the field experiment portion of this thesis lies in the estimation of conditional likelihoods. In estimating these likelihoods, no previous research effort had examined as many independent variables or had explored possible interactions among independent variables. In addition, no previous research attempt employed as powerful a statistical methodology.

The main shortcoming of the research effort is its limited ability to generalize. As with any empirical study, the results of the field experiment are confined to the specific population tested. That is, the results of the field experiment are confined to the Michigan State University Employees Credit Union. The researcher, in realizing this shortcoming, has attempted to describe the experimental population in sufficient detail so that readers can decide for themselves whether the results of the field experiment are applicable to the reader's specific population of concern.

Summary

The objective of this chapter was to apply the descriptive analysis of Chapter III to the field experiment conducted as part of this thesis research. The main product of the field experiment was the estimation of two conditional likelihoods upon which the evaluation of informativeness (sufficiency) of alternative confirmation forms is dependent. The validity of these estimates is, in turn, dependent upon the reliability of the experimental methodology. The

descriptive analysis of this chapter provides the reader with the ability to judge for himself the validity and reliability of the field experiment and the related conditional likelihood estimates. In addition, this chapter and Chapter III serve as reference points in comparing and contrasting the results of this research with that of prior studies.

FOOTNOTES

1. Second requests were mailed on both positive blank confirmation requests. Second requests could not be mailed on negative confirmations.

2. In other words, the independent variable (factor) confirmation type possesses three levels - negative, blank, and positive confirmation forms.

3. Meyer Dwass, Probability, (New York: W. A. Benjamin, Inc., 1970), pp. 322-323.

4. Gene V. Glass and Julian C. Stanley, Statistical Methods in Education and Psychology, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 285.

5. The assumptions presented here are those made for a fixed effects analysis of variance procedure such as employed in this research. See Glass and Stanley, op. cit., p. 340.

6. Because the subjects selected for inclusion in the experiment were randomly selected and no dependency conditions were discovered, the independence assumption is considered reasonably satisfied. Because for analysis of variance the effects of non-normality on the nomial level of significance of the F test are extremely slight, the normality assumption may also be considered reasonably satisfied. See Glass and Stanley, op. cit., p. 372.

7. G. H. Lunney, "Using Analysis of Variance with a Dichotomous Dependent Variable: An Empirical Study," Journal of Educational Measurement, (Winter, 1970), pp. 263-269.

8. Ralph B. D'Agostino, "A Second Look at Analysis of Variance on Dichotomous Data," Journal of Educational Measurement, (Winter, 1971), pp. 327-333.

9. M. S. Bartlett, "The Use of Transformations," Biometrices, (Volume 3, 1947), pp. 39-53.

10. The above two data matrices are directly related to the data matrix on page 67. The cell frequencies on page 67 represent the number of confirmations sent in each category less bad addresses and recipients who contacted the credit union. The cell frequencies of the nonproportional data matrix represent the number of recipients in each category who responded to the confirmation in the case of positives or the same cell frequencies on page 67 in the case of negatives. The proportional matrix was derived from the nonproportional matrix by random deletion of observations.

11. Glass and Stanley, op. cit., pp. 376 & 548-551.

12. P values indicate the α levels necessary to obtain statistically significant results. For example, a p = .50 implies that the effects of an independent variable would not be statistically significant except at an α level of .50 or greater. For the purposes of this experiment an α level of .05 is utilized.

13. The transformed data analysis is based upon proportional cell frequencies.

14. Point and interval estimates were obtained from the observed, proportionate cell frequencies.

15. Point and interval estimates were obtained from the observed, proportionate cell frequencies.

16. For a further discussion of ordinality and disordinality see Glass and Stanley, op. cit., pp. 410-411.

17. The above two data matrices are directly related to the data matrix given on page 66. The cell frequencies on page 66 represent the number of confirmations sent in each category less bad addresses and recipients who contacted the credit union. The cell frequencies of the nonproportional data matrix represent the number of respondents in each category for blank and positive confirmations and the same cell frequencies as on page 66 for negatives. The proportional data matrix was derived from the nonproportional matrix by random deletion of observations.

18. Point and interval estimates were obtained from the observed, proportionate cell frequencies.

CHAPTER V

INFORMATION CONTENT

Introduction

The objective of this chapter is to examine the concept of informativeness and its implications for choosing among alternative confirmation forms. This chapter is organized organized as follows:

I. Information Content
   A. A general review
   B. Sufficiency
II. An Empirical Test
III. Conclusions

Information Content

A General Review

Recall from Chapter I that one objective of this study is to generate a ranking of alternative confirmation forms based upon information content. Ceteris paribus, it is assumed that auditors will prefer that form which is most informative.

The informational content of a confirmation form is dependent upon the likelihood that a correct message will be received. That is, it depends on the likelihood that if an account is, in fact, correct (incorrect) the message generated from the confirmation procedure indicates the account is correct (incorrect). From Chapter I these likelihoods are restated as:

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

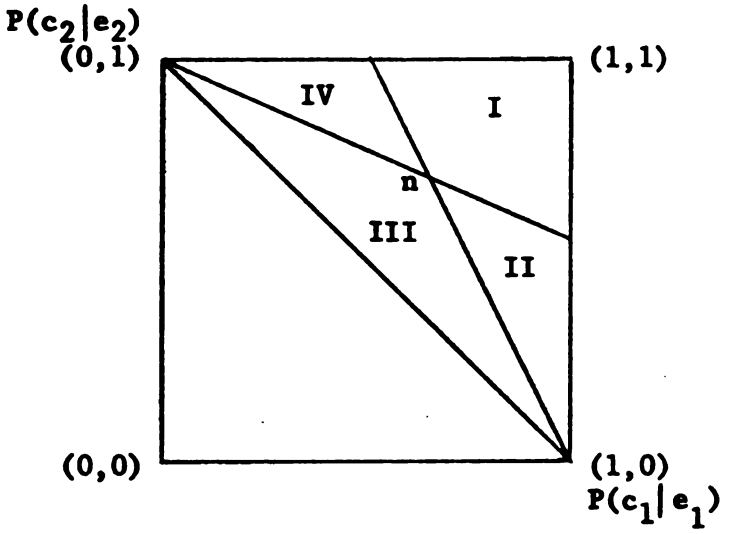
and

> The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

Sufficiency

In order to generate a ranking among alternative confirmation forms based on information content, the statistical concept of sufficiency is employed. Sufficiency was developed primarily by Blackwell and is related to the statistical properties of information.[1] It is dependent strictly on the likelihoods mentioned above and is therefore independent of individual auditor preferences or prior uncertainties as to the degrees of error in accounts.[2] If sufficiency holds between two alternative forms, for example, if positives are sufficient for negatives, then positives are at least as informative as negatives regardless of individual auditor preferences or uncertainties.

Consistent with Chapter I, sufficiency is empirically examined through the use of graphic analysis. Recall from Chapter I that in the graphic analysis, sufficiency is dependent upon the relative location of plotted points within an information triangle. For example, letting the point n represent the two conditional likelihoods $P(c_1|e_1)$ and $P(c_2|e_2)$ for negative confirmations, one could obtain the following result:[3]



Where $P(c_1|e_1)$ = The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

$P(c_2|e_2)$ = The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

Lines extending from the points (1,0) and (0,1) through point n partition the information triangle ((0,1), (1,0), and (1,1)) into four regions. If when plotting the likelihood point for an alternative confirmation form, say positive confirmations, that point falls within region I then positives are sufficient for (at least as informative as) negatives.[4] If, on the other hand, the positive confirmation point falls within region III then negatives are sufficient for (at least as informative as) positives.[5] If the positive confirmation likelihood point falls within regions II or IV then neither confirmation form is sufficient for the other.[6] In this situation an information ranking cannot be generated without further specification of individual auditor preferences and uncertainties. On the other hand, if sufficiency

does hold then an informativeness ranking may be generated which is independent of individual auditor preferences or uncertainties. Obviously, the use of sufficiency as part of the research methodology of this thesis increases the potential impact of generalizations across auditors and auditing situations.

An Empirical Test

The field experiment described in Chapter IV dealt with the estimating of the conditional likelihoods for each of the alternative confirmation forms. With respect to the first likelihood, $P(c_1|e_1)$, it was found that there existed three significant differences - the main effect of confirmation type and two interactions. The main effect of confirmation type will, of course, directly influence the sufficiency computations, but only one of the interactions will have a direct implication. The AD (Account Type by Direction of Discrepancy) interaction does not influence sufficiency since it does not distinguish among confirmation types, i.e., it is indpendent of the confirmation form utilized. Hence, with respect to the first likelihood, the two significant differences with implications for sufficiency are the main effect of confirmation type and the ASC (Account Type by Size of Account by Confirmation Type) interaction. Since the ASC interaction is disordinal sufficiency must be examined for each component of the interaction. The relevant likelihood estimates are as follows:

	The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect, i.e., $P(c_1 \mid e_1)$		
	Negative	Positive	Blank *
Main Effect of Confirmation	.17	.29	1.0
ASC Interaction:			
Loan - Small	.15	.36	1.0
Loan - Large	.21	.29	1.0
Share - Small	.19	.14	1.0
Share - Large	.13	.38	1.0

* Assumed equal to one

With respect of the second likelihood, $P(c_2 \mid e_2)$, it was found that there existed only one significant difference - the main effect of confirmation type. Hence, sufficiency need only be examined for this effect. The relevant likelihood estimates are as follows:

	The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct, i.e., $P(c_2 \mid e_2)$.		
	Negative	Positive	Blank
Main Effect of Confirmation	.79	.95	.47

In what follows, sufficiency is examined using graphic analysis for each of the five estimates of the first likelihood given the single estimate of the second likelihood. The relevant notation for this examination is:

c_1 = the message received from the recipient indicates the account is incorrect.

c_2 = the message received from the recipient indicates the account is correct.

e_1 = the account is incorrect

e_2 = the account is correct

$P(c_1|e_1)$ = the likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect

$P(c_2|e_1)$ = the likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is correct

$P(c_1|e_2)$ = the likelihood that given the account is correct, the recipient of the confirmation indicates the account is incorrect

$P(c_2|e_2)$ = the likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct

The sufficiency examination is presented in Figures I through V, the results of which are summarized below:

SUMMARY OF SUFFICIENCY RESULTS

FIGURE I - Main Effect of Confirmation Type
1. Blank and Positive confirmations are sufficient for Negatives.
2. The analysis is indeterminant as to whether Blank confirmations are sufficient for Positives or vice versa.

FIGURE II - ASC Interaction (Loan/Small)
1. Blank and Positive confirmations are sufficient for Negatives.
2. The analysis is indeterminant as to whether Blank confirmations are sufficient for Positives or vice versa.

FIGURE III - ASC Interaction (Loan/Large)
1. Blank and Positive confirmations are sufficient for Negatives.
2. The analysis is indeterminant as to whether Blank confirmations are sufficient for Positives or vice versa.

FIGURE IV - ASC Interaction (Share/Small)
1. Blank confirmations are sufficient for Negatives.
2. The analysis is indeterminant as to whether Blank confirmations are sufficient for Positives or vice versa.
3. The analysis is indeterminant as to whether Positive confirmations are sufficient for Negatives or vice versa.

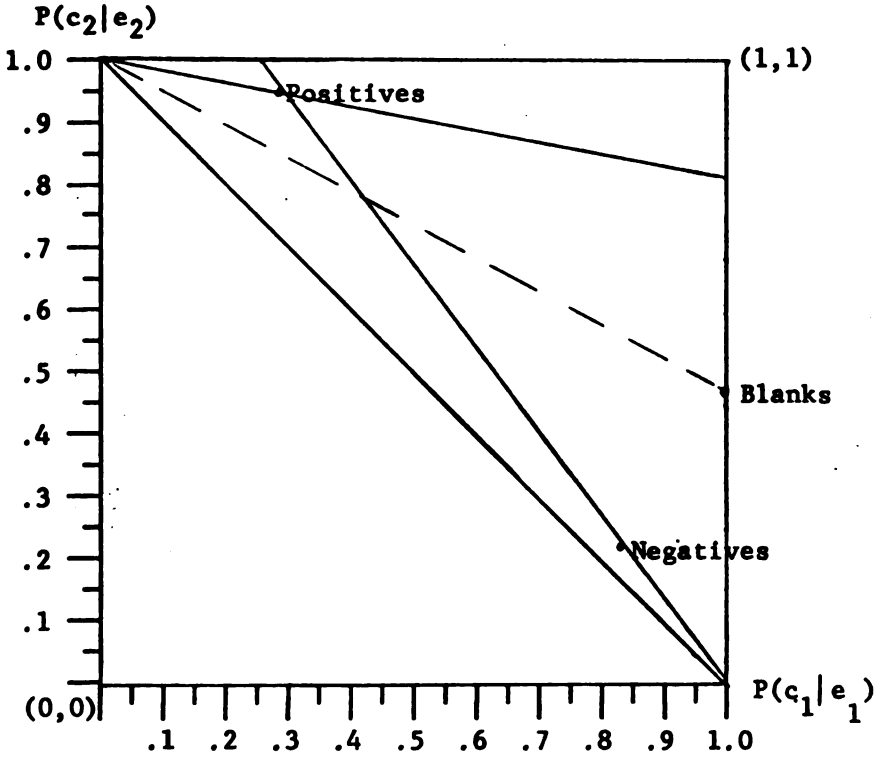
FIGURE V - ASC Interaction (Share/Large)

1. Blank confirmations are sufficient for Negatives.
2. The analysis is indeterminant as to whether Blank confirmations are sufficient for Positives or vice versa.
3. The analysis is indeterminant as to whether Positive confirmations are sufficient for Negatives or vice versa.

ANALYSIS I

MAIN EFFECT OF CONFIRMATION TYPE

FIGURE I



Likelihoods

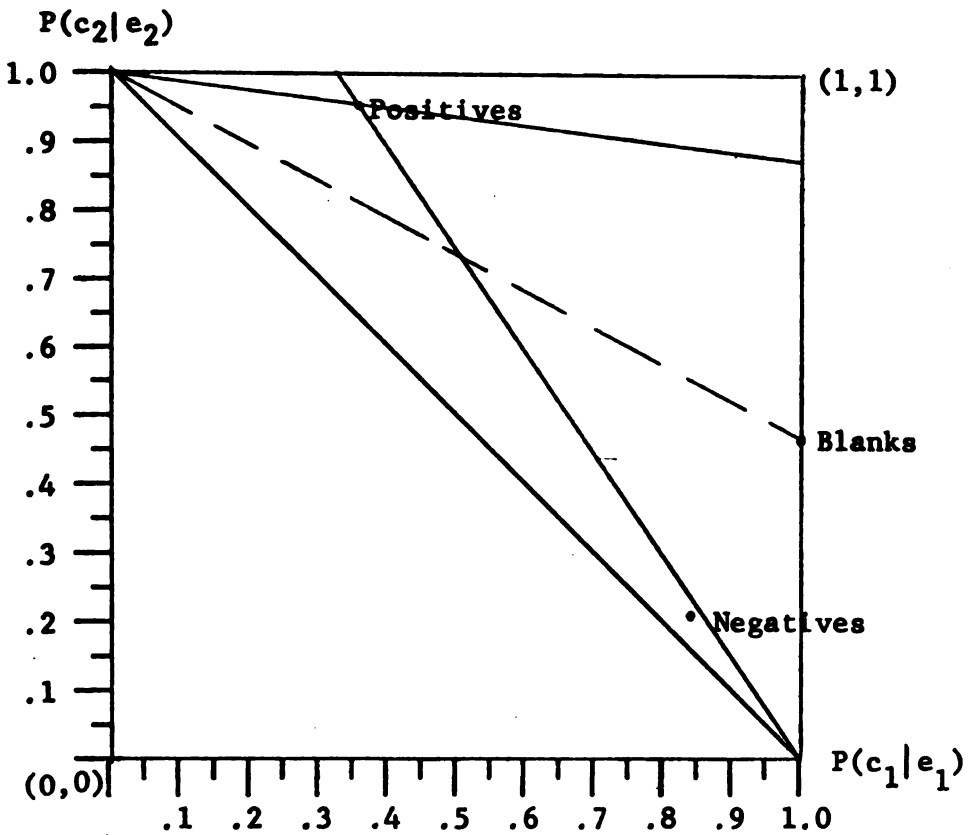
	$P(c_1 \mid e_1)$	$P(c_2 \mid e_2)$
Negatives *	.17	.79
Positives	.29	.95
Blanks	1.00	.47

* In graphing the two negative confirmation likelihoods, one minus the above likelihoods were plotted so that the likelihood point would fall within the information triangle ((1,0), (0,1), (1,1)). Hence, for negatives the vertical axis represents $P(c_1 \mid e_2)$ and the horizontal axis represents $P(c_2 \mid e_1)$. The use of these likelihoods does not affect the validity of the sufficiency examination.

