

ON THE PROBLEMS OF NONRESPONSE
AND IMPROPER RESPONSE TO
CONFIRMATION REQUESTS

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This is to certify that the

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ABSTRACT

ON THE PROBLEMS OF NONRESPONSE AND IMPROPER RESPONSE TO CONFIRMATION REQUESTS

by Eugene H. Sauls

The circularization of accounts has been a standard auditing procedure for many years. There has, however, always been some who have felt that the inadequacies of this procedure have not been fully recognized.

The two major shortcomings of the circularization of accounts are: (1) some of those to whom a confirmation request is sent do not respond and (2) the auditor cannot be sure that those who do respond checked their records.

These two shortcomings lead to errors in estimation which are respectively called nonresponse and improper response errors. Nonresponse and improper response errors are members of a larger class called nonsampling errors. Nonsampling errors are those errors which would exist if each account were circularized.

The effect that nonresponse and improper response errors have upon the estimates of the accounts has not heretofore been determined. It is principally to this end that this thesis is directed.

Hypotheses were formulated concerning the behavior of confirmation request recipients. These hypotheses

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concerned reactions to confirmation requests which reflected correct amounts and requests which reflected incorrect amounts. Hypotheses concerning reaction to various forms were also formulated.

These hypotheses were tested by means of statistical tests based on results of experiments conducted on deposit accounts of the MSU Employees Credit Union and loan accounts of the Continental Illinois National Bank and Trust Company of Chicago. The experiments were conducted by sending out confirmation requests which reflected incorrect amounts as well as confirmation requests which reflected correct amounts.

These tests revealed that improper response is an important variable which must be dealt with by the auditor. They also indicated that nonresponse, though prevalent, may not adversely affect the auditors' estimations concerning the accounts.

Recommendations are made, based on the results of this study, of means by which the auditor may avoid improper response and circumvent nonresponse errors. These recommendations can be incorporated into the statistical sampling techniques currently employed in the auditing profession.

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By

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CHAPTER I

PRELIMINARY CONSIDERATIONS

1.1 Introduction

In regard to the question of confirming receivables by direct communication with the debtor, the following recommendation is made:

That hereafter, whenever practicable and reasonable, and where the aggregate amount of notes and accounts receivable represents a significant portion of the current assets or of the total assets of a concern, confirmation of notes and accounts receivable by direct communication with the 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, and that the method, extent, and time of confirming receivables or a part thereof, be determined by the independent certified public accountant as in other phases of procedure requiring the exercise of his judgment.¹

This statement of position, issued by the Committee on Auditing Procedure of the American Institute of Accountants, was the first in a series of similar statements on the position of the Committee concerning the procedure of confirming accounts receivable.

¹Committee on Auditing Procedures, Statements on Auditing Procedure, No. 1, Extensions of Auditing Procedure, (New York: American Institute of Accountants; October 1939), pp. 7-8.

The Committee on Practice Review of the American Institute of Certified Public Accountants stated in 1966

that generally accepted auditing procedures require that in all cases in which receivables or inventories are material factors, the omission of confirmation of the receivables . . . with respect to the latest balance sheet should be disclosed . . .¹

This thesis is an examination into the problems connected with the confirmation procedure. More specifically, it is addressed to the problems caused by those recipients who fail to respond and by those who respond that the confirmation request is correct when in fact it is wrong.

There are four questions which must be resolved by the auditor in confirming accounts. (1) Are confirmations necessary or even desirable under the particular circumstances? (2) What type of confirmation should be used? (3) How many accounts should be circularized? (4) Which accounts should be circularized?

In determining the need to circularize the accounts receivable the auditor must decide whether they are a significant portion of the current assets or of the total assets. If he concludes that they are significant he must decide if the confirmation procedure is reasonable and practicable. "In auditing, practicable means 'capable

¹Committee on Practice Review, Departures From Generally Accepted Auditing Standards and Accounting Principles, (New York: American Institute of Certified Public Accountants; 1966), p. 34.

of being done with the available means' or 'with reason or prudence'; reasonable means 'sensible in the light of the surrounding circumstances'."¹

The type of confirmation that can be used is either positive or negative. A positive type confirmation is one which requests the recipient to respond whether or not the amount reported on the confirmation request is in agreement with his records. A negative type confirmation is one which asks the recipient to respond only if the amount reported on the confirmation request is not in agreement with his records. In general, a positive type confirmation should be used if the amounts of individual accounts are large, if there are indications that the account is in dispute, or if there is reason to believe that a negative type confirmation will not receive the proper attention.² A negative type confirmation may be used if there are a large number of accounts none of which has a large balance.

The number of accounts that the auditor should confirm ranges from all of the accounts down to a sample of a relatively small percent of the accounts. If there

¹Committee on Auditing Procedure, Auditing Standards and Procedures, (New York: American Institute of Certified Public Accountants, 1963), p. 38.

²See for example Norman J. Lenhart, Philip L. DeFliese, Montgomery's Auditing, 8th ed., (New York: The Ronald Press Company, 1957), p. 175 or Howard F. Stettler, Auditing Principles 2nd ed., (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961), pp. 158-9.

are only a small number of accounts, all of the accounts should be confirmed. In the usual circumstance (where there are a large number of accounts) a sample of the accounts may be confirmed, under the assumption that the sample represents the population of the accounts. There are two forms of sampling: judgment sampling and statistical sampling. Judgment sampling is a subjective determination of the number of accounts to be confirmed. Statistical sampling requires the auditor to establish certain boundaries of acceptable results which in turn determines the size of the sample. As pointed out by the Committee on Statistical Sampling of the American Institute of Certified Public Accountants, "Only after the auditor has specified in quantitative terms, the levels of precision and reliability which are acceptable to him may statistical sampling be used to determine the size and other characteristics of the sample to be drawn for the audit test."¹

The selection of the specific accounts to be confirmed can be accomplished by a selective sample or by a random sample. A selective sample is one in which the auditor selects those accounts which appear to him to be the ones most likely to be misstated or the ones whose misstatement would have the greatest impact upon the

¹Committee on Statistical Sampling, Statistical Sampling and the Independent Auditor, (New York: American Institute of Certified Public Accountants, 1961).

statements. A random sample is one taken without regard to the condition of any of the accounts so that each account has a known probability of being selected. A random sample is required for the use of statistical sampling techniques. The use of random sampling does not preclude the weighting of accounts with large balances. If some form of weighting is desired, it can be accomplished by stratifying the accounts and confirming a larger percent of accounts in one strata than in another strata.

1.2 Limitations of Confirmation Procedures

There are two types of errors that may occur in any sampling technique which tend to reduce the effectiveness of the confirmation procedure; sampling errors and nonsampling errors. Sampling errors are those errors which occur because all of the items in the population are not examined. Statistical sampling has the desirable attribute of quantifying the probability of and the extent of sampling errors. Judgment sampling, on the other hand, simply assumes that the probability of and the extent of sampling errors are within a range which is acceptable to the auditor. Nonsampling errors are those errors which would occur even if a complete census of the population were taken. Professors Vance and Neter suggest that nonsampling errors may be more important than sampling

errors.¹

There are two major sources of the nonsampling errors which arise from the circularization of accounts; nonresponse and improper response. Nonresponse errors arise when the recipient of the confirmation fails to respond to the request. Improper response errors arise when the recipient confirms the amount (i.e., states that the amount is correct) when in fact the confirmation is not in agreement with his records or when the recipient states that the amount is incorrect when in fact the amount is in agreement with his records.

Nonresponse is obvious whenever positive-type confirmations are used but when negative-type confirmations are used it is not possible to determine the extent of nonresponse. The problem of nonresponse can be resolved in a number of ways. (1) The auditor can assume that the recipient would have responded if there had been a discrepancy. Such an assumption was advocated by an unnamed practitioner in answer to a question posed in The Journal of Accountancy. This practitioner contended "that any debtor who disagrees with the amounts shown by the accountants' confirmation form will be sure to reply" and that the accountant "is reasonably safe in assuming that such debtors as do not reply accept the amounts stated in the

¹L. Vance and J. Neter, Statistical Sampling for Auditors and Accountants, (New York: John Wiley & Sons, Inc., 1956), pp. 171-2.

confirmation forms as being correct."¹ This position was opposed by Norman Lenhart and Philip Defliese who stated that "the auditor may not assume that failure to reply to the request indicates that the debtor agrees with the reported balance."² This latter viewpoint seems to prevail in the auditing profession today. (2) The auditor can assume that the proportion of incorrect accounts among nonrespondents is the same as that among respondents. This assumption is implicit in those instances where the auditor accepts the responses and draws conclusion therefrom. Since the auditor does not test this assumption it is untenable. In spite of the lack of evidence to support this position, it is often implicit in statistical sampling models currently in use in the auditing profession. (3) The auditor can perform alternative steps. There are many accountants who advocate the use of alternative procedures as a substitute for confirmations which are not returned. Norman Lenhart and Philip Defliese state that if the auditor "fails to receive positive confirmation of a substantial number of accounts or material dollar amount of receivables, the auditor should employ supplementary auditing procedures . . ."³ Professors Vance and Neter concur that the solution

¹Accounting Questions, Answer from an unnamed practitioner, Vol. 58, No. 5, (The Journal of Accountancy, November 1934), p. 391.

²Op. cit., p. 174.

³Ibid., p. 175.

is "to obtain sufficient evidence from other sources to settle the point if the confirmation cannot be had."¹ Robert E. Healy, in discussing an actual small company case, detailed a procedure followed by the auditor to satisfy himself as to the reasonableness of the accounts. Healy reports that in a case when 30 or 108 accounts did not respond the auditor

employed the usual alternative auditing techniques and examined shipping documents for the invoices in question, as well as original remittance advices of the customers. These procedures provided him with the evidence that the balances were bona fide and served as a substitute for the customer's confirmation.²

One might ask, how satisfactory these alternative procedures are as a substitute for the confirmation? W. H. Broadhurst contends that "alternative auditing steps are less conclusive and more time-consuming than confirmation replies."³ Richard C. Lytle takes an even stronger position regarding the possible inadequacy of alternative procedures as a substitute for confirmations. Lytle states that

in most cases, omission of the confirmation procedure, or inability to obtain a reply where the amount is material, can pose serious problems for the independent auditor in obtaining sufficient competent

¹Op. cit., p. 141.