ANALYSIS II

ASC INTERACTION - LOAN/SMALL

FIGURE II



Likelihoods

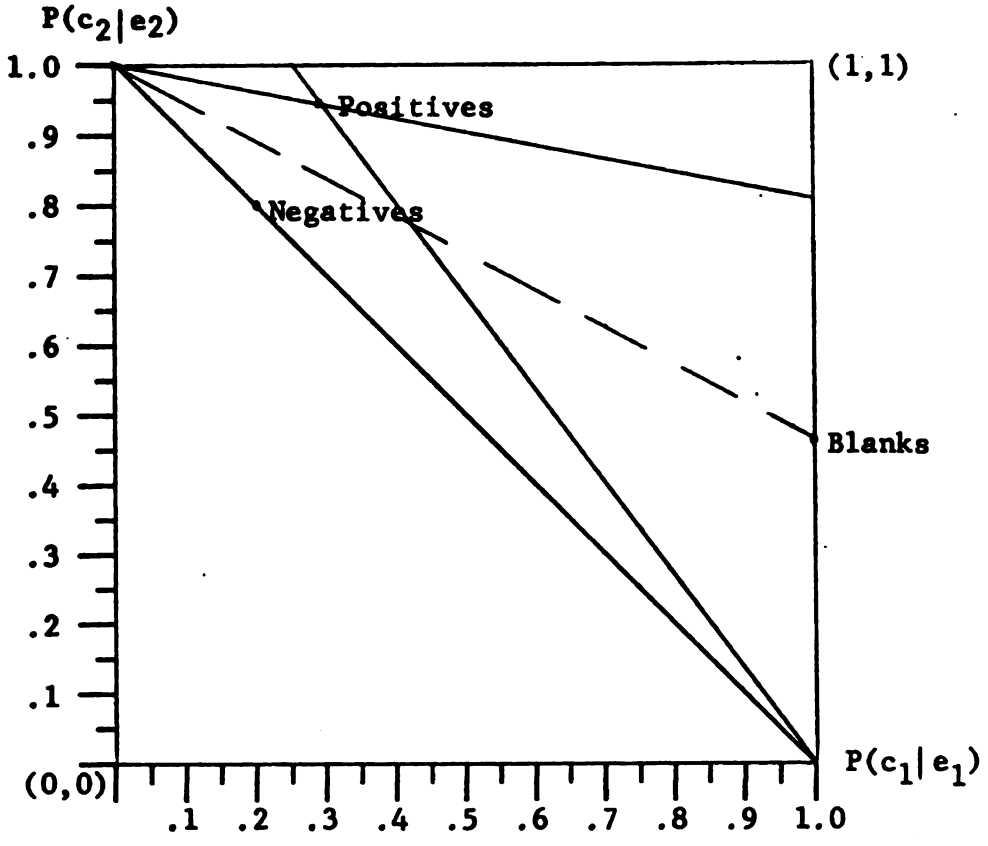
	$P(c_1\|e_1)$	$P(c_2\|e_2)$
Negatives *	.15	.79
Positives	.36	.95
Blanks	1.00	.47

* In graphing the two negative confirmation likelihoods, one minus the above likelihoods were plotted so that the likelihood point would fall within the information triangle ((1,0), (0,1), (1,1)). Hence, for negatives the vertical axis represents $P(c_1|e_2)$ and the horizontal axis represents $P(c_2|e_1)$. The use of these likelihoods does not affect the validity of the sufficiency examination.

ANALYSIS III

ASC INTERACTION - LOAN/LARGE

FIGURE III



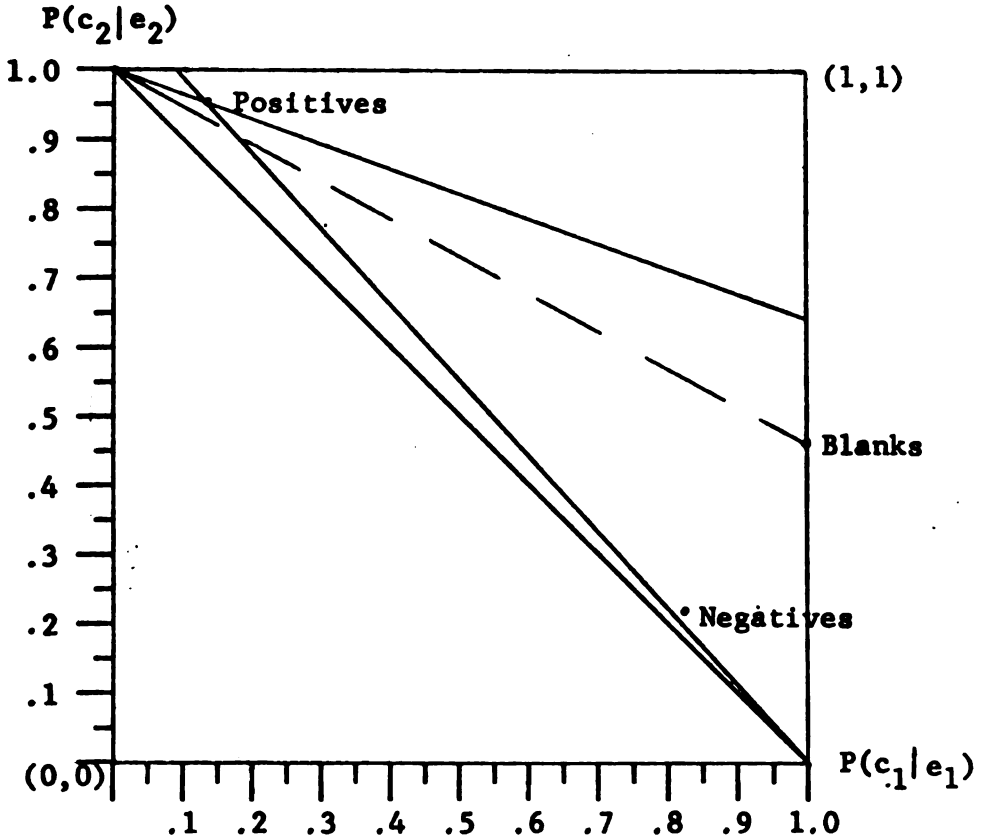
Likelihoods

	$P(c_1\|e_1)$	$P(c_2\|e_2)$
Negatives	.21	.79
Positives	.29	.95
Blanks	1.00	.47

ANALYSIS IV

ASC INTERACTION - SHARE/SMALL

FIGURE IV



Likelihoods

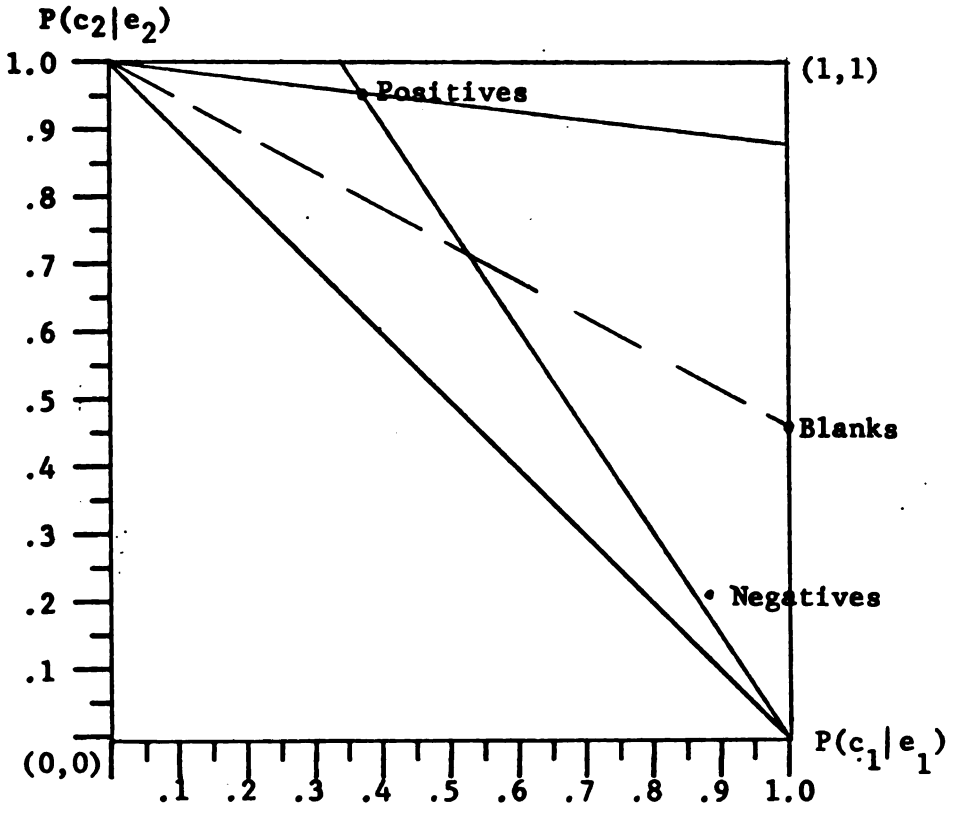
	$P(c_1\|e_1)$	$P(c_2\|e_2)$
Negatives *	.19	.79
Positives	.14	.95
Blanks	1.00	.47

* In graphing the two negative confirmation likelihoods, one minus the above likelihoods were plotted so that the likelihood point would fall within the information triangle ((1,0), (0,1), (1,1)). Hence, for negatives the vertical axis represents $P(c_1|e_2)$ and the horizontal axis represents $P(c_2|e_1)$. The use of these likelihoods does not affect the validity of the sufficiency examination.

ANALYSIS V

ASC INTERACTION - SHARE/LARGE

FIGURE V



Likelihoods

	$P(c_1\|e_1)$	$P(c_2\|e_2)$
Negatives *	.13	.79
Positives	.38	.95
Blanks	1.00	.47

* In graphing the two negative confirmation likelihoods, one minus the above likelihoods were plotted so that the likelihood point would fall within the information triangle ((1,0), (0,1), (1,1)). Hence, for negatives the vertical axis represents $P(c_1|e_2)$ and the horizontal axis represents $P(c_2|e_1)$. The use of these likelihoods does not affect the validity of the sufficiency examination.

Conclusions

The results obtained in examining sufficiency for each of the estimated conditional likelihoods are summarized below:[7]

Main Effect of Confirmation Type	Blanks and Positives are sufficient for Negatives
ASC Interaction:	
Loan/Small	Blanks and Positives are sufficient for Negatives
Loan/Large	Blanks and Positives are sufficient for Negatives
Share/Small	Blanks are sufficient for Negatives
Share/Large	Blanks are sufficient for Negatives

In three out of five cases blanks and positives were sufficient for (at least as informative as) negative confirmations. In the other two cases blanks are sufficient for negative confirmations, but no conclusion could be reached with respect to positive confirmations. In these last two cases (ASC Interaction - Share/Small and Share/Large), positives were <u>almost</u> sufficient for negatives. This points out one of two possible weaknesses of the above analysis.[8] This weakness is that we have no information as to the stability of the likelihood estimates employed in the sufficiency determination. Therefore, it is entirely possible that estimates derived from another sample might show different sufficiency results. In addition, it must be remembered from Chapter I that for positive and blank confirmations sufficiency only examines information generated by signals from respondents to confirmations. That is, sufficiency, as examined above, ignores any informational content derived from follow-up procedures on nonrespondents. Assuming that such follow-up

procedures have informational content, then since blanks are sufficient for negatives in all cases, positives are sufficient for negatives in three out of five cases, and positives are "almost" sufficient for negatives in the other two cases, the results of this research suggest that negatives are least informative. With respect to positive versus blank confirmations, the results are indeterminant if one assumes that the informational content of follow-up procedures is approximately the same for both confirmation types.

Hence, regardless of individual auditor preferences or prior uncertainties as to the degrees of error in accounts being confirmed, the above analysis suggests that negative confirmations are least informative.

FOOTNOTES

1. See David Blackwell, "Equivalent Comparisons of Experiments," Annals of Mathematical Statistics, 24 (1953), pp. 265-272, and D. Blackwell and A. Girshick, Theory of Games and Statistical Decisions, (New York: McGraw-Hill Book Co., 1970), pp. 324-336.

2. Jacob Marschak, "Economics of Information Systems," Journal of the American Statistical Association, (March, 1971), p. 203.

3. Ibid.

4. Ibid.

5. Ibid.

6. Ibid.

7. For a more precise examination of sufficiency and a verification of the graph analysis results see Appendix D.

8. The second weakness is that the above analysis ignores costs - a subject to be discussed further in Chapter VI.

CHAPTER VI

Cost

Introduction

In answering the normative question posed by this thesis, the primary objective of this chapter is to examine the relative cost of alternative confirmation forms. In doing so, this chapter is partitioned into the following topical areas:

I. Cost
   A. A general review
   B. Possible implications

II. Empirical Evidence
   A. Introduction
   B. Response rates - Cost Study I
   C. Questionnaire - Cost Study II

III. Conclusions

The above partition will provide a basic framework for viewing this chapter.

Cost

A General Review

In decision making, decision alternatives may be viewed in terms of benefits derived and benefits foregone. The rational decision maker chooses that alternative for which the benefits derived exceed the benefits foregone by more than any other alternative. The benefits derived for alternative confirmations was examined in Chapter V in terms of informativeness and sufficiency. This chapter examines

cost-benefits foregone.

Possible Implications

Cost is a reflection of the benefits foregone from choosing a particular confirmation form. By the previous assumption, auditors will attempt to minimize expected cost. That is, *ceteris paribus*, auditors will choose that confirmation form which is least costly. Hence, given relative cost quantifications, a preference ranking based upon expected cost may be generated for alternative confirmation forms.

Analyzing benefits derived and benefits foregone separately may allow for the generation of two *ceteris paribus* preference rankings. If these two preference rankings are consistent, an optimal conclusion may be forthcoming in two instances:

1. If the least costly confirmation form is sufficient for (at least as informative as) the other two forms, then the least costly form should be chosen.

2. If two confirmation forms are sufficient for (at least as informative as) a third form and the third form is the most costly of the three, then the third form should not be chosen.

In all other cases, an optimal conclusion cannot be reached without further specification of auditor preferences and prior feelings of uncertainty as to degrees of error in the accounts being confirmed.

Given the results of Chapter V which indicate negative confirmations are least informative, it appears that if an optimal conclusion is to result it must be of the second type. That is, if negative confirmations are most costly then negative confirmations should not be chosen. *A priori*, one would expect that negative confirmations are, in fact, least costly. However, such *a priori* reasoning can, in

general, be listed as one justification for attempting research in the confirmation area. Hence, consistency implies that empirical evidence be gathered on the relative cost of alternative confirmation forms.