²Robert E. Healy, "Sampling in Auditing is for All Auditors," The New York Certified Public Accountant, Vol. XXXVI, No. 5, (May 1966), p. 366.

³W. H. Broadhurst, "Follow-up of Accounts Receivable Circularization," Canadian Chartered Accountant, Vol. 86, No. 2, (February 1965), p. 145.

evidence to support an unqualified opinion, and may require qualification of an opinion or a disclaimer.¹

(4) A sample of the nonrespondents can be taken and these can be contacted in order to get an answer to the request. The results of this sample are combined with the results of the first sample and projected to the population. This method will be discussed at greater length later in this thesis.

Improper responses pose an even greater challenge to the auditor than do nonresponses because the auditor is not able to measure their effect. Historically the auditor has accepted a confirmation at its face value without questioning the respondent further. This is probably more a matter of necessity than of choice. Carman G. Blough quoted the following comments by Manfred E. Philip regarding confirmations of small loan companies.

Many accountants feel that many of these debtors do not know the exact amount of their balance and, therefore, are in no position to confirm a figure of which they have only a hazy notion. To accept any confirmation received under these circumstances at face value would give² the auditor a false sense of security.

¹Richard C. Lytle, ed. "Accounting and Auditing Problems," The Journal of Accountancy, Vol. 118, No. 3, (September 1964), p. 73.

²Carmen G. Blough, ed., "Confirmation Procedure Must Be Adapted to the Circumstances," Accounting and Auditing Problems, The Journal of Accountancy, Vol. 97, No. 3, (March 1954), p. 345.

1.3 Prior Studies

An experiment was conducted by Gordan Davis, John Neter, and Roger Palmer which directly concerned audit confirmations.¹ This study was conducted by placing a code number directly below the account balance on the bank statements of a sample of customers. Confirmation requests were then sent to these customers asking them to confirm both the balance in the account and the code numbers. Three hundred and fifty positive-type confirmation requests were mailed of which 200 reflected inaccurate code numbers. One hundred and eighty-three of the inaccurate confirmations were returned; however, about 36% of these failed to note the discrepancy. This quality of response must certainly raise some doubts about the confidence the auditor can place in an individual confirmation request.

A related study was conducted by E. Scott Maynes in 1963.² Prof. Maynes circularized a sample of members of the Census Federal Credit Union. The questionnaire which was employed requested the recipient to provide the data concerning his savings and loan accounts. The recipient was informed, by means of a cover letter, that

¹Gordon B. Davis, John Neter, and Roger R. Palmer, "An Experimental Study of Audit Confirmations," The Journal of Accountancy, Vol. 123, No. 6, (June 1967), pp. 36-44.

²E. Scott Maynes, "Minimizing Response Errors in Financial Data: The Possibilities," Journal of the American Statistical Association, Vol. 63, No. 321, (March 1968), pp. 214-27.

the questionnaire was in conjunction with a study which had the approval of the Credit Union and The Bureau of the Census. Some of the recipients were asked to check their records and some were asked to furnish the information without checking their records. Of those who were asked to check their records and responded to the questionnaire, 85% were within 1% of the credit union's balance; 91% were within 5% of the credit union's balance. This leaves 9% of the respondents reporting errors in excess of 5% of their balances. These studies certainly cast doubt upon the reliance that can be placed on the accuracy of confirmation requests.

1.4 Statistical Sampling

1.4.1 History of Use in Auditing:

As is typical for innovation it is not possible to exactly set the time of the beginning of the auditors' interest in statistical sampling. Alden Smith proposes that,

Perhaps the first article advocating the application of statistical sampling techniques to test checking by auditors was 'The Efficacy of Tests' by Lewis A. Carman, which was published in The American Accountant in December 1933.¹

It was not until the 1950s, however, that the certified public accounting firms began to take a serious interest in

¹Alden C. Smith, "The Accounting Profession's Growing Interest in Statistical Sampling," The New York Certified Public Accountant, Vol. XXVII, No. 7, (July 1957), p. 452.

statistical sampling and began conducting research into its application to auditing. After its introduction it enjoyed rather spectacular growth, as exhibited by the results of reviews of working papers of Price Waterhouse & Co. These reviews revealed that in 1960, 32% of the engagements reviewed used statistical sampling, in 1963 this percentage had increased to 55%.¹ These reviews encompassed large, medium, and small engagements, therefore one would expect that 100% application would not be appropriate because the small engagements would be less amenable to the use of statistical sampling.

1.4.2 Advantages:

Hill, Roth, and Arkin rank the advantages of statistical sampling as first, Measurement; second, Objectivity; then, Effectiveness and Efficiency.² Their contention is that measurement aids the auditor in forming a sound opinion regarding the account under consideration. The auditor is able to express the parameters with which he is concerned in such a manner that he can determine whether they are within an acceptable range. For example, if a given percentage of the accounts receivable confirmations reveal errors in the accounts, the auditor will

¹Robert E. Healy, "Sampling in Auditing: The Whole Story," Price Waterhouse Review, Vol. 9, No. 4, (Winter 1964), p. 40.