Empirical Evidence

Introduction

Two types of empirical evidence are gathered on the relative cost of alternative confirmation forms. The first type of evidence concerns response rates and reflects the assumption that relatively low response rates are associated with follow-up procedures on nonrespondents and hence, are associated with high dollar costs. Response rates are generated from the field experiment and are analyzed using the same descriptive framework as employed in Chapters III and IV. Response rates, however, can only be computed for blank and positive confirmations. Because of this, a second type of empirical evidence was gathered. The second type of empirical evidence is gathered through the use of a questionnaire sent to certified public accounting firms. The questionnaire requests recipients to provide time (cost) estimates for each of the three alternative confirmation forms. By analyzing the results of these two empirical studies, a preference ranking based upon expected cost is generated.

Response Rates - Cost Study I

The cost of alternative confirmation forms is dependent, in part, upon response rates. Low response rates imply additional follow-up procedures will be necessary and hence, additional costs will be incurred. A secondary purpose of the field experiment (see Chapter IV) was to supply estimates of response rates for alternative confirmation

forms.

The descriptive analysis employed in analyzing the conditional probabilities of Chapter IV will also be employed in this chapter in analyzing response rates. The response rate analysis will be confined to positive and blank confirmations since auditors normally assume a perfect response rate for negative confirmations. Consistent with Chapter IV, the descriptive analysis of response rates will take the following form:

I. Description of the Response Rate Experiment
   A. Chapter IV implications
   B. Experimental variables
      1. Independent variables
      2. Dependent variables
   C. Data matrices
      1. Nonproportional data matrix
      2. Proportional data matrix
   D. Power estimates

II. Major Conclusions and Findings
   A. Results of analysis of variance
   B. Conclusions

The essence of the response rate analysis will be communicated through the use of the above descriptive analysis.

I. Description of the Response Rate Experiment

A. Chapter IV implications

The objective of Chapter IV was to adequately describe the field experiment conducted as part of this thesis research. That description will also hold for the response rate analysis with respect to the purpose of the experiment, methodology, and the experimental population (see Chapter IV).

B. Experimental Variables

1. Independent variables

In estimating response rates, the following independent variables were considered;

Type of Confirmation

Positive confirmation - This confirmation request was of the standard positive format (see Appendix A) and asked the recipient to indicate his agreement or disagreement with the account balance shown on the confirmation request.

Blank confirmation - This confirmation type asked the recipient to provide information from his records (see Appendix A).

Type of Account Confirmed

This variable was examined at two levels: asset versus liability accounts. Asset accounts consisted of loan accounts appearing on the MSU Employees Credit Union's books and liability accounts consisted of members' share accounts.

Size of Account

This variable was examined at two levels: large versus small accounts. The operational definition utilized in the field experiment for distinguishing large from small was based upon the median statistic. That is, large accounts included all accounts falling above the median value for the random sample chosen and small accounts included all those falling below the median.

2. Dependent variable

The dependent variable, response rate, defined in this experiment was the proportion of sample accounts for which responses were obtained. That is, the response rate was estimated as:

$$\frac{\text{number of recipients who responded}}{\text{number of confirmations sent}}$$

C. Data Matrices

1. Nonproportional data matrix

	Blank		Positive	
	Share	Loan	Share	Loan
Large	19	17	19	17
Small	18	20	18	19

2. Proportional data matrix

	Blank		Positive	
	Share	Loan	Share	Loan
Large	18	17	18	17
Small	18	17	18	17

D. Power Estimates

The power estimates for all independent variables tested with respect to response rates are as follows:

Degrees of Freedom	1,132	
Meaningful Difference	.10	.05
ϕ	1.78	.89
Power of Test	.72	.30

II. Major Conclusions and Findings

A. Results of analysis of variance

The results of the analysis of variance with respect to response rates are given in Table XV.

TABLE XV

ANOVA RESULTS - RESPONSE RATES

Source	P Values[1] Original Data Proportional	Transformed[2]
C - Confirmation Type	.0081*	.0473*
A - Account Type	.7823	******
S - Size of Account	.2114	******
Interactions:		
CA	.6452	******
AS	.3524	******
CS	.0506	.2462
CAS	.6306	******

*Indicates significance at the .05 level.
******For the analysis involving the transformed variable these terms were not tested statistically since they were pooled to estimate the error team, i.e., MS within.

B. Conclusions

Based upon the above analysis, the only independent variable which may be considered statistically significant is confirmation type. Confirmation type is significant at the .05 level for both proportional and transformed analyses. Hence, confirmation type is a statistically significant variable in the determination of response rates for positive and blank confirmations.

Given the statistical significance of confirmation type, the following point estimates have been computed for each alternative confirmation form:[3]

Positive confirmations .74

Blank confirmations .53

Confidence intervals (95%) for the above point estimates are as follows:

Positive confirmations $.63 \leq r \leq .85$

Blank confirmations $.42 \leq r \leq .64$

Point and interval estimates for the nonsignificant main effects are given in Table XVI.

TABLE XVI

RESPONSE RATES
NONSIGNIFICANT MAIN EFFECTS

Main Effect	Estimates for Levels of Variables		Least Squares Estimates of Effects of Variable	
	Point #	Interval *	Point	Interval *
Account Type				
Share	.64	$.53 \leq r \leq .75$	-.02	$-.18 \leq e \leq .13$
Loan	.65	$.54 \leq r \leq .76$		
Size of Account				
Large	.69	$.58 \leq r \leq .80$	.10	$-.05 \leq e \leq .26$
Small	.59	$.48 \leq r \leq .70$		

Obtained from observed, proportionate cell frequencies
* Generated at a 95% Confidence Level

Questionnaire - Cost Study II

The response rate analysis provided cost information relative only to positive and blank confirmations. Negative confirmations were not examined within the response rate analysis. Because negative confirmations were ignored and because response rates alone do not determine total confirmation cost, a survey was conducted among national, regional, and local certified public accounting firms. The survey was conducted through the use of a three page questionnaire and accompanying cover letter. Both the questionnaire and cover letter are shown in Appendix E. Partners of twenty certified public accounting firms were sent the questionnaire and requested to complete the questionnaire themselves or forward it on to a qualified individual within their firm. Except for Hurdman and Cranstoun, Penny & Co., questionnaire was sent to Michigan offices of national certified public

accounting firms and Michigan local and regional firms. The twenty firms surveyed are listed in Table XVII. Because the sample size was relatively small, no attempt was made to identify particular firms or types of firms. Of the twenty questionnaires sent, twelve responses were received.

TABLE XVII

CERTIFIED PUBLIC ACCOUNTING FIRMS SURVEYED

Arthur Andersen & Co.	Main Lafrentz & Co.
Arthur Young & Company	Hurdman and Cranstoun, Penney & Co.
Ernst & Ernst	Plant & Moran
Haskins & Sells	Doeren, Mayhew, Grob & McNamara
Lybrand, Ross Bros. & Montgomery	Danielson, Schultz & Co.
Peat, Marwick, Mitchell & Co.	Wager, Lunt & Rehmann
Price Waterhouse & Co.	Bayle, Norman & Echelbarger
Touche Ross & Co.	Hungerford, Cooper, Luxon & Co.
Seidman & Seidman	Yeo & Yeo
Alexander Grant & Co.	Schippers, Kintner & Robertson

The questionnaire was purposely designed in a case study type of format. The objective in doing so was to assure that the questionnaire results would be consistent with the informativeness notion of Chapter V. The consistency implied here is one of experimental populations. That is, in Chapter V the sufficiency notion was tested and examined with respect to a specific experimental population as described in Chapter IV. In order to have the cost information based upon the same experimental population, a case study type of format was developed and incorporated into the questionnaire.

Question One (page two of the questionnaire, Appendix E) is of immediate concern to this chapter because it requests the recipients to provide time estimates for each of the three alternative confirmation forms.[4] These time estimates are based upon the mailing of one

hundred of each type of confirmation type and are broken down by level of audit expertise. The results of question are summarized in Tables XVIII through XXII.

TABLE XVIII

POSITIVE CONFIRMATIONS
TIME ESTIMATES*

Response	Client Assistants	Staff Assistants	Senior	Manager/ Partner	Total
1	2.00	1.50	.50	.25	4.25
2	6.00	3.50	1.00	.00	10.50
3	1.00	.50	.50	.25	2.25
4	4.00	11.00	4.00	.25	19.25
5	6.00	2.00	1.00	.00	9.00
6	7.00	7.00	3.00	.33	17.33
7	3.50	2.50	.50	.25	6.75
8	.50	.50	1.50	.00	2.50
9	2.00	10.00	.50	.50	13.00
10	7.00	7.00	1.00	.00	15.00
11	8.00	20.00	4.00	2.00	34.00
12	8.00	9.00	1.00	.00	18.00

* Times estimates are given in hours.

TABLE XIX

NEGATIVE CONFIRMATIONS
TIME ESTIMATES*

Response	Client Assistants	Staff Assistants	Senior	Manager/ Partner	Total
1	2.00	1.00	.50	.25	3.75
2	5.00	2.50	.50	.00	8.00
3	1.00	.50	.50	.25	2.25
4	1.00	2.00	.25	.25	3.50
5	4.00	2.00	1.00	.00	7.00
6	2.50	5.00	3.00	.33	10.83
7	2.50	1.00	.50	.00	4.00
8	1.50	1.00	.00	.00	2.50
9	2.00	5.00	.50	.50	8.00
10	5.00	5.00	.00	.00	10.00
11	8.00	8.00	2.00	1.00	19.00
12	8.00	5.00	1.00	.00	14.00

* Times estimates are given in hours.

TABLE XX

BLANK CONFIRMATIONS
TIME ESTIMATES*

Response	Client Assistants	Staff Assistants	Senior	Manager/ Partner	Total
1	1.00	1.00	.50	.25	2.75
2	7.00	5.00	3.00	.00	15.00
3	1.00	.50	.50	.25	2.25
4	1.00	11.00	4.00	.25	16.25
5	5.00	2.00	1.00	.00	8.00
6	7.00	7.00	3.00	.33	17.33
7	3.00	2.50	.50	.25	6.25
8	2.00	.50	2.00	.00	4.50
9	2.00	10.00	.50	.50	13.00
10	5.00	5.00	.00	.00	10.00
11	8.00	24.00	6.00	2.00	40.00
12	3.00	12.00	1.00	.00	16.00

* Times estimates are given in hours.

TABLE XXI

TOTAL AND AVERAGE HOURS

	Client Assistants	Staff Assistants	Senior	Manager/ Partner	Total
Positives:					
Average	4.58	6.21	1.54	.32	12.65
Total	55.00	74.50	18.50	3.83	151.83
Negatives:					
Average	3.54	3.17	.81	.22	7.74
Total	42.50	38.00	9.75	2.58	92.83
Blanks:					
Average	3.75	6.71	1.83	.32	12.61
Total	45.00	80.50	22.00	3.83	151.33

TABLE XXII

INDIVIDUAL RANKINGS
FROM LEAST
TO
MOST COSTLY

Response	Negative	Positive	Blank
1	2	3	1
2	1	2	3
3	2	2	2
4	1	3	2
5	1	3	2
6	1	2.5	2.5
7	1	3	2
8	1.5	1.5	3
9	1	2.5	2.5
10	1.5	3	1.5
11	1	2	3
12	1	3	2

Based upon total number of hours estimated per confirmation type.

where 1 = least costly
2 = intermediate
3 = most costly

Note: Where half numbers appear (e.g., 1.5 and 2.5), the respondent ranked the confirmation types as equally costly.

To determine whether the above rankings differed significantly across confirmation types, the Friedman Two-Way Analysis of Variance by Ranks Test was performed.[5] The results indicated that the above rankings differed significantly at a .01 level. Since, a priori, this significant difference appears to be due to the relatively low ranking given negative confirmations, an additional analysis was performed to determine whether the rankings given positive and blank confirmations differed significantly. The Wilcoxon Matched-Pairs Signed-Ranks Test was employed in this later analysis.[6] The results

indicated that the cost rankings given positive and blank confirmations did not differ significantly at a .05 level.

The obvious interpretations of the questionnaire results are that negative confirmations are least costly and that positive and blank confirmations are equally costly. The total time estimates for negative, positive, and blank confirmations respectively are 92.83, 151.83, and 151.33 hours. If one eliminates time allotted to client assistance on the basis that such time is relatively cost free, the total time estimates for negative, positive, and blank confirmations are 50.33, 96.83, and 106.33 hours respectively.

Conclusions

The primary objective of this chapter was to examine the relative cost of alternative confirmation forms. Although a priori reasoning would lead one to expect that negative confirmations are least costly and blank confirmations most costly, empirical evidence was sought through a response rate analysis and a questionnaire survey.

The response rate analysis examined response rates of both positive and blank confirmations. The response rates were estimated through the use of a field experiment (see Chapter IV) and statistically analyzed through the use of analysis of variance. Two independent variables, type of account and size of account, were analyzed in addition to confirmation type. These two variables were not found to be statistically significant and hence, do not have to be taken into consideration when estimating response rates for positive or blank confirmations. The results of the response rate analysis indicated that individuals are more likely to respond to positive than

blank confirmations. This evidence supports the notion that positive confirmations cost less than blank confirmations.

The questionnaire survey examined cost information furnished by a cross section of national, regional, and local certified public accounting firms. The three page questionnaire employed a case study format and requested partners of the firms surveyed to furnish time estimates required by various personnel to properly mail and follow-up on one hundred of each confirmation type. The questionnaire analyses indicated that, in general, partners of certified public accounting firms view negative confirmations as requiring the least amount of time and positive and blank confirmations approximately equal amounts of time.

Consolidating the results of the response rate analysis with the questionnaire analysis implies the following ordering from least to most costly:

negative confirmations

positive confirmations

blank confirmations

A priori this is what one would expect. Negative confirmations are least costly because auditors don't have to worry about second requests and because negative confirmations generate only limited follow-up. On the other hand, one would expect blank confirmations to be most costly from the standpoint of a lower response rate in addition to the large amount of follow-up required on responses which indicate errors even though the account is correct. For example, the field experiment indicated that for blank confirmations the likelihood that an individual will indicate an error exists when his account is,

in fact, correct is .53. The same likelihood is only .05 and .21 for positive and negative confirmations respectively. Interestingly enough, this additional follow-up was not born out by the questionnaire results which indicated that the estimated time required for positive and blank confirmations is approximately equal. This can be attributed, in part, to certified public accounting firms' lack of familiarization with blank confirmations which currently receive only limited use.

FOOTNOTES

1. P values indicate the α levels necessary to obtain statistically significant results. For example, a $p = .50$ implies that the effects of an independent variable would not be statistically significant except at an α level of a .50 or greater. For the purposes of this experiment an α level of .05 is utilized.

2. The transformed data analysis is based upon proportional cell frequencies.

3. These estimates are based upon the observed, proportionate cell frequencies.

4. A discussion of questions two and three is deferred until Chapter VII.

5. Sidney Siegel, Nonparametric Statistics For the Behavioral Sciences, (New York: McGraw-Hill Book Co., 1956), pp. 166-172.

6. Ibid., pp.75-83.

CHAPTER VII

A SUMMARIZATION, REVIEW, & EVALUATION

Introduction

The primary objective of this chapter is to summarize, review, and evaluate the findings of this thesis research. In doing so, this chapter is partitioned into the following topical areas:

I. A General Review
   A. Objective of thesis
   B. Plan of thesis
II. Thesis Findings
   A. Benefits derived - Informativeness
   B. Benefits foregone - Cost
   C. Conclusions
III. Three Alternative Methodologies
   A. General discussion
   B. Methodology I - Questionnaire
      1. Question two
      2. Question three
   C. Methodology II - Descriptive Analysis
   D. Methodology III - A Priori Opinion
IV. Summary

The above partition will provide the basic framework for viewing this chapter.

A General Review

Objective of Thesis

The normative question to which this thesis addresses itself is: Which confirmation form - negative, positive, or blank - should auditors use? Thus, primary objective of this thesis is to attempt to determine, on the basis of empirical analyses, which confirmation

form should be chosen.

Plan of Thesis

In attempting to accomplish the objective of this thesis, it is assumed that auditors are rational decision makers and choose among alternative confirmation forms on the basis of benefits derived and benefits foregone. That is, ceteris paribus, auditors will choose that confirmation form from which they can derive the most benefits at the least cost. Conversely, auditors will not choose that confirmation form from which they derive minimum benefits at maximum cost.

If one accepts the above assumption then one must, in order to reach an optimal conclusion, evaluate benefits derived and benefits foregone for alternative confirmation forms. For the purposes of this thesis, the benefits derived component is equated with information content while the benefits foregone component is equated with dollar cost. Analyzing each of these two components separately may allow for the generation of two preference rankings. If these two preference rankings are consistent, an optimal conclusion may be forthcoming in two instances:

> If the least costly confirmation form is sufficient for (at least as informative as) the other two forms, then the least costly form should be chosen.
>
> If two confirmation forms are sufficient for (at least as informative as) a third form and the third form is the most costly of the three, then the third form should not be chosen.

In all other cases, an optimal conclusion cannot be reached without further specification of auditor preferences and feelings of uncertainty as to degrees of error in accounts being confirmed.

Thesis Findings

Benefits Derived - Informativeness

This thesis viewed the selection among alternative confirmation forms as choosing among alternative information systems. That is, each confirmation form was viewed as an alternative information system which emits messages indicating whether individual accounts are correctly or incorrectly stated.

The informational content of an information system is dependent upon the accuracy of the messages received from that information system. That is, the likelihood that if an account is, in fact, correct (incorrect) the message generated from the confirmation will indicate the account is correct (incorrect).

The methodology employed in this thesis to evaluate the relative accuracy of messages was based upon the statistical concept of sufficiency. Sufficiency is related to the statistical properties of information and is defined in terms of specific likelihoods, i.e., the likelihood that a specific message will be received given a specific state of nature exists. In order to examine sufficiency, estimates of the above likelihoods were generated from a field experiment conducted at the Michigan State University Employees Credit Union. The field experiment yielded five estimates for one conditional likelihood and one estimate for the second conditional.

Sufficiency was examined for each possible combination of likelihoods. The results of the sufficiency examination suggested that negative confirmations are least informative.

Benefits Foregone - Cost

The benefits foregone from employing a confirmation form are reflected by the dollar cost of generating messages. Auditors, as rational decision makers, will attempt, ceteris paribus, to minimize expected cost. Hence, given relative cost quantifications, a ranking based upon expected cost may be generated for alternative confirmation forms.

Two types of empirical evidence were gathered on the relative cost of alternative confirmation forms. The first type of evidence concerned response rates and reflected the assumption that relatively low response rates are associated with follow-up procedures on non-respondents and hence, are associated with high dollar costs. Because response rates were gathered only for positive and blank confirmations, a second type of empirical evidence was obtained through the use of a questionnaire. The questionnaire requested certified public accounting firms to provide time (cost) estimates for each of the three alternative confirmation forms. By analyzing the results of these two empirical studies, a preference ranking was generated. This ranking from least to most costly was negative, positive, and blank confirmations respectively.

Conclusions

In attempting to answer the normative question posed by this thesis, a research methodology was developed such that an optimal conclusion would be forthcoming in two instances:

> If the least costly confirmation form is sufficient for (at least as informative as) the other two forms, then the least costly form should be chosen.

> If two confirmation forms are sufficient for (at least as informative as) a third form and the third form is the most costly of the three, then the third form should not be chosen.

The empirical analyses of Chapters V and VI generated an informativeness and a cost preference ranking respectively. These preference rankings are given below from most to least preferred.

Informativeness	Cost
Positive or Blank*	Negative
Negative	Positive
	Blank

* The results were indeterminant as to which was sufficient for the other (see Chapter V).

Obviously, given the above empirical results, an optimal conclusion cannot be forthcoming without further specification of auditor preferences and prior uncertainties as to degrees of error in accounts being confirmed. Although it is impossible, given the above results, to specify an optimal confirmation form for all situations and for all auditors, it is possible to specify normative conclusions based upon less rigorous methodologies.[1] Three such normative methodologies are set forth below.

Alternative Methodologies

A General Discussion

The original objective of this research effort was to provide auditors guidance as to which confirmation form - positive, negative, or blank - should be chosen. In attempting to meet this objective a research methodology was developed through employing the statistical concept of sufficiency. However, because an optimal conclusion could not be made, three alternative methodologies were developed. These

alternative methodologies consist of a questionnaire analysis, a descriptive analysis, and an a priori opinion.

Methodology I - Questionnaire

The same three page questionnaire employed in Chapter VI to gather cost information was also employed to gather information relative to auditors' preferences for alternative confirmation forms.[2] The questionnaire was designed such that partners of certified public accounting firms were furnished a case study with estimates of conditional likelihoods. The case study described a fictitious audit based upon the Michigan State University Employees Credit Union. The MSU Employees Credit Union was used as the basis of the case study in order to obtain consistency with the estimated conditional likelihoods generated from the field experiment.

Given their own preferences and knowledge of alternative confirmation cost, each recipient of a questionnaire was requested to choose between alternative confirmation forms. This choice process involved two questions both of which were preceded by the following likelihood (probability) descriptions:

Suppose that if an account is in error, the probability with each of the below confirmations of an individual failing to report the error in the confirmation response is the following:

Positive Confirmations	Negative Confirmations	Blank Confirmations
.71	.83	.00

Suppose that if an account is correct, the probability with each of the below confirmations of an individual reporting an error in the confirmation response is the following:

Positive Confirmations	Negative Confirmations	Blank Confirmations
.05	.21	.53

In an attempt to keep the questionnaire as short as possible, four other estimates of the first conditional likelihood, generated by the ASC interaction (see Chapter IV) were not included within the questionnaire. Instead, an attempt was made at measuring the effect of the ASC interaction by Question Three which requested auditors to choose alternative confirmation forms based upon a stratified sample. Hence, auditors, given their own preferences, their own cost information, their own uncertainty as to the degrees of error in the accounts being confirmed, and given estimated conditional likelihoods, were requested to reveal their preferences by completing the questionnaire shown in Appendix E. As indicated in Chapter VI, twelve responses out of a total possible of twenty were received. These responses are summarized below in Tables XXIII and XXIV.

TABLE XXIII

QUESTION TWO

"Given the above probability information and the time estimates you provided earlier, if you could only send 100 of one type of confirmation, which one would you choose?"

RESULTS

Positive Confirmations	- 4
Negative Confirmations	- 2
Blank Confirmations	- 6
Total Responses	12

TABLE XXIV

QUESTION THREE

"Now suppose you have the opportunity of sending a mixture of the three confirmation types, which one(s) would you choose for the following stratified samples?"

Stratified Sample	Please Circle Your Choice
25 Small Loan Accounts ($0 - $400)	Positive Negative Blank
25 Large Loan Accounts ($401 - $1000)	Positive Negative Blank
25 Small Deposit Accounts ($0 - $65)	Positive Negative Blank
25 Large Deposit Accounts ($66 - $1000)	Positive Negative Blank

RESULTS

	Positive	Negative	Blank	Total
Small Loan Accounts	2	9	1	12
Large Loan Accounts	6	0	6	12
Small Deposit Accounts	3	8	1	12
Large Deposit Accounts	6	1	5	12

Question Two

First, considering Question Two, the primary conclusion is that overall, negative confirmations are preferred less than either positive or blank confirmations. This implies that even though negative confirmations are by far the least costly confirmation, auditors weigh the benefits (informativeness) of using blank and positive confirmations more heavily than the cost savings associated with negatives.

A secondary conclusion is that blank confirmations are preferred to positive confirmations. This is especially interesting since

positive confirmations are widely employed in the public accounting profession and blank confirmations seldom employed.

In order to gain additional insight into the results of Question Two, a supplementary analysis was conducted on the results of Question Two in comparison to the results of Question One (the cost question). The following facts and explanations were generated.

First, the supplementary analysis revealed that both individuals who chose negative confirmations for Question Two also ranked negatives as least costly. Apparently these individuals felt that overall, the additional informativeness of positive and blank confirmations did not out weigh the potential cost savings of negatives. This also suggests that respondents to the questionnaire were consistent and rational in their responses. That is, the likelihoods provided by the questionnaire clearly imply, as the sufficiency analysis later confirmed, that negatives are least informative. The two individuals who chose negatives were rational in the sense that they traded-off informativeness for cost savings. An irrational decision (answer) would have been to rank positives or blanks as least costly and select negatives for Question Two. In that case, the individual would have been trading-off informativeness and cost savings and would have received nothing in return. Since this type of irrationality was not present in any of the responses, the results suggest that auditors interpreted the questionnaire correctly and responded rationally.

Secondly, the supplementary analysis revealed that overall seven of the twelve respondents traded-off cost savings for informativeness.[3] Of the four respondents who did not make this trade-off,

two, as already mentioned, selected negative confirmations. The other two selected blank confirmations and either rated blanks as less or as equally costly as positives and/or negatives. These facts again suggest that auditors interpreted the questionnaire correctly and responded rationally.

Finally, the supplementary analysis revealed that two of the six individuals who selected blanks also ranked blanks as more costly than positives. Likewise, three of four individuals who selected positives also ranked positives as more costly than blanks. These results suggest that of the ten individuals who chose positive or blank confirmations, five considered either positives or blanks more informative than the other. Specifically, three respondents considered positives more informative than blanks and two considered blanks more informative than positives. These facts support the sufficiency conclusions of Chapter V. The sufficiency analyses were indeterminant as to whether blanks were more informative than positives or vice versa. Hence, the choice between positives and blanks is dependent upon individual auditor preferences and uncertainties. One would expect that some auditors would choose blanks and some would choose positives. The fact that not all auditors chose blanks or positives suggests the indeterminant sufficiency conclusions of Chapter V were correct.

Question Three

The results of Question Three indicate that negative confirmations are preferred to both positive and blank confirmations for small loan and small deposit accounts. Both positive and blank

confirmations are preferred to negative confirmations for large loan and large deposit accounts. In addition, positive confirmations are at least as preferred as blank confirmations in all four stratified samples.

Generalizing from the above results, it appears as though negative confirmations are preferred for small accounts while blank and positive confirmations are preferred for larger accounts. This interpretation would be consistent with the American Institute of Certified Public Accountant's Statement on Auditing Procedure No. 43.[4] The second generalization that positive confirmations are at least as preferred as blanks is, however, contradictory to the results of Question Two.

The apparent contradiction between the results of Question Two and Three arises because positive confirmations were ranked as at least as preferred as blanks in all four stratified samples of Question Three, and yet, blank confirmations were ranked above positives in Question Two. A possible explanation for this contradiction is a lack of familiarization of auditors with blank confirmations. That is, it is the researcher's subjective opinion that in answering Question Three respondents, in essence, ignored the two conditional likelihoods provided as a part of Question Two and reverted to professional pronouncements, i.e., positives should be used with large accounts and negatives with small accounts. If this were the case, one wouldn't expect the results of Questions Two and Three to be entirely consistent.

In concluding the questionnaire analysis, one should note that the results are specific to the population of respondents and to the

specific questionnaire. The interpretation and generalization of these results are hence, qualified accordingly.

Methodology II - Descriptive Analysis

The purpose of the descriptive analysis is to present enough information so that auditors may decide for themselves which confirmation to choose. The choice between alternative confirmation forms is dependent upon auditor preferences, conditional likelihoods of correct messages, auditor feelings as to degrees of error in the accounts being confirmed, and alternative confirmation cost. The descriptive analysis presented below attempts to provide estimates of the conditional likelihoods and alternative confirmation cost. Given adequate descriptions of these two factors, auditors may decide for themselves which confirmation form to select.

Estimated conditional likelihoods generated from the field experiment are described in detail in Chapter IV. These estimated conditional likelihoods are briefly described below:

Estimated Likelihood

> The likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect.

Main Effect of Confirmation Type

Positive Confirmations	.29
Negative Confirmations	.17
Blank Confirmations	(Assumed Equal to one)

Account Type/Size of Account/Confirmation Type Interaction

	Loan Accounts	Share Accounts
Small - Positive	.36	.14
Small - Negative	.15	.19
Large - Positive	.29	.38
Large - Negative	.21	.13

Estimated Likelihood

The likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct.

Main Effect of Confirmation Type

Positive Confirmations	.95
Negative Confirmations	.79
Blank Confirmations	.47

The above likelihood estimates are, of course, specific to the experimental population.[5] From the auditor's standpoint the above estimates reveal some interesting implications. First, with respect to the likelihood that given the account is incorrect, the recipient of the confirmation indicates the account is incorrect, the only significant main effect was confirmation type. This implies that the auditor doesn't have to concern himself with estimating this likelihood for small versus large accounts, for loan versus share accounts, for accounts which are thought to be understated versus those thought to be overstated, or for accounts with large versus small errors. The auditor only has to be concerned with the estimated likelihoods associated with positive versus negative confirmations and with the account type/size of account/confirmation type

interaction.

With respect to the likelihood that given the account is correct, the recipient of the confirmation indicates the account is correct, the only significant main effect was confirmation type. This implies that the auditor doesn't have to concern himself with estimating the second likelihood for small versus large accounts or for loan versus share accounts. The auditor only has to be concerned with the overall estimated likelihood associated with positive, negative, and blank confirmations.

The estimated cost information generated from the response rate analysis and the questionnaire survey is described in detail in Chapter VI. Those results are briefly summarized below.

Response Rates

Positive Confirmations	Blank Confirmations
.74	.53

The response rate analysis implies that recipients of positive confirmations are more responsive than recipients of blank confirmations. This, in turn, implies less follow-up on nonresponses and hence, ceteris paribus, less cost.

Relaxing the ceteris paribus assumption and including negative confirmations, auditors of selected certified public accounting firms were requested to estimate time requirements necessary for the sending of one hundred confirmation requests of each alternative form. The results of the questionnaire survey are briefly summarized below.

	Total Time Estimated*
Positive Confirmations	151.83
Negative Confirmations	92.83
Blank Confirmations	151.33

*Expressed in hours

The above differences were found to be statistically significant at a .01 level. Additional analyses indicated that positive and blank confirmations are approximately equally costly at a .05 level.

Consolidating the results of the response rate analysis with that of the questionnaire leads to the conclusion that negative confirmations are least costly followed by positive and blank confirmations respectively.

In the past, the main difficulty for auditors in choosing among alternative confirmation forms has been lack of knowledge. In order for an auditor to make an optimal selection he must have knowledge as to his own preferences, knowledge of possible degrees of error in the accounts being confirmed, knowledge of alternative confirmation cost, and knowledge of likelihoods of receiving correct messages from alternative confirmations.[6] The biggest gap of knowledge has been in estimating the likelihoods of receiving correct messages. To date, the only limited knowledge in this area has come from the four prior studies described in Chapter III. This lack of knowledge combined with varying preferences, audit costs, and degrees of errors across auditors, auditing firms, and clients respectively, has made for wide variations in confirmation selection procedures. Hopefully, the above descriptive analysis and the more detailed analyses of Chapters IV, V, and VI will aid auditors in making the proper selection among alternative confirmation forms.