²Henry P. Hill, Joseph L. Roth, and Herbert Arkin, Sampling in Auditing, (New York: The Ronald Press Company, 1962), pp. 7-9.

have a measure of the probable range of error. The auditor will, therefore, be able to base his judgment as to the reasonableness of the accounts on a defined estimate and not some vague notion. One of the desirable traits of an audit tool is that it be objective. Since statistical sampling is objective it is of great advantage to the auditor. One of the advantages of statistical sampling is that it is more likely to assure a cross section of the accounts. Another advantage of statistical sampling is that the auditor establishes beforehand the criteria on which he will make his decision. Once these criteria have been established, the extent of verification required is determined by the statistical sampling model used. The criteria which the auditor establishes are the confidence interval and the confidence level (both to be discussed later).

The effectiveness of statistical sampling is derived in part from the fact that it requires the establishment of the criteria for acceptability prior to the actual test and in part because it focuses attention on the objectives of the test. The objectives of the test and the criterion for an error must be clearly defined and understood.

Statistical sampling is never less efficient than judgmental sampling. A tool is more efficient if it requires less effort to obtain the same result. The reason statistical sampling is never less efficient can be easily shown. Once the criteria for the test have

been established, the auditor utilizes the statistical sampling model to determine the sample size, the sample size thus determined is the minimum which will satisfy the criteria established: any less would be insufficient. If judgmental sampling results in less verification, then the auditor has not gathered a sufficient amount of evidence. If, on the other hand, judgmental sampling results in more verification, then the auditor has performed more work than was necessary under the circumstances.

1.4.3 Terminology:

There are two technical terms used in statistical sampling which must be defined for any discussion in the area. The two terms are confidence interval and confidence level. Confidence interval is defined here as the range of values on either side of the expected value of the parameter being estimated. The result, then, is a range of expected values for the parameter being estimated. The term precision is sometimes used to refer to this range. Confidence level is defined as the probability that the confidence interval encompasses the true value of the parameter being estimated. For example, if the expected value of the parameter being estimated is 0.35 (as a result of the sample) and the auditor establishes a confidence level of 95% and a confidence interval of ± 0.05 , then the auditor is 95% sure that for any random sample of the same size from the population, the

confidence interval computed from the sample would include the true value of the parameter. The implication drawn from this is that the true value of the parameter is between 0.30 and 0.40.

1.4.4 Sampling Plans¹

The sampling plan which the auditor employs must be attuned to the purpose of the specific test. The sampling plans which are normally used are acceptance sampling, attribute sampling, variable sampling, and discovery sampling.

Acceptance sampling is based on the notion of accept or reject. The auditor establishes a maximum error level as a criterion for acceptance of the population from which the sample is drawn. For example, the auditor may establish the maximum error rate for accounts receivable confirmations as 10%, that is, if the estimated proportion of errors, based on the sample, exceeds 10%, the auditor will not accept the accounts as being reasonably stated. A sampling plan which is closely related to acceptance sampling is double or multiple sampling. Multiple sampling is characterized by establishing two critical levels. In the case of accounts receivable confirmations the procedure would be to set an error rate for acceptance and another error

¹The order of discussion in sections 1.4.4 and 1.4.5 closely follows the order in Sampling in Auditing by Henry P. Hill, Joseph L. Roth, and Herbert Arkin.

rate for rejection. An acceptance level of 2% and a rejection level of 5% would mean that if the percentage of errors in the sample were less than 2%, the auditor would accept the balance of the account as being reasonably correct; if the percentage of errors in the sample were more than 5%, the auditor would reject the balance of the account as not being reasonably stated; if the percentage of errors in the sample were between 2% and 5% the auditor would expand his sample, either with new acceptance-rejection levels or maintaining the same levels.

Attribute sampling is a natural extension of acceptance sampling; it not only indicates whether the error rate in the population exceeds some acceptable limit but it also estimates the rate of occurrence of the error. Attribute sampling is useful in estimating some qualitative feature of the population. This is especially useful for an evaluation of internal control. The degree of internal control is not dichotomous, (i.e., it cannot be evaluated as totally effective or nonexistent), it spans a wide range which, for reasons of convenience, is expressed in discrete terms. Attribute sampling is useful in estimating the proportion of errors in the population and from this the auditor may be able to evaluate the internal control as being at a certain level.

Variable sampling is designed to estimate some

quantitative feature of the population and for this reason is extremely useful to the auditor in rendering an opinion as to the reasonableness of the account. Variable sampling essentially estimates the dollar value of the account. In the case of accounts receivable confirmations the auditor would estimate the dollar value of errors in the accounts based on the dollar value of errors uncovered by the sample.