Methodology III - A Priori Opinion

The purpose of this a priori opinion is to present the reader some guidance, based upon the researcher's own expertise and

experience, as to which confirmation form(s) should be chosen. It is the researcher's opinion that none of the currently available confirmation forms - negative, positive, or blank - provide enough information per dollar cost to justify exclusive use. The inconclusive results of the sufficiency and cost examination supports this assertion as does the questionnaire results.

The inability to reach an optimal conclusion by examining sufficiency and relative cost implies that one confirmation form cannot be recommended as best in all situations. Likewise, the belief that there exists no one optimal form is also supported by Question Three of the questionnaire. Overwhelmingly auditors chose negative confirmations for small accounts and positive or blank confirmations for large accounts. Out of twelve responses only one chose negative confirmations for a large account. This implies that auditors, based upon past experience and audit expertise, have definite preferences concerning types of confirmations to be used in specific situations. Hence, in support of my prior assertion, auditors obviously believe there is no one best confirmation form.

Given that one accepts the notion that no one type of confirmation form should be chosen for all situations, the question becomes what combination of forms should be employed.

It is the researcher's opinion that the results of the field experiment imply that a majority of recipients of confirmations are unable to confirm their account balances within reasonable tolerance limits.[7] This conclusion is supported by Chapter IV which reported a likelihood of .53 for blank confirmations that given a recipient's account is correct, the recipient of the confirmation indicates the

account is incorrect. This likelihood can be paraphased as: the likelihood that a recipient doesn't know what his account balance is. Given that over half of the recipients of confirmations didn't know what their account balances were, it is highly questionable whether confirmations serve a useful purpose. The use of positive or negative confirmations in such circumstances only gives auditors unwarranted assurances of accuracy and reliability. In such circumstances, a more reasonable audit alternative would be to expand the tests of transactions (test of transactions of revenue in the case of accounts receivable) and rely on other confirmation alternatives. Because of possible misleading implications, neither positive or negative confirmations should be employed. Instead, blank confirmations should be reserved for highly material items or items where the possibility of fraud exists and detail analyses should be made of all reported differences.

Given the above conclusion, a question could be raised as to whether the researcher isn't recommending the use of blank confirmations to the obvious exclusion of negative and positive confirmations. Such a recommendation would be inconsistent with the prior conclusion that none of the currently available confirmations - negative, positive, or blank - provide enough information per dollar cost to justify exclusive use. This apparent inconsistency is inapplicable since the above conclusion was specific to circumstances where empirical results clearly indicated that over half of the recipients were incapable of confirming their account balances. In other more desirable situations, the researcher is willing to concede the usefulness of both positive and negative confirmations.

The researcher believes that the choice among confirmation types should be governed by the ability of recipients to confirm their account balances. Given a reasonable ability to confirm, the researcher believes that positive confirmations may be a very useful and appropriate audit tool. Given a high degree of ability to confirm, negative confirmations may be a useful and appropriate audit tool.

The determination of the ability to confirm can best be made through the use of blank confirmations. In the researcher's opinion, a correct response rate of less than .50 to blank confirmations would preclude the use of either positive or negative confirmations. A correct response rate of between .50 and .75 would indicate a sufficient ability to confirm for the use of positive confirmations. A correct response rate of greater than .75 would indicate a sufficient ability to confirm for the use of negative confirmations. The above cutoff probabilities are entirely a priori and are based upon the researcher's subjective beliefs and preferences.

Like the evaluation of internal control, the ability to confirm should be determined as early as possible in an audit. It is the researcher's belief that use of positive and negative confirmations without proper determination of the ability to confirm is not only naive, but also, in material cases, an ex post facto violation of public trust.

Summary

The original objective of this chapter was to summarize, review, and evaluate the findings of this thesis research. In doing so, the

original thesis methodology was examined followed by three somewhat less rigorous methodologies.

The original thesis methodology viewed the auditor as choosing between alternative confirmation forms on the basis of benefits derived and benefits foregone. The benefits derived component was equated with information content and the benefits foregone component with dollar cost. The results of this methodology suggested that an optimal confirmation form could not be specified for use in all circumstances by all auditors.

Because the original methodology was indeterminant, three alternative methodologies were developed. These three methodologies consisted of a questionnaire analysis, a descriptive analysis, and an a priori opinion. Although it was impossible, given the results of the original methodology, for any of the alternative methodologies to specify an optimal confirmation form, it was possible to suggest normative conclusions for specific subsets of auditors.

FOOTNOTES

1. Normative used here in the sense of being optimal for a specific subset of auditors.

2. See Appendix E.

3. A respondent was determined to have made the trade-off of cost savings for informativeness if he ranked negatives as least costly, but selected either positives or blanks in response to Question Two.

4. Committee on Auditing Procedure, Statement on Audit Procedure No. 43 (New York: American Institute of Certified Public Accountants, 1970), paragraph 5.

5. A descriptive analysis of the experimental population is given in Chapter IV.

6. An optimal selection in the sense of maximization of auditors' expected gross utility from choosing a particular confirmation form - see Appendix B.

7. A tolerance limit of $\pm$ 1% was used throughout this study.

CHAPTER VIII

SHORTCOMINGS AND FUTURE RESEARCH

Introduction

The primary objective of this chapter is to summarize the shortcomings of this research thesis and to isolate areas for future research in the area of confirmations. In doing so, this chapter is partitioned into the following topical areas:

I. Overall Shortcoming
II. Specific Shortcomings and Areas for Further Research
    A. Primary methodology
        1. Alternative confirmation cost
        2. Informativeness
        3. A possibility for further research
    B. Secondary methodologies
        1. Questionnaire analysis
        2. Descriptive analysis
        3. A *priori* opinion
III. Concluding Remarks

The shorcomings of this research effort are inherent in the need for further research. Hence, the following paragraphs consider both simultaneously.

Overall Shortcoming

The overall shortcoming of this research is one of generalization. Statistically, the results of the field experiment cannot be generalized beyond the specific population of the field experiment - the population sampled from the Michigan State University Employees

Credit Union. In general, however, this is a weakness of any type of empirical research. One really never knows whether empirical results will hold for different populations or, in some cases, even similar populations. This type of uncertainty points to the real need for replication. Replication of this research attempt for both similar and different populations may be considered a valid area for future research.

Specific Shortcomings and Areas for Further Research

Primary Methodology

Shortcomings and areas for further research with respect to the primary research methodology may be conveniently grouped into two categories - those dealing with alternative confirmation cost and those dealing with informativeness.

With respect to alternative confirmation cost two analyses were conducted. A response rate analysis was conducted on accounts employed in the field experiment. The results of this analysis indicated that overall, recipients are more responsive to positive confirmations than blank confirmations. A logical extension of this analysis would be to examine response rates of different population groupings. In addition, one could examine response rates for first and second requests. Perhaps a more important extension would be an attempt to answer the questions: Why do the response rates for positive and blank confirmations differ? and, How may the response rates to confirmations be improved?

Alternative confirmation cost information was also obtained

through a survey conducted with the use of a questionnaire. The questionnaire was sent to twenty national, regional, and local certified public accounting firms. Of the twenty questionnaires sent twelve responded (a response rate of 60%). The questionnaire was designed in a case study type of framework. A logical extension of this analysis would be to examine alternative confirmation cost for different types of cases (population groupings). In addition, the questionnaire results based upon such a small sample (twelve firms) could possibly be misleading. Although, *a priori*, the results seem logical a more extensive sampling of firms might yield differences.

The informativeness analysis was centered about the statistical concept of sufficiency. Sufficiency examinations were dependent upon point estimates of specific conditional likelihoods. A logical question arises as to the stability of these likelihood estimates. That is, are these likelihood estimates reasonably constant over time? and, are these likelihoods relatively constant over population groupings? Both of these questions warrant further research.

An extension of the primary research methodology could also yield a possibility for further research in the confirmation area. The primary research methodology was based upon the assumption that auditors choose among confirmation forms on the basis of benefits derived and benefits foregone. Both benefits derived and foregone were analyzed separately and two *ceteris paribus* preference rankings

were generated. A comparison of these ceteris paribus preference rankings yielded inconclusive results. An extension of the primary research methodology would be to attempt a specification of auditor preferences and prior uncertainties such that benefits derived and foregone could be analyzed simultaneously.

Secondary Methodologies

Shortcomings and areas for further research with respect to the secondary research methodologies may be conveniently grouped into three categories - questionnaire analysis, descriptive analysis, and a priori opinion.

With respect to the questionnaire analysis, the results are specific to the twelve certified public accounting firms who replied and to the case situation described within the questionnaire. A logical extension would be the incorporation of other case situations and an expansion of the sample size.

With respect to the descriptive analysis, the results are specific to the given population grouping examined. As previously mentioned, logical extensions would involve descriptive analyses of new population groupings.

The a priori opinion set forth as a secondary methodology reflects the researcher's biases and preferences. To the extent of the researcher's expertise within the confirmation area, this a priori approach gives auditors guidance in selecting among alternative confirmation forms. A logical extension would be the collection of a

series of such a priori opinions from qualified experts. Such expert opinions should be sought from both the professional and academic worlds of accounting. In addition, a collection of opinion on the appropriateness of alternative auditing techniques and procedures might also be sought.

Concluding Remarks

Obviously, there are many shortcomings of this thesis research and many areas for further research within the confirmation area. The objective of this thesis research was to provide some guidance to practicing auditors as to which confirmation form(s) - negative, positive, or blank - should be chosen. Hopefully, this objective has been met.

APPENDICES

APPENDIX A

CONFIRMATION FORMS

POSITIVE CONFIRMATION

Dear Member:

Will you please advise our auditor, LAWRENCE E. THOMPSON, Certified Public Accountant, of the correctness of the balances in your account as shown by our books at the date and in the amount stated below, or of any exception you may take thereto. A stamped, self-addressed envelope is enclosed for your convenience.

(This is merely a request for confirmation and NOT for remittance.)

According to the records of the Credit Union as of_____

_____, 19____, the balances in your account No. _____ were:

SHARES - - - - $_____

REGULAR LOAN - - $_____

_____ $_____

The above statement is correct except as noted below.

Exceptions (If none, so state): _____

_____

_____

SIGNED:_____

Member

NEGATIVE CONFIRMATION

Dear Member:

If the balances shown on this statement do not agree with your records, please notify our auditor at once, using the enclosed envelope addressed to:

LAWRENCE E. THOMPSON
Certified Public Accountant

(This is merely a request for confirmation and NOT for remittance)

According to the records of the Credit Union as of_____

_____, 19____, the balances in your account No. _____ were:

SHARES . . . . . $_____

REGULAR LOAN . . . $_____

_____ $_____

Exceptions: _____

_____

_____

SIGNED:_____
Member

BLANK CONFIRMATION - LOAN ACCOUNT

M S U EMPLOYEES
CREDIT UNION
600 EAST CRESCENT ROAD
EAST LANSING, MICHIGAN 48823

Dear Member:

Will you please examine your records and advise our auditor, LAWRENCE E. THOMPSON, Certified Public Accountant, of the balance in your loan account as of March 31, 1972. A stamped, self-addressed envelope is enclosed for your convenience.

Account No. _____

Loan Balance _____

Signature _____
(MEMBER)

(This is merely a request for confirmation and NOT for remittance.)

BLANK CONFIRMATION - SHARE ACCOUNT

M S U EMPLOYEES
CREDIT UNION
600 EAST CRESCENT ROAD
EAST LANSING, MICHIGAN 48823

Dear Member:

Will you please examine your records and advise our auditor, LAWRENCE E. THOMPSON, Certified Public Accountant, of the balance in your share account as of March 31, 1972. A stamped, self-addressed envelope is enclosed for your convenience.

Share Account No. _____

Share Balance _____

Signature _____
(MEMBER)

APPENDIX B

SUFFICIENCY AND DECISION THEORY

APPENDIX B

SUFFICIENCY AND DECISION THEORY

Introduction

The objective of this appendix is first, to illustrate the choice among confirmation forms within a decision theory framework; secondly, to give the more mathematically minded reader additional insight into the concept of sufficiency; and thirdly, to relate the consistency between sufficiency and decision theory in a confirmation choice context.

Decision Theory and Selection Among Alternative Confirmations

In illustrating the choice among alternative confirmation forms within a decision theory framework, two presentations are given. Both presentations illustrate essentially the same selection process and yet, do so from slightly different perspectives. These presentations are given below and hopefully, complement each other in a way that the reader obtains a more complete and full understanding.

- Presentation I -

Selection among alternative confirmation forms essentially involves choosing between alternative information systems. This information choice problem will be presented in a decision theory framework such as set forth by Crandall, Feltham, Demski, Marschak, Marshall, Savage, et.al.[1]

Decisions

In using confirmations auditors are attempting to decide whether a control account (e.g., accounts or notes receivable) is fairly stated. In doing so, auditors examine whether individual accounts are in error. In examining individual accounts, auditors must ultimately choose between two alternatives:

d_1 = reject the account as being in error

d_2 = accept the account as being correctly stated

Let the set D = $\{d_1, d_2\}$

States of Nature

With respect to the above decision, two alternative states of nature exist:

e_1 = the account is incorrect

e_2 = the account is correct

Let the set E = $\{e_1, e_2\}$

Prior Probability

It is assumed, of course, that auditors are uncertain as to which state of nature will exist. Auditors express this uncertainty in terms of a probability function, ϕ. The value of ϕ, $\phi(e)$, represents an auditor's prior probability that the state of nature is e, e.g.,

$\phi(e_1)$ = the prior probability that the account is incorrect, e_1

$\phi(e_2)$ = the prior probability that the account is correct, e_2

Information

In examining the informativeness of alternative information systems, let n_i denote a particular information system, i.e.,

n_1 = the negative confirmation system

n_2 = the positive confirmation system

n_3 = the blank confirmation system

Let the set $n = \{n_1, n_2, n_3\}$

These information systems emit the following signals:

c_1 = the account is incorrect

c_2 = the account is correct

Let the set $c = \{c_1, c_2\}$

Since different signals may result in different decisions, the decision maker, the auditor, must develop conditional probability distributions of signals for each possible state of nature. For example, $P(c_1|e_1,n_1)$ denotes the probability of signal c_1, indicating that the account is incorrect, given that negative confirmations (n_1) are used and the account is incorrect (e_1).

Decision Strategies

Given an information system, say n_1, and a signal emitted from that system, c, auditors must choose between the alternatives, d_1 and d_2. In doing so, an auditor has available a set of rules, decision strategies, from which he must choose an optimal strategy. Letting δ_i denote the ith decision strategy, an auditor's decision between d_1 and d_2 is dependent upon the decision strategy chosen and the signal emitted from the information system, c, i.e., $d = \delta_i(c)$. In the context of this thesis, there are four available decision strategies from which an auditor may choose:

Strategy Strategy	Signal Emitted	Decision	Signal Emitted	Decision
δ_1	c_1	$\delta_1(c_1) = d_1$	c_2	$\delta_1(c_2) = d_1$
δ_2	c_1	$\delta_2(c_1) = d_1$	c_2	$\delta_2(c_2) = d_2$
δ_3	c_1	$\delta_3(c_1) = d_2$	c_2	$\delta_3(c_2) = d_1$
δ_4	c_1	$\delta_4(c_1) = d_2$	c_2	$\delta_4(c_2) = d_2$

Let the set $\Delta = \{\delta_1, \delta_2, \delta_3, \delta_4\}$

Utilities

It is assumed that auditors have preferences concerning the consequences of their decisions and that they express these preferences by means of gross utility functions. The value of a gross utility function is denoted $u(e,d) = u(e,\delta(c))$ and represents the gross utility to an auditor when the state of nature is e and his decision is d[2].