Discovery sampling is a plan whereby the auditor is concerned with any error disclosed. This plan is generally employed when the auditor is primarily concerned with the possibility of a defalcation. It has been generally established that the independent certified public accountant does not bear the responsibility for uncovering a defalcation in the ordinary course of an audit when the purpose of the audit is the rendering of an opinion as to the reasonableness of the accounts and the fairness of their presentation by means of financial statements. Although independent certified public accountants may not find discovery sampling useful for uncovering irregularities, they may find it useful in testing for adherence to stated procedures. Internal auditors may, on the other hand, find discovery sampling has many desirable qualifications. In those cases where the internal auditor wishes to satisfy himself that there are no irregularities or that the employees are following the prescribed procedures as established by management, an

appropriate tool would be discovery sampling because one incident may be enough to require attention for corrective action.

1.4.5 Random Number - Systematic Sampling:

There are two major methods of applying the statistical sampling plan selected: Random number sampling and systematic sampling. Random number sampling is the process of selecting the items for examination on the basis of a table of random numbers. These tables are plentiful and are often provided in books on statistical sampling. The tables are generated in such a manner that human biases do not affect the selection process. The use of the tables poses no problem to the auditor; he has only to determine a starting point and proceed from there. If the items in the population are prenumbered, the auditor would use the respective identifying digits, i.e., if the numbers in the population were in the thousands, the auditor might use the last four digits of the numbers in the random number table. If the items in the population are not prenumbered, the auditor might number the items and proceed as he would if they were prenumbered. This illustrates one of the problems associated with the use of random number tables. It may often be inconvenient to number the items if they are not prenumbered. In this case the auditor may find it more convenient to conduct a systematic sampling process. Systematic sampling is the process of selecting every nth item in a population.

Systematic sampling has the advantage of not requiring the numbering of the accounts; however, it has the disadvantage that the sequence of items in the population may be in such a manner as to introduce a bias in the sample. For example, the accounts receivable subsidiary ledger may be prepared by entering a particular type of account at equal intervals. The auditor should be aware of these potential dangers and make certain that they do not exist. It should be pointed out that the use of systematic sampling is not restricted to those instances where the accounts are not prenumbered, it is simply that its relative advantage is increased under these circumstances.

Either random number sampling or systematic sampling can be applied in different ways. The sampling can be done on the basis of a simple random sample, a stratified sample, or a cluster sample. A simple random sample is one in which each item in the population is treated as an independent item and as each item is drawn from the population each remaining item has an equal probability of being selected. A simple random sample has the advantage that generally a smaller sample can be used to provide the same confidence interval and confidence level than either a stratified or a cluster sample. A stratified sample is one in which the items in the population are segregated, on some basis, into groups and then random samples are taken of the items

within these groups. A stratified sample has the advantage that weights can be given to those accounts which are considered the most critical or important. For instance, the accounts receivable may be segregated on the basis of size, the larger accounts in one group and the smaller accounts in another group. A larger proportion of the larger accounts could be sampled, thus providing more information on the upper range of the estimated value of the accounts. Stratified sampling would require a larger sample if one were testing for attributes whereas it might require a smaller sample if one were testing for dollar amounts, under the assumption that the accounts would more likely be overstated than understated. A third way to sample is by cluster sampling. Cluster sampling is grouping the items in some contiguous fashion and taking a sample of these groups. Each item in the groups selected would constitute a part of the sample. Cluster sampling has the advantage of convenience, it is generally much more convenient to examine each item in an array of items than to examine the same number of items on an unrestricted random basis. If the groups are naturally of equal size, the use of cluster sampling is even more attractive because the auditor would have no need to count the items in the group. If the groups are not of equal size then they should not have an equal probability of being selected. The probability of selection

of a group should be proportional to its size. The disadvantage of cluster sampling is that a larger sample is required to obtain a particular goal than would be required if unrestricted random sampling were used.

1.5 Liabilities vs. Receivables

The discussion so far has centered around accounts receivable; the same is generally true of the literature on confirmations. However, the confirmation procedure is equally applicable to liabilities. One of the reasons that attention is focused on receivables is that one normally assumes that a client will attempt to present his position in the most favorable light possible. This being the case, the client is more likely to overstate than to understate assets; the reverse is true for liabilities. It follows therefore that the auditor must be on guard against fictitious assets and omitted liabilities. If the liability is omitted, the auditor may not have an opportunity to include this in his sample for circularization. There are, of course, ways by which the auditor may avoid this problem with liabilities to suppliers. The auditor can examine invoices or cancelled checks for the names of past suppliers who are not included in the list of accounts payable. The names of these past suppliers could be added to the list of accounts payable to form the population from which the auditor draws his sample.

This attention to accounts receivable should not

be interpreted to mean that accounts receivable confirmations are more important than liability confirmations, especially in the case of a financial institution which holds deposits for its customers. The Committee on Bank Accounting and Auditing of the American Institute of Certified Public Accountants suggests that confirmations should be sent to a sample of active deposit accounts and to a sample of nonactive deposit accounts.¹ The Committee recognized the possibility that the recipient of a confirmation of a loan account may not know the amount of his unpaid balance. The committee recommends that "it is frequently preferable to request the borrower to confirm the amount of each monthly payment and the number of payments remaining."²

1.6 Purpose of Study

The purpose of this thesis was to inquire into, to analyze, and to answer some of the questions concerning the auditing procedure of circularizing accounts receivable and deposit accounts. This was accomplished by conducting experiments confirming loan accounts and deposit accounts under normal auditing conditions. The remainder of this section is devoted to discussions of the specific areas of inquiry which received attention and the means of

¹Committee on Bank Accounting and Auditing, Audits of Banks, (New York: American Institute of Certified Public Accountants, 1968), pp. 134-5.