Value of Information

Ignoring all cost implications, auditors, as rational decision makers, will attempt to maximize the expected value of their gross utility functions.[3] The expected value of an auditor's gross utility function for any decision strategy, δ, is given by:

$$E(\delta|u,\phi,n) = \sum_c \sum_e u(e,\delta(c))\ P(c|e,n)\ \Phi(e)$$

The maximization of this function implies that an auditor chooses an appropriate decision strategy, δ^*, such that:[4]

$$E(\delta^*|u,\phi,n) = \max_{\delta\in\Delta} E(\delta|u,\phi,n) = \max_{\delta\in\Delta} \sum_c \sum_e u(e,\delta(c))\ P(c|e,n)\ \Phi(e)$$

By maximizing his expected gross utility for a particular information system, an auditor obtains a measure of value for that particular system.[5] For example,

Let $V_{\phi,u}(n_i)$ = the value of system n_i

then $V_{\phi,u}(n_i) = E(\delta^*|u,\phi,n_i) = \max_{\delta\in\Delta} E(\delta|u,\phi,n_i) =$

$$\max_{\delta\in\Delta} \sum_c \sum_e u(e,\delta(c))\ P(c|e,n_i)\ \Phi(e) =$$

$$\sum_c \sum_e u(e,\delta^*(c))\ P(c|e,n_i)\ \Phi(e).^6$$

By comparing values of alternative information systems, a complete preference ordering may be obtained. Hence, an auditor, when

faced with alternative information systems, chooses that system, say n*, such that:

$$V_{\phi,u}(n^*) = \text{Max } V_{\phi,u}(n_i) \quad \text{for all } n_i \epsilon n$$

$$\text{or} \quad V_{\phi,u}(n^*) \geq V_{\phi,u}(n_i) \quad \text{for all } n_i \epsilon n$$

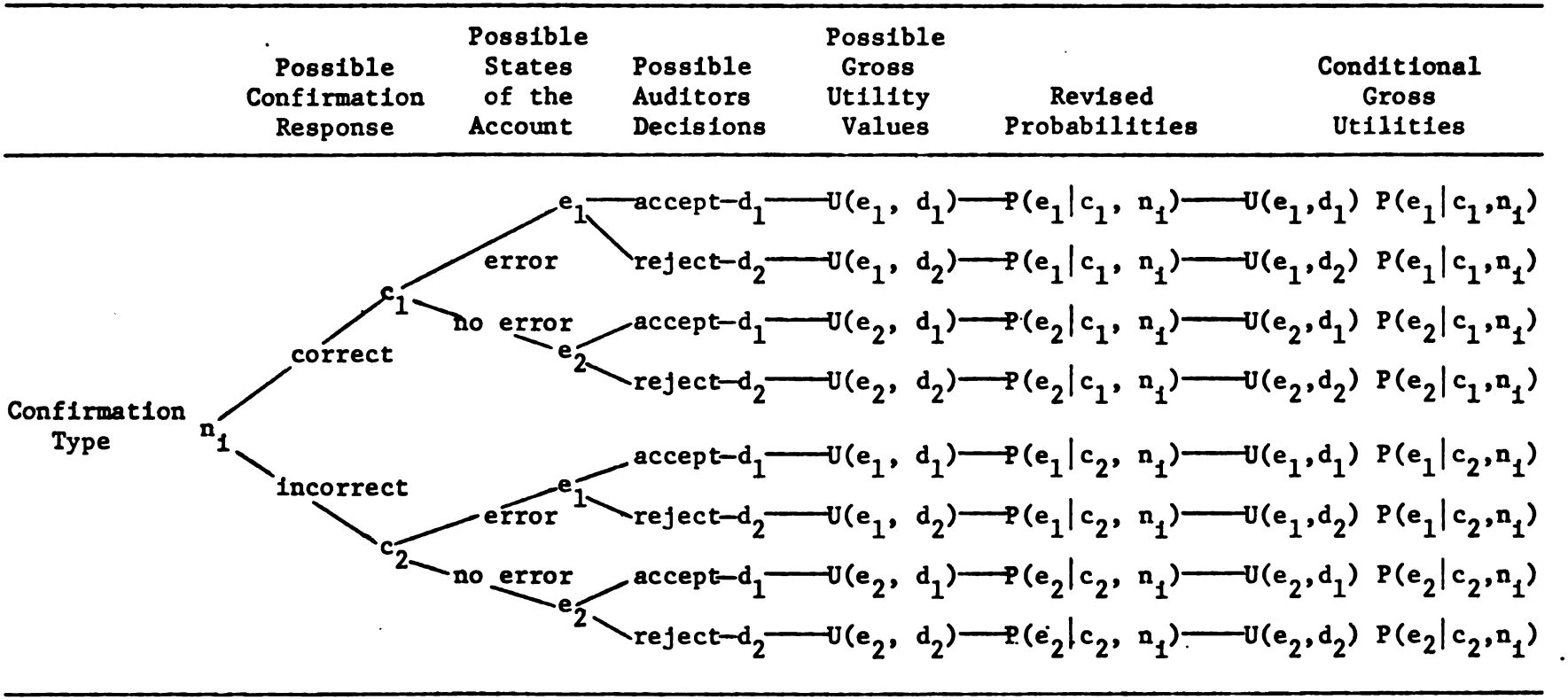
That is, an auditor compares alternative systems and chooses that system yielding the highest expected gross utility.

- Presentation II -

In order to better illustrate the selection among alternative confirmation forms within a decision theory framework, the following diagram is presented. In doing so, the same notation as used above in Presentation I is also appropriate here.

FIGURE VI

CONDITIONAL GROSS UTILITIES



Given the specific messages c_1 and c_2, the expected gross utilities of decisions d_1 and d_2 can be derived from Figure VI and are given below:

$$E(d_1|c_1,n_i) = U(e_1,d_1)\ P(e_1|c_1,n_i) + U(e_2,d_1)\ P(e_2|c_1,n_i)$$

$$E(d_2|c_1,n_i) = U(e_2,d_2)\ P(e_2|c_1,n_i) + U(e_1,d_2)\ P(e_1|c_1,n_i)$$

$$E(d_1|c_2,n_i) = U(e_1,d_1)\ P(e_1|c_2,n_i) + U(e_2,d_1)\ P(e_2|c_2,n_i)$$

$$E(d_2|c_2,n_i) = U(e_2,d_2)\ P(e_2|c_2,n_i) + U(e_1,d_2)\ P(e_1|c_2,n_i)$$

Assuming auditors are rational decision makers and attempt to maximize expected utility, auditors will, for any given message, say c_1, compare the expected utilities of making decision d_1 or d_2, $E(d_1|c_1,n_i)$ and $E(d_2|c_1,n_i)$, and make that decision with the highest expected utility. Assuming that auditors do this, they will adopt an optimal strategy and, for example, make decision d_i for message c_1 and decision d_2 for message c_2.

Letting δ^* denote the optimal decision strategy for any message c, then the maximum expected gross utility for any information system, say n_i, is given by the following expression:

$$V_{\phi,u}(n_i) = \sum_c E(\delta^*|c,n_i)\ P(c|n_i)$$

where $$E(\delta^*|c,n_i) = \sum_e u(e,\delta^*)\ P(e|c,n_i)$$

and $$P(e|c,n_i) = \frac{P(c|e,n_i)\ \Phi(e)}{P(c|n_i)}$$

substituting $$V(n_i) = \sum_c [\sum_e u(e,\delta^*)\ P(e|c,n_i)]\ P(c|n_i)$$

and $$V(n_i) = \sum_c \sum_e \left[\frac{u(e,\delta^*)\ P(c|e,n_i)\ \Phi(e)}{P(c|n_i}\right] P(c|n_i)$$

which implies $$V(n_i) = \sum_c \sum_e u(e,\delta^*)\ P(c|e,\ n_i)\ \Phi(e)$$

Given the above expression, which is the same as that derived in Presentation I, the rest of the analysis follows. That is, auditors when faced with alternative information systems (confirmation forms) will choose that system, say n*, such that

$$V_{\phi,u}(n^*) = \text{Max } V_{\phi,u}(n_i) \quad \text{for all } n_i \epsilon n$$

which implies $V_{\phi,u}(n^*) \geq V_{\phi,u}(n_i)$ for all $n_i \epsilon n$

In other words, auditors will choose that information system yielding the highest expected gross utility.

Sufficiency

The concept of sufficiency is related to the statistical properties of information and is defined in terms of conditional probabilities, i.e., the probability that a specific message will be received given a specific state of nature exists. Within the main body of this thesis, sufficiency was determined by the relative location of plotted points within an information triangle. Sufficiency will now be more specifically defined. In doing so, assume the same notation as employed in the preceding sections and define the probabilities below as:

$P(c_1|e_1,n_i)$ = the probability that given an account is incorrect, the recipient of conformation n_i will indicate the account is incorrect.

$P(c_2|e_1,n_i)$ = the probability that given an account is incorrect, the recipient of confirmation n_i will indicate the account is correct.

$P(c_1|e_2,n_i)$ = the probability that given an account is correct, the recipient of confirmation n_i will indicate the account is incorrect.

$P(c_2|e_2,n_i)$ = the probability that given an account is correct, the recipient of confirmation n_i will indicate the account is correct.

Given the above probabilities, for n_1 to be sufficient for n_2 there must exist a matrix G such that[7]

$$\begin{bmatrix} P(c_1|e_1,n_2) & P(c_2|e_1,n_2) \\ P(c_1|e_2,n_2) & P(c_2|e_2,n_2) \end{bmatrix} = \begin{bmatrix} P(c_1|e_1,n_1) & P(c_2|e_1,n_1) \\ P(c_1|e_2,n_1) & P(c_2|e_2,n_1) \end{bmatrix} \overset{G}{\begin{bmatrix} g_{11} & g_{12} \\ g_{21} & g_{22} \end{bmatrix}}$$

$$\text{where } \sum_j g_{ij} = 1 \text{ and } g_{ij} \geq 0 \text{ for all } i,j$$

The n_1 is sufficient for n_2 then n_1 is said to be at least as informative as n_2.[8] This is intuitively plausible since if a matrix G exists then each component of the likelihood matrix for n_2 is a linear combination of the components of the n_1 likelihood matrix, i.e.,

$$P(c_1|e_1,n_2) = P(c_1|e_1,n_1)\, g_{11} + P(c_2|e_1,n_1)\, g_{21}$$

$$P(c_2|e_1,n_2) = P(c_1|e_1,n_1)\, g_{12} + P(c_2|e_1,n_1)\, g_{22}$$

$$P(c_1|e_2,n_2) = P(c_1|e_2,n_1)\, g_{11} + P(c_2|e_2,n_1)\, g_{21}$$

$$P(c_2|e_2,n_2) = P(c_1|e_2,n_1)\, g_{12} + P(c_2|e_2,n_1)\, g_{22}$$

In addition, the components of the G matrix may be viewed as conditional probabilities of the following form:

Notationally let:

c_1^1 = message c_1 (the account is incorrect) is emitted from information system n_1

c_2^1 = message c_2 (the account is correct) is emitted from information system n_1

c_1^2 = message c_1 (the account is incorrect) is emitted from information system n_2

c_2^2 = message c_2 (the account is correct) is emitted from information system n_2

$P(c_1^2|c_1^1)$ = the probability that given message c_1 was emitted from n_1, message c_1 will also be emitted from n_2

$P(c_1^2|c_2^1)$ = the probability that given message c_2 was emitted from n_1, message c_1 will be emitted from n_2

$P(c_2^2|c_1^1)$ = the probability that given message c_1 was emitted from n_1, message c_2 will be emitted from n_2

$P(c_2^2|c_2^1)$ = the probability that given message c_2 was emitted from n_1, message c_2 will also be emitted from n_2

If, as in the above example, n_1 is sufficient for n_2 then the components of the G matrix are as follows:[9]

$$g_{11} = P(c_1^2|c_1^1) \qquad g_{12} = P(c_2^2|c_1^1)$$

$$g_{21} = P(c_1^2|c_2^1) \qquad g_{22} = P(c_2^2|c_2^1)$$

Substituting into the linear combinations one obtains:

$$P(c_1|e_1,n_2) = P(c_1|e_1,n_1)\ P(c_1^2|c_1^1) + P(c_2|e_1,n_1)\ P(c_1^2|c_2^1)$$

$$P(c_2|e_1,n_2) = P(c_1|e_1,n_1)\ P(c_2^2|c_1^1) + P(c_2|e_1,n_1)\ P(c_2^2|c_2^1)$$

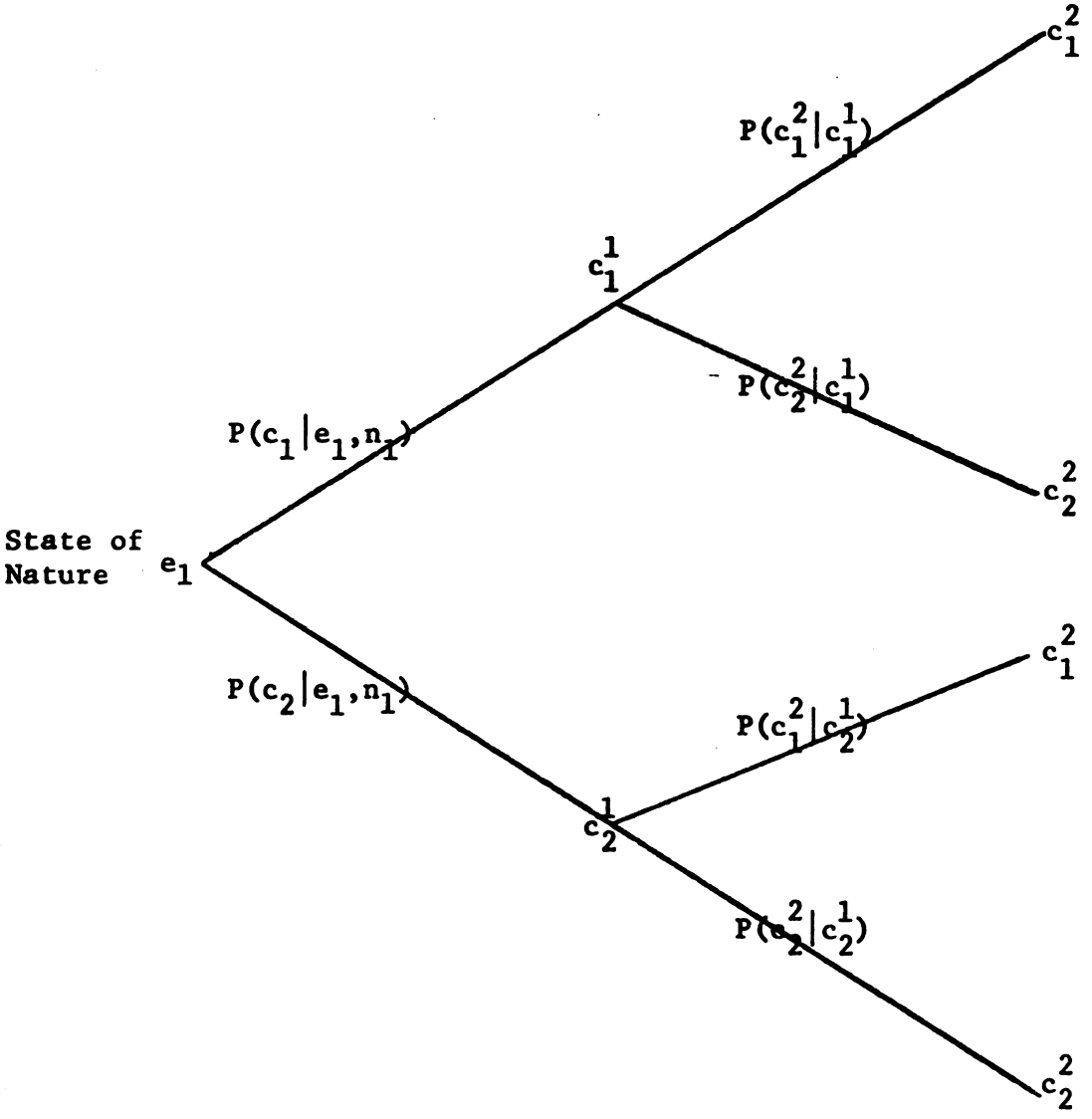
$$P(c_1|e_2,n_2) = P(c_1|e_2,n_1)\ P(c_1^2|c_1^1) + P(c_2|e_2,n_1)\ P(c_1^2|c_2^1)$$

$$P(c_2|e_2,n_2) = P(c_1|e_2,n_1)\ P(c_2^2|c_1^1) + P(c_2|e_2,n_1)\ P(c_2^2|c_2^1)$$