²Ibid., p. 120.

resolving these questions.

An examination was made of the effects of non-response upon the conclusions which the auditor may draw concerning the reasonableness of the balance of the account and upon the reliance that can be placed on the internal control of the firm being audited. To determine these effects, confirmation requests reporting incorrect amounts were sent in addition to confirmation requests which report correct amounts. Correct is defined as that amount reported on the books of the company. A comparison of the extent of nonresponse for each of these samples was made to determine whether there is a statistically significant difference in the amount of non-responses.

The relative effects of nonresponse upon loan accounts and deposit accounts was analyzed to determine if there is a difference between the two. This analysis was made only on the basis of first requests because second requests were not used in conjunction with the loan account confirmation requests which reflected incorrect amounts. It is felt, however, that the results of the first requests were sufficient for the comparison to be made.

The effect of the direction of the error was analyzed for deposit accounts to determine whether the confirmation recipient is more inclined or less inclined to respond to an error in his favor than to one in the

company's favor. This was tested by sending confirmation requests with comparable errors in either direction; i.e., the amounts on some of the confirmations were understated and the amounts on others were overstated. The results of these two samples were compared to determine if there is a statistically significant difference in the amount of nonresponses to each.

The effect of the size of the account was analyzed, in the case of the deposit accounts, to determine if there is a relationship between the size of the account and the proportion of responses. One would normally expect that the larger the account the more likely the recipient would be to respond to the confirmation request. It would seem natural to assume that a person would be more concerned about his account if the account represents a large amount than he would if the account represents a small amount. However, the size of the account relative to the wealth of the recipient may be the factor which influences response rather than the absolute amount of the account. Data concerning the wealth of the recipients were not available and therefore this latter idea could not be tested. The results of the experiment were subjected to statistical analysis to determine whether there is any difference in the response due to the size of the account.

The influence that the ages of the confirmation recipients have upon the amount of responses was tested by subjecting the results of the deposit account confirma-

tions to statistical tests.

The effect that the form and content (wording) of the confirmation has upon the amount of nonresponses was tested by preparing confirmations in several forms where the only difference was the form itself. This test was conducted for both the loan accounts and the deposit accounts.

An analysis was made of the effects of improper response upon the conclusions which the auditor may draw concerning the reasonableness of the balance of the account and the reliance that can be placed on the internal control of the firm being audited. This was accomplished by sending confirmation requests which reflected incorrect amounts to a sample of customers. The estimated proportion of improper responses was computed for both the deposit accounts and the loan accounts so as to have some idea of the probable extent of improper response.

The proportion of improper responses on the loan accounts was compared with that of the deposit accounts to determine whether there is a statistically significant difference between the two. Second requests were not sent on the loan account confirmations which reflected incorrect amounts so the comparison was made on the basis of the first requests.

The effect of the direction of the error was analyzed for the deposit accounts to determine whether the

confirmation recipient is more inclined or less inclined to respond improperly to an error in his favor than to one in the company's favor. This was tested by sending confirmation requests with comparable errors in either direction. The results of these two samples were compared to determine if there is a statistically significant difference in the proportion of improper responses to each.

A possible solution to the problem of improper response is to utilize a confirmation form which does not provide the account data for the recipient to compare with his records but instead asks him to furnish the data which can then be compared to the company's records. The use of such a form was tested both for its reliability (i.e., obtaining the correct amount) and for the probability of obtaining a response. This type of form was sent to a sample of both deposit accounts and loan accounts. Statistical tests were performed to determine whether the response to this type of form differs from that of the form which provides the recipient with the data concerning his account and asks him to compare these data with his records and respond, either confirming the data or noting an exception.

The final purpose of this thesis is to propose means whereby the problems of nonresponse and improper response could be minimized or eliminated. To achieve

this purpose sampling models which have been developed to counteract the problem of nonresponse were studied to determine their applicability to auditing and to provide, if necessary, a statistical sampling model which includes variables for nonresponse. Nonresponse is a problem which has been confronted by the professional statistician and some work has been conducted in developing a sampling model which overcomes the nonresponse error. A reduction in the problem of improper response will hopefully be achieved through the results of this study.

CHAPTER II

THEORETICAL CONSIDERATIONS

2.1 Behavioral Reaction to Confirmation Requests

Each recipient of a confirmation request reacts in such a way that he becomes a member of one (and only one) of the following reaction groups:

- G_1 - Those who compare the confirmation requests with their records and respond that the amount is correct.
- G_2 - Those who do not compare the confirmation requests with their records and respond that the amount is correct.
- G_3 - Those who compare the confirmation requests with their records and reply that the amount is not correct (i.e., take exception to the amount).
- G_4 - Those who do not compare the confirmation requests with their records and reply that the amount is not correct.
- G_5 - Those who compare the confirmation requests with their records and do not reply.
- G_6 - Those who do not compare the confirmation requests with their records and do not reply.