A study of the above linear combinations suggest that information system n_2 may be viewed as a <u>randomization</u> of the outcomes (messages) of information system n_1.[10] This randomization is made according to the conditional probabilities of the row-stochastic matrix G. That is, n_2 may be viewed as equivalent to an information system whose outcomes are determined first by applying information system n_1 and then randomizing the results in the following way: If the outcome of n_1 is c_1, then report c_1 with probability $P(c_1^2|c_1^1)$ and report c_2 with probability $P(c_2^2|c_1^1)$. If the outcome of n_1 is c_2, then report c_1 with probability $P(c_1^2|c_2^1)$ and report c_2 with probability $P(c_2^2|c_2^1)$.[11] This randomization process is illustrated in Figures VII and VIII.[12]

FIGURE VII

SUFFICIENCY
RANDOMIZATION - n_2 GIVEN e_1



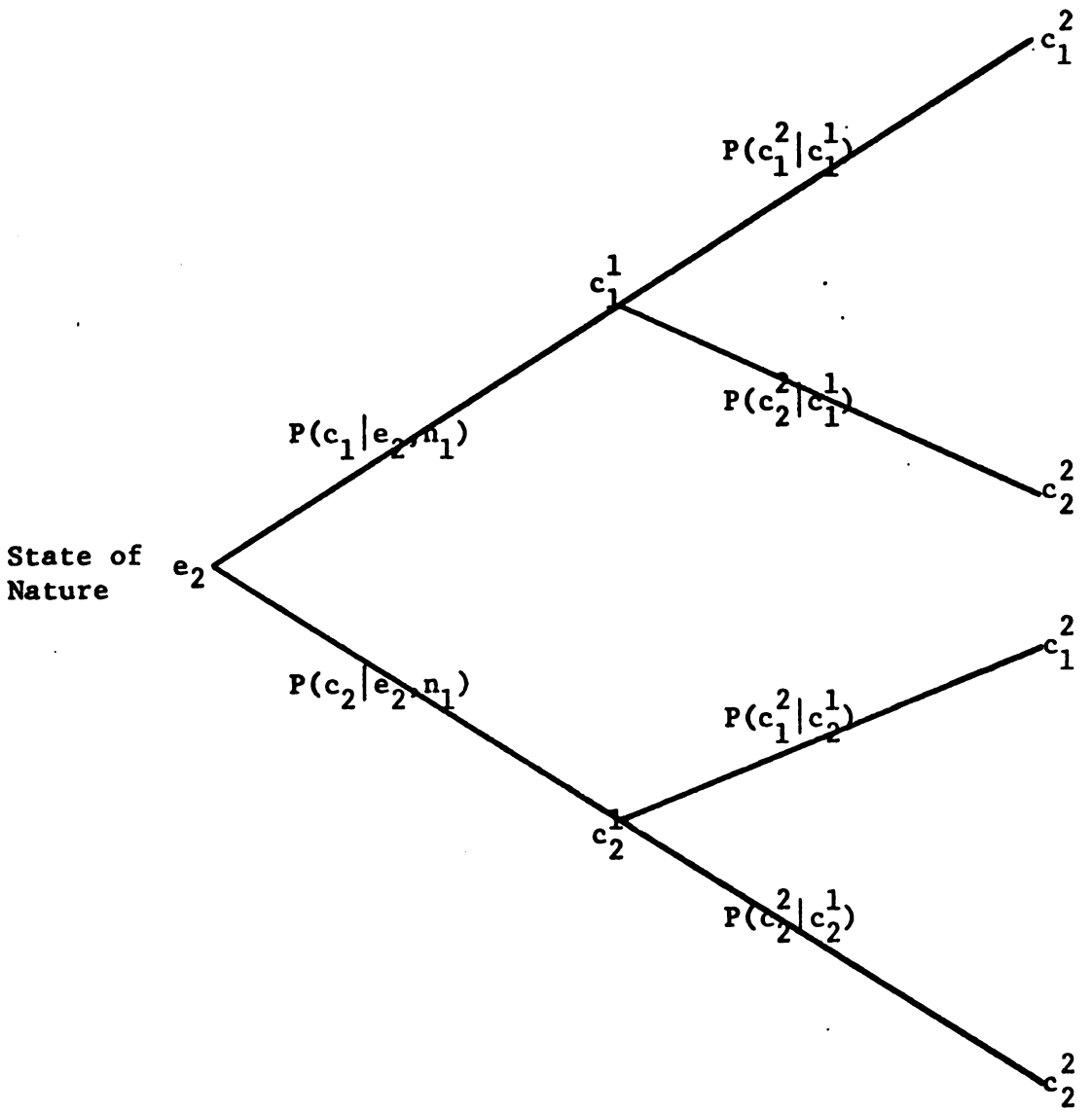
Where

$$P(c_1|e_1,n_2) = P(c_1|e_1,n_1)\ P(c_1^2|c_1^1) + P(c_2|e_1,n_1)\ P(c_1^2|c_2^1)$$

$$P(c_2|e_1,n_2) = P(c_1|e_1,n_1)\ P(c_2^2|c_1^1) + P(c_2|e_1,n_1)\ P(c_2^2|c_2^1)$$

FIGURE VIII

SUFFICIENCY
RANDOMIZATION - n_2 GIVEN e_2



Where

$$P(c_1|e_2,n_2) = P(c_1|e_2,n_1)\ P(c_1^2|c_1^1) + P(c_2|e_2,n_1)\ P(c_1^2|c_2^1)$$

$$P(c_2|e_2,n_2) = P(c_1|e_2,n_1)\ P(c_2^2|c_1^1) + P(c_2|e_2,n_1)\ P(c_2^2|c_2^1)$$

Note that the randomization procedure shown in Figures VII and VIII is independent of the state of nature which exists - that is, the procedure is the same for e_1 as it is for e_2. This implies that n_2 cannot increase the information which is provided by n_1. In fact, such a randomization procedure can only obscure information so that n_2 could contain less information than n_1. Hence, if n_1 is sufficient for n_2 then it can be concluded that n_1 is <u>at least an informative</u> as n_2.

<u>Sufficiency and Decision Theory</u>

The objective of this section is to relate the consistency between sufficiency and decision theory in the confirmation context.

Within the decision theory framework it was assumed that auditors would choose that confirmation form yielding the highest expected utility. That is, an auditor, when faced with alternative confirmation forms, chooses that form, say n*, such that:

$$V_{\phi,u}(n^*) = \text{Max } V_{\phi,u}(n_i) \quad \text{for all } n_i \epsilon n$$

or

$$V_{\phi,u}(n^*) \geq V_{\phi,u}(n_i) \quad \text{for all } n_i \epsilon n$$

where

$$V_{\phi,u}(n^*) = \sum_c \sum_e u(e,\delta^*)\, P(c|e,n^*)\, \phi(e)$$

Note that the expected value of a confirmation form is dependent, in part, on the conditional probability $P(c|e,n)$. This is the same probability upon which sufficiency is dependent. As a matter of fact, Marschak has shown that if n_1 is sufficient for n_2 then $V_{\phi,u}(n_1)$ is greater than or equal to $V_{\phi,u}(n_2)$.[13] Hence, sufficiency is consistent with the maximization of expected gross utility and hence, is consistent with the decision theory framework presented in this appendix.

It is also important to note that sufficiency is consistent with the maximization of expected gross utility regardless of individual auditor gross utility or prior probability functions. Hence, if positives are sufficient for negatives then we may conclude that the expected gross utility of positives is at least as great as negatives regardless of individual auditor preferences or uncertainties as to degrees of error in the accounts being confirmed. Obviously, the use of sufficiency as part of the research methodology of this thesis increased the potential impact of generalizations across auditors and auditing situations.

Summary

The objective of this appendix was first, to illustrate the choice among confirmation forms within a decision theory framework; secondly, to give the more mathematically minded reader additional insight into the concept of sufficiency; and thirdly, to relate the consistency between sufficiency and decision theory in a confirmation choice context. In meeting this objective, the choice among confirmation forms within a decision theory framework was examined through two presentations. Although the presentations were similar in content, hopefully, their slightly different perspectives complemented one another in yielding a more complete understanding. Secondly, sufficiency was examined from a slightly more mathematical viewpoint than presented in the main body of the thesis.[14] Any additional mathematical or statistical explanations may be easily obtained from the referenced material presented in footnotes. Thirdly, sufficiency was revealed to be entirely consistent with the decision theory framework

presented initially, i.e., consistent with the maximization of auditors' expected gross utility.

FOOTNOTES

1. Robert H. Crandall, "Information Economics and Its Implications for Further Development of Accounting Theory," The Accounting Review, (July, 1969).

   Joel S. Demski, Information Analysis, (Reading, Massachusetts: Addison-Wesley Publishing Co., 1972).

   Joel S. Demski and Gerald A. Feltham, "Forecast Evaluation," The Accounting Review, (July, 1972).

   Gerald A. Feltham and Joel S. Demski, "The Use of Models in Information Evaluation," The Accounting Review, (October, 1970).

   Gerald A. Feltham, "The Value of Information," The Accounting Review, (October, 1968).

   Jacob Marschak, "Economics of Information Systems," Journal of the American Statistical Association, (March, 1971).

   Ronald M. Marshall, "Determining An Optimal Accounting Information System for An Unidentified User," Journal of Accounting Research, (Autumn, 1972).

   Leonard J. Savage, The Foundations of Statistics, (New York: Wiley & Sons, Inc., 1954).

2. Note that gross utility is defined independent of cost. Alternative confirmation costs are dealt with explicitedly in Chapters I, XI, and VII.

3. Savage, op. cit., pp. 97-105.

4. Marschak, op. cit., p. 198.

5. Ibid.

6. Ibid.

7. Ibid., p. 200.

8. Ibid.

9. Ibid.

10. D. Blackwell and A. Girshick, Theory of Games and Statistical Decisions, (New York: John Wiley & Sons, 1954), pp. 330-331.

11. Marshall, op. cit., (not as yet printed).

12. Ibid.

13. Marschak, op. cit., p. 200.

14. The presentation of mathematical sufficiency theorems and proofs of theorems is considered outside the scope of this thesis. However, the reader may obtain this type of information from the following sources:

D. Blackwell, "Equivalent Comparisons of Experiments," Annals of Mathematical Statistics, 24, (1953), pp. 265-272.

D. Blackwell and A. Girschick, op. cit., pp. 328-330.

M. H. DeGroot, Optimal Statistical Decisions, (New York: McGraw-Hill Book Co., 1970), pp. 434-435.

J. Marschak and K. Miyasawa, "Economic Comparability of Information Systems," International Economic Review, (1968), pp. 152-154.

APPENDIX C

CREDIT UNION FINANCIAL STATEMENT

THE MEASURE OF PROGRESS OF THE MSU EMPLOYEES CREDIT UNION

	Dec. 31, 1971	Dec. 31, 1970
ASSETS (What We Own)		
Loans to Members (Ourselves)	$14,479,242.19	$13,525,174.68
Cash on Hand & In Bank	288,744.46	209,171.82
Investments	2,965,276.52	2,628,661.87
Furniture & Equipment	176,967.82	62,423.93
Our Building & Land	1,385,146.73	839,984.67
Prepaid Items & Other Assets	73,518.72	103,868.76
TOTAL VALUE OF WHAT WE OWN	$19,368,896.44	$17,369,285.73
LIABILITIES (What We Owe)		
Payroll Taxes & Other Accounts Payable	$ 9,207.76	$ 12,042.56
Deposits, Promissory Notes & Christmas Club	6,945,264.97	5,842,802.11
Notes Payable to Other Credit Unions	295,000.00	953,500.00
Shares Savings of Our Members (We Owe Ourselves)	11,057,151.36	9,600,242.23
Reserves for Bad Loans	585,682.79	537,575.70
Special Reserve	108,295.18	108,295.18
Undivided Earnings	368,294.38	314,827.95
TOTAL OWED TO OURSELVES AND OTHERS	$19,368,896.44	$17,369,285.73
INCOME RECEIVED		
Interest on Loans to Members	$ 1,612,640.71	$ 1,509,070.67
Income from Our Investments	149,780.35	94,040.75
Other Income	7,110.92	4,329.98
TOTAL INCOME	$ 1,769,531.98	$ 1,607,441.40
OPERATING EXPENSES		
Salaries & Employee Benefits	$ 278,994.80	$ 239,080.65
General Office Expense	69,140.78	72,339.50
Cost of Space	33,381.40	22,891.31
Credit Bureau & Collection Expense	6,583.79	6,620.81
Depreciation of Furniture & Equipment	10,541.47	12,554.32
Interest Paid on Borrowed Money	25,324.50	71,518.17
Other Operating Costs	26,318.07	12,216.25
TOTAL OPERATING EXPENSES	$ 450,284.81	$ 437,221.01
MEMBER SERVICES		
Borrowers Insurance	$ 59,118.58	$ 65,232.45
Life Savings Insurance	23,494.24	24,588.43
League Dues	30,904.57	28,673.46
Surety Bond Premium	1,081.08	789.00
Educational Expense	20,363.80	23,111.07
Annual Meeting (East Lansing, Oakland)	12,180.47	7,857.66
Interest Paid to Members on Time Deposits	364,611.38	237,926.39
Other Member Services	27,673.50	11,213.13
TOTAL EXPENSE FOR MEMBER SERVICES	$ 539,427.62	$ 399,391.59
TOTAL EXPENSE	$ 989,712.43	$ 836,612.60
NET EARNINGS FOR YEAR (TOTAL INCOME LESS TOTAL EXPENSE)	$ 779,819.55	$ 770,828.80
AMOUNT TRANSFERRED TO RESERVES	$ 182,436.28	$ 236,586.96
DIVIDENDS AND INTEREST REBATE PAID	$ 597,383.27	$ 534,241.84
TOTAL INCOME RETURNED TO MEMBERS	$ 961,994.65	$ 772,168.23
Number of Accounts at End of Year	15,128	13,882
Number of Loans Made During Year	11,846	11,699
Amount Loaned to Members During Year	$13,671,965.57	$14,217,739.38
Amount Loaned to Members Since Organization	$114,749,673.25	$101,077,707.68

APPENDIX D

SUFFICIENCY - VERIFICATION

APPENDIX D

SUFFICIENCY - VERIFICATION

The objective of this appendix is to verify the sufficiency results of Chapter V. This verification is necessary because in borderline situations the graphic approach is rather imprecise. In addition, such a verification will also act as a cross check on possible plotting and interpretation errors.