Figure 1 is a matrix representation of this division.

Figure 1

Behavioral Reaction to Confirmation Requests

	<u>respond correct</u>	<u>respond exception</u>	<u>do not respond</u>
Compare confirmation with records	G ₁	G ₃	G ₅
Do not compare confirmation with records	G ₂	G ₄	G ₆

Each of these groups (G₁, . . . G₆) can be dichotomized by those confirmations which reflect correct balances and those confirmations which reflect incorrect balances (Figure 2).

Figure 2

Dichotomization of Behavioral Reaction
to Confirmation Requests

Confirmation amount correct	G _{1a}	G _{2a}	G _{3a}	G _{4a}	G _{5a}	G _{6a}
Confirmation amount incorrect	G _{1b}	G _{2b}	G _{3b}	G _{4b}	G _{5b}	G _{6b}

It is not possible for the auditor to determine the proper group into which confirmation requests should be placed because (1) it is not feasible (and probably not possible) for the auditor to determine whether the recipients did compare the confirmation requests with their records and (2) the correctness of the amount is the purpose in the confirmation procedure; if the auditor knew this, there would be no need to send confirmations. The auditor must summarize the groups into categories about

which he has knowledge. These categories are:

C_1 - Those who respond that the amount is correct.

$$C_1 = G_{1a} + G_{1b} + G_{2a} + G_{2b}$$

C_2 - Those who respond that the amount is incorrect.

$$C_2 = G_{3a} + G_{3b} + G_{4a} + G_{4b}$$

C_3 - Those who do not respond.

$$C_3 = G_{5a} + G_{5b} + G_{6a} + G_{6b}$$

Category one is accepted by the auditor at its face value. This acceptance may influence the auditor to erroneously accept the account balance as being reasonable. This erroneous acceptance would occur when responses are in group (1b) or group (2b). Although those who are in group (2a) did not perform as requested by the auditor, the auditor will still be influenced toward making a correct decision as to the reasonableness of the account balance.

Category two requires additional work on the part of the auditor. The auditor must extend his examination on these accounts until he has satisfied himself either that the respondent or that the client is right. Those confirmations from respondents in group (3a) can often be reconciled by an examination of transactions around the confirmation date. For example, an accounts receivable confirmation which is returned with the customer claiming a smaller balance may be reconciled by a payment recorded within a reasonable length of time subsequent to the confirmation date; because the payment was in transit the account on the creditor's records will not reflect

it whereas the debtor has recorded the payment on his records. Those confirmations from respondents in group (4a) are the most aggravating to the auditor. In these cases the respondent would probably make a general statement to the effect that the amount was wrong. The auditor would prefer not to risk alienating the respondent by requesting additional information, so he will make a search of the records in an attempt to determine the validity of the respondent's claim. This search will continue until the auditor decides to (1) consider the exception as being an error by the customer, (2) accept the exception, but with reservations, or (3) request additional information from the respondent. Often the auditor will choose not to contact the respondent and he is usually unwilling to disregard the exception, so he ends up accepting the exception with reservations.

Those confirmations from respondents in group (3b) must be followed up by the auditor; but, they generally require less time than those from respondents in groups (4a) or (4b) and are of great assistance in judging the reasonableness of the account balances and the effectiveness of the internal control. Those confirmations from respondents in group (4b), though properly an exception, may waste a great deal of the auditor's time. As with those in group (4a) the respondent will often make a general statement about the incorrectness of the account. The auditor will make a search of the records in an

attempt to determine the validity of the claim. If the auditor is fortunate, he will quickly locate a discrepancy in the client's records which would verify the respondent's claim, if not, he may spend a great deal of time following up the exception and he may never find evidence to support the respondent's claim.

Category three requires the auditor to employ alternative procedures to satisfy himself as to the reasonableness of the account balances. As was the case with confirmations from respondents in category one, the auditor's decision as to the reasonableness of the account is not affected by the recipients' failure to compare the data on the confirmation requests with their records. One cannot say without qualification what the effect upon the judgment of the auditor will be as a result of non-responses; but, it would seem reasonable to conclude that the auditor would be influenced toward erroneously judging the account balances as being correct. The rationale behind this is that for groups (5a & 6a) the auditor will not make an incorrect judgment because he will not find an error (since there are no errors) whereas with groups (5b & 6b) he may not discover the error and therefore he will reach an incorrect conclusion. If one accepts the assumption that the confirmation procedure is more efficient and more effective than alternative procedures, then it follows that the auditor is more likely to discover an error through the confirma-

tions than through alternative procedures.

There are, then, three variables working upon the confirmation procedure; the response variable (respond correct, respond exception, do not respond), the inspect variable (compare confirmation with records, do not compare confirmation with records), and the correctness variable (amount correct, amount not correct). The response variable can be evaluated presently by the auditor. The inspect variable does not affect the auditor's decision regarding the reasonableness of the account, only the amount of work required to reach that decision. An evaluation of the correctness variable would improve the auditor's judgment as to the reasonableness of the account balance. This study is a step toward providing the auditor with the means whereby he can evaluate the correctness variable.

2.2 Hypotheses

The remainder of this chapter is devoted to the formulation of hypotheses which were tested by the experiments described in chapter three. The experiment on the deposit accounts was more comprehensive and was, therefore, analyzed in greater depth. It is for this reason that some hypotheses were formulated for deposit accounts but not for loan accounts. The hypotheses are divided into three classifications: those concerning deposit accounts, those concerning loan accounts, and those which concern the relationship between deposit and loan accounts.

To aid the reader in understanding the hypotheses some definitions will be reviewed. A proper response is one which acknowledges that the amount reported on the confirmation request is correct when the amount is in fact correct or which states that the amount is incorrect when it is incorrect. Correct here means that the records being audited are in agreement with the recipients' records. Incorrect here means that the records being audited are not in agreement with the recipients' records. Proper responses, then are the sum of groups (1a), (2a), (3b), and (4b). An improper response is one which acknowledges that the amount reported on the confirmation request is correct when in fact the amount is incorrect or which states that the amount is incorrect when the amount is in fact correct. Improper responses, then, are the sum of groups (1b), (2b), (3a), and (4a). Nonresponses arise from those confirmation requests which are not returned, these are the sum of groups (5a), (5b), (6a), and (6b).

2.2.1 Hypotheses Concerning Deposit Account Confirmation Requests:

Fifteen hypotheses concerning deposit account confirmation requests were formulated. These are presented in the following groupings:

D1-D7 Hypotheses on the effect of incorrect amounts on the proportion of proper responses, on the proportion of improper responses, and

on the proportion of nonresponses.

D8-D9 Hypotheses on the effect of the confirmation form on the proportion of responses.

D10 Hypothesis on the relationship between first and second requests.

D11-D12 Hypotheses on the effects of age of recipients and size of the accounts upon the proportion of responses.

D13-D15 Hypotheses concerning telephone calls and visits to the office being audited and their relationship to proper responses.

Hypothesis D1 - The proportion of proper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is 0.90. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is less than 0.90.

As discussed in chapter one, the auditor implicitly assumes either that the proportion of proper responses to confirmation requests which reflect incorrect amounts is 1.00, i.e., each confirmation request which reflects an incorrect amount will elicit a proper response, or that it is equal to the proportion of responses to confirmation requests which reflect correct amounts. The 1.00 is considered too stringent a criterion for testing and the latter, i.e., that the proportion of proper responses to confirmation requests reflecting incorrect amounts is equal to the proportion of proper responses to confirmation requests reflecting correct amounts, would cause the

test criterion to be dependent upon the results of the experiment.

The 0.90, though arbitrary, is considered the minimum proportion with which the auditor can be satisfied.

Hypothesis D2 - The proportion of proper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records is 0.90. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records is less than 0.90.

The discussion concerning hypothesis D1 applies equally to this hypothesis. It is conceivable that the auditor would not view these two errors as equals. It is probably true that most auditors would be more concerned about the accounts which are understated, because this would lead to an understatement of the liabilities, and would want a greater proportion of proper responses from these accounts. These differences are not taken into account because it is difficult to establish some defensible criterion on which to test and even more difficult to establish some defensible relative criterion on which to test related parameters. In addition to the practical problem of establishing criteria there are the theoretical aspects which raise doubts about the contention that the auditor should be more concerned about errors in one direction than errors in the opposite direction. Concern for the direction of error would probably be justified only if the auditor knew that any error which might exist would be in a given direction.

Hypothesis D3 - The proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is 0.05. The alternative hypothesis against which the null hypothesis is tested is that the proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is more than 0.05.

The selection of the five percent was arbitrary. It would be naive of the auditor to believe that the percentage was zero; because, one must recognize that, for various reasons, there are always going to be some cases of people responding improperly.

Hypothesis D4 - The proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records is 0.05. The alternative hypothesis against which the null hypothesis is tested is that the proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records is more than 0.05.

The discussion concerning hypotheses D2 and D3 apply to this hypothesis as well. For the sake of brevity these discussions will not be repeated.

Hypothesis D5 - The proportion of nonresponses to confirmation requests which reflect incorrect amounts is equal to the proportion of nonresponses to confirmation requests which reflect correct amounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to confirmation requests which reflect incorrect amounts is not equal to the proportion of nonresponses to confirmation requests which reflect correct amounts.

Whenever population estimates are made without an adjustment being made to compensate for the nonresponse, from samples which were subject to some nonresponse, there is an implicit assumption that this null hypothesis is true. It has been a common practice to accept this

assumption if alternative procedures did not reveal evidence to the contrary.

Hypothesis D6 - The proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is equal to the proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records. The alternative hypothesis against which the null hypothesis is tested is that the proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is not equal to the proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records.

The proposition of this hypothesis is that a recipient's reaction to incorrect amounts is independent of the possible benefit to the recipient. There is an obvious implication that if people are basically honest then this hypothesis