The verification technique which will be employed was developed by Marschak and is based upon two likelihood ratios.[1] For notational ease in illustrating this technique, assume that two likelihood matrices are given as follows:

$$\begin{bmatrix} q_{11} & q_{12} \\ q_{21} & q_{22} \end{bmatrix} \qquad \begin{bmatrix} q'_{11} & q'_{12} \\ q'_{21} & q'_{22} \end{bmatrix}$$

$$Q \qquad\qquad Q'$$

where the components of the first row in each matrix are $P(c_1|e_1,n)$ and $P(c_2|e_1,n)$ and the components of the second row are $P(c_1|e_2,n)$ and $P(c_2|e_2,n)$

The specific ordering of components within rows of the above likelihood matrices is unimportant except that $P(c_1|e_1,n)$ and $P(c_1|e_2,n)$ must appear within the same column. Likewise, $P(c_2|e_1,n)$ and $P(c_2|e_2,n)$ must appear within the same column. The specific ordering of columns within the matrices should be such that the determinant of each matrix is non-negative, i.e., $|Q| \geq 0$ and $|Q'| \geq 0$.[2] Hence, a likelihood matrix could take either of the following forms dependent upon which form

yielded a non-negative determinant.

$$\begin{bmatrix} P(c_1\ e_1,n) = q_{11} & P(c_2\ e_1,n) = q_{12} \\ P(c_1\ e_2,n) = q_{21} & P(c_2\ e_2,n) = q_{22} \end{bmatrix} \quad \begin{bmatrix} P(c_2\ e_1,n) = q_{11} & P(c_1\ e_1,n) = q_{12} \\ P(c_2\ e_2,n) = q_{21} & P(c_1\ e_2,n) = q_{22} \end{bmatrix}$$

Given likelihood matrices, two likelihood ratios are defined as follows:[3]

$$z_1 = \frac{q_{11}}{q_{21}} \qquad z_2 = \frac{q_{22}}{q_{12}}$$

Letting matrix Q reflect the likelihoods of information system n_1 and Q' the likelihoods of n_2, then n_1 is sufficient for n_2 if and only if $z_1 \geq z_1'$ and $z_2 \geq z_2'$.[4] For example, the likelihood matrices of the Main Effect of Confirmations (see Chapter V - An Empirical Test).

MAIN EFFECT OF CONFIRMATIONS (ANALYSIS I)

(1)

Negatives	Positives	Blanks
.83 .17	.29 .71	1.0 .00
.79 .21	.05 .95	.53 .47

Notationally, let the likelihood ratios for negatives be denoted by z_1 and z_2; positives by z_1' and z_2'; and blanks by z_1'' and z_2''.

Computing the likelihood ratios yields:

$z_1 = \frac{.83}{.79} = 1.05$ $\quad z_1' = \frac{.29}{.05} = 5.80$ $\quad z_1'' = \frac{1.0}{.53} = 1.89$

$z_2 = \frac{.21}{.17} = 1.24$ $\quad z_2' = \frac{.95}{.71} = 1.31$ $\quad z_2'' = \frac{.47}{.00} =$ very large

Comparing likelihoods:

$z_1' \geq z_1$ and $z_2' \geq z_2$ which implies positives are sufficient for negatives

$z_1'' \geq z_1$ and $z_2'' \geq z_2$ which implies blanks are sufficient for negatives

Examining the above technique for each of the remaining analyses of Chapter V (Analyses II through V) yields the following results:

ASC INTERACTION - LOAN / SMALL (ANALYSIS II)

(2)

Negatives	Positives	Blanks
.85 .15	.36 .64	1.0 .00
.79 .21	.05 .95	.53 .47

Computing the likelihood ratios yields:

$z_1 = \frac{.85}{.79} = 1.08$ $\quad z_1' = \frac{.36}{.05} = 7.20$ $\quad z_1'' = \frac{1.0}{.53} = 1.89$

$z_2 \quad \frac{.21}{.15} = 1.40$ $\quad z_2' = \frac{.95}{.64} = 1.48$ $\quad z_3'' = \frac{.47}{.00} =$ very large

Comparing likelihoods:

$z_1' \geq z_1$ and $z_2' \geq z_2$ which implies positives are sufficient for negatives

$z_1'' \geq z_1$ and $z_2'' \geq z_2$ which implies blanks are sufficient for negatives

ASC INTERACTION - LOAN / LARGE (ANALYSIS III)

(3)

Negatives	Positives	Blanks
.21 .79	.29 .71	1.0 .00
.21 .79	.05 .95	.53 .47

Computing the likelihood ratios yields:

$z_1 = \frac{.21}{.21} = 1.00$ $\quad z_1' = \frac{.29}{.05} = 5.80$ $\quad z_1'' = \frac{1.0}{.53} = 1.89$

$z_2 = \frac{.79}{.79} = 1.00$ $\quad z_2' = \frac{.95}{.71} = 1.31$ $\quad z_2'' = \frac{.47}{.00} =$ very large

Comparing likelihoods:

$z_1' > z_1$ and $z_2' \geq z_2$ which implies positives are sufficient for negatives

$z_1'' \geq z_1$ and $z_2'' \geq z_2$ which implies blanks are sufficient for negatives

ASC INTERACTION - SHARE / SMALL (ANALYSIS IV)

(4)

Negatives	Positives	Blanks
.81 .19	.14 .86	1.0 .00
.79 .21	.05 .95	.53 .47

Computing the likelihood ratios yields:

$z_1 = \frac{.81}{.79} = 1.03$ $\quad z_1' = \frac{.14}{.05} = 2.80$ $\quad z_1'' = \frac{1.0}{.53} = 1.89$

$z_2 = \frac{.21}{.19} = 1.11$ $\quad z_2' = \frac{.95}{.86} = 1.10$ $\quad z_2'' = \frac{.47}{.00} =$ very large

$z_1'' \geq z_1$ and $z_2'' \geq z_2$ which implies blanks are sufficient for negatives

ASC INTERACTION - SHARE / LARGE (ANALYSIS V)

(5)

Negatives	Positives	Blanks
.87 .13	.38 .62	1.0 .00
.79 .21	.05 .95	.53 .47

Computing the likelihood ratios yields:

$z_1 = \frac{.87}{.79} = 1.10$ $\quad z_1' = \frac{.38}{.05} = 7.60$ $\quad z_1'' = \frac{1.0}{.53} = 1.89$

$z_2 = \frac{.21}{.13} = 1.62$ $\quad z_2' = \frac{.95}{.62} = 1.53$ $\quad z_2'' = \frac{.47}{.00} =$ very large

Comparing likelihoods:

$z_1'' \geq z_1$ and $z_2'' \geq z_2$ which implies blanks are sufficient for negatives

The likelihood ratio results are summarized below:

Analyses	Results
Main Effect of Confirmations	Positives and Blanks are Sufficient for Negatives
ASC Interaction:	
Loan / Small	Positives and Blanks are Sufficient for Negatives
Loan / Large	Positives and Blanks are Sufficient for Negatives
Share / Small	Blanks are Sufficient for Negatives
Share / Large	Blanks are Sufficient for Negatives

Summary

The objective of this appendix was to verify the sufficiency results of Chapter V. This verification was made through the use of a likelihood ratio technique and the results were entirely consistent with the graphic analysis of Chapter V.

FOOTNOTES

1. Jacob Marschak, "Economics of Information Systems," Journal of the American Statistical Association, (March, 1971), p. 203.

2. Ibid.

3. Ibid.

4. Ibid.

APPENDIX E

QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY EAST LANSING • MICHIGAN 48823

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

DEPARTMENT OF ACCOUNTING & FINANCIAL ADMINISTRATION • EPPLEY CENTER

Mr. Carl Warren is a Ph.D. student at Michigan State University working under my supervision on his dissertation. Fortunately, he is doing some relevant research in auditing. In order to help him complete a project that may have an important effect on our profession, he needs some help from a few CPA firms. I would appreciate it if you would provide that help or pass it on to someone in your firm who will.

His general area of research is the relative reliability and effectiveness of different types of confirmations. He needs information about the relative cost of the different confirmation types. Naturally, any information he obtains will be confidential.

Thanks for your help.

Sincerely,

Alvin A. Arens
Associate Professor of Accounting

AAA/cmb

QUESTIONNAIRE

INSTRUCTIONS:

The purpose of this questionnaire is primarily twofold: the first objective is to obtain relative cost information about three types of alternative confirmation forms; the second objective is to obtain information about which types of confirmations auditors prefer. In answering this questionnaire you are asked to assume the role of an auditor completing an interim or year-end audit of a relatively large credit union.

Accounts of Concern

For the purposes of this questionnaire assume you are auditing deposit and loan accounts of a credit union and the balances of these accounts range up to $ 1000. Having decided to send confirmations, you are told that limited client assistance is available for confirmation preparation. Assume you have completed an internal control evaluation and have performed a test of transactions and found no exceptions that warrant any thing other than normal audit procedures.

Confirmation Forms

For the purposes of this questionnaire and the assumed audit, three types of confirmation forms are available.

Positive confirmation - This confirmation supplies individuals with account balances and requests them to respond to the auditor regardless of whether the balance is correct or incorrect.

Negative confirmation - This confirmation supplies individuals with account balances and requests them to respond to the auditor only if the balance as reported by the confirmation is incorrect. Assume that negative confirmations utilized in this audit are sent separately from any billing or monthly statement.

Blank confirmation - This confirmation supplies individuals with their account numbers and requests them to fill in their account balances on the confirmation and return the confirmation to the auditor.

Question One

Assume that you have decided to send 100 confirmations of each of the above confirmation types - positive, negative, and blank. Self-addressed, stamped envelopes will be included with each confirmation request and second requests will be mailed three weeks

after the first mailing to all nonrespondents of positive and blank confirmations (a final cutoff will be made three weeks after the second mailing). Also assume that all monthly statements have been withheld pending the results of the confirmation tests.

Please fill in a rough time estimate (in hours) each of the above confirmation procedures would consume by each of the following groups. Please base your estimates upon the mailing of 100 of each type of confirmation form. Include the time consumed in sending second requests and in following-up on nonrespondents.

	Client Assistants	Staff Assistants	Senior	Manager/ Partner
Positive Confirmations	_____	_____	_____	_____
Negative Confirmations	_____	_____	_____	_____
Blank Confirmations	_____	_____	_____	_____

* I realize that with the limited information given above your estimates must necessarily be subjective. However, please attempt to be as accurate as possible.

Question Two

Assume that you are given the following information.

Suppose that if an account is in error, the probability with each of the above confirmations of an individual failing to report the error in the confirmation response is the following:

Positive Confirmations	Negative Confirmations	Blank Confirmations
.71	.83	.00

Suppose that if an account is correct, the probability with each of the above confirmations of an individual reporting an error in the confirmation response is the following:

Positive Confirmations	Negative Confirmations	Blank Confirmations
,05	.21	.53

Given the above probability information and the time estimates you provided earlier, if you could only send 100 of one type of confirmation which one would you choose? (Please circle your answer)

Positive Negative Blank

Question Three

Now suppose you have the opportunity of sending a mixture of the three confirmation types, which one(s) would you choose for the following stratified sample?

Stratified Sample	Please Circle Your Choice		
25 Small loan accounts ($ 0 - $ 400)	Positive	Negative	Blank
25 Large loan accounts ($ 401 - $ 1000)	Positive	Negative	Blank
25 Small deposit accounts ($ 0 - $ 65)	Positive	Negative	Blank
25 Large deposit accounts ($ 66 - $ 1000)	Positive	Negative	Blank

* Assume that 100 total confirmations are sent.

Please mail this questionnaire in the enclosed self-addressed, stamped envelope. Your cooperation is sincerely appreciated.

THANK YOU,

Carl Warren
Michigan State University

SELECTED BIBLIOGRAPHY

Books

Blackwell, D., and Girshick, A. Theory of Games and Statistical Decisions. New York: John Wiley & Sons, Inc., 1954.

DeGroat, M. H. Optimal Statistical Decisions. New York: McGraw-Hill Book Co., 1970.

Demski, Joel S. Information Analysis. Reading, Massachusetts: Addison-Wesley Publishing Co., 1972.

Dwass, Meyer. Probability. New York: W. A. Benjamin, Inc., 1970.

Glass, Gene V., and Stanley, Julian C. Statistical Methods in Education and Psychology. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970.

Mautz, R. K., and Sharaf, Hussein A. The Philosophy of Auditing. Evanston, Ill.: American Accounting Association, 1961.

Palmer, Roger R.; Neter, John; and Davis, Gordon B. A Research Study on the Effectiveness of Confirming Personal Checking Accounts. The Association for Bank Audit, Control, and Operation, 1967.

Sauls, Eugene H. On the Problems of Nonresponse and Improper Response to Confirmation Requests. Unpublished Ph.D. dissertation, Michigan State University, 1969.

Savage, Leonard J. The Foundations of Statistics. New York: Wiley & Sons, Inc., 1954.

Siegel, Sidney. Nonparametric Statistics For the Behavioral Sciences. New York: McGraw-Hill Book Co., 1956.

Stettler, Howard F. Systems Based Independent Audits. Englewood, N. J.: Prentice-Hall, Inc., 1967.

Willingham, John J., and Carmichael, D. R. Auditing Concepts and Methods. New York: McGraw-Hill Book Co., 1971.

Windal, Floyd W. An Analysis of the Relative Reliability of the Various Types of Audit Evidence. Unpublished Masters thesis, University of Illinois, 1955.

Articles and Periodicals

Bartlett, M. S. "The Use of Transformations." Biometrics, (Volume 3, 1947), 39-53.

Blackwell, David. "Equivalent Comparisons of Experiments." Annals of Mathematical Statistics, (Volume 24, 1953), 265-272.

Crandall, Robert H. "Information Economics and Its Implications for the Further Development of Accounting Theory." The Accounting Review, (July, 1969), 457-466.

D'Agostino, Ralph B. "A Second Look at Analysis of Variance on Dichotomous Data." Journal of Educational Measurement, (Winter, 1971), 327-333.

Demski, Joel S., and Felthom, Gerald A. "Forecast Evaluation." The Accounting Review, (July, 1972), 533-548.

Felthom, Gerald A. "The Value of Information." The Accounting Review, (October, 1968), 684-696.

_____, and Demski, Joel S. "The Use of Models in Information Evaluation." The Accounting Review, (October, 1970), 623-640.

Lunney, G. H. "Using Analysis of Variance with a Dichotomous Dependent Variable: An Empirical Study." Journal of Educational Measurement, (Winter, 1970), 263-269.

Marschak, Jacob. "Economics of Information Systems. Journal of the American Statistical Association, (March, 1971), 192-219.

_____, and Miyasawa, K. "Economic Comparability of Information Systems." International Economic Review, (June, 1968), 137-174.

Marshall, Ronald M. "Determining An Optimal Accounting Information System for An Unidentified User." Journal of Accounting Research, (Autumn, 1972).

Maynes, E. Scott. "Minimizing Response Errors in Financial Data: The Possibilities." Journal of the American Statistical Association, (March, 1968), 214-227.

Potter, John C. "Confirmation of Receivables." The Journal of Accountancy, (July, 1957), 45-49.

Sauls, Eugene H. "An Experiment on Nonsampling Errors." Empirical Research in Accounting: Selected Studies, 1970. Chicago: University of Chicago Press, 1971, 157-171.

_____. "Nonsampling Errors in Accounts Receivable Confirmation." The Accounting Review, (January, 1972), 109-115.

Reports

Carmichael, D. R. "Comments on Conformation of Accounts Receivable." Unpublished working paper prepared for the Committee on Auditing Procedure of the American Institute of Certified Public Accountants, New York, 1969.

Committee on Auditing Procedure. Statement on Auditing Procedure No. 1. New York: American Institute of Accountants, 1939.

_____. Statement on Auditing Procedure No. 26. New York: American Institute of Accountants, 1956.

_____. Statement on Auditing Procedure No. 33. New York: American Institute of Certified Public Accountants, 1963.

_____. Statement on Auditing Procedure No. 43. New York: American Institute of Certified Public Accountants, 1970.

Study Group on Audit Techniques. Confirmation of Accounts Receivable. Toronto: Canadian Institute of Chartered Accountants, 1969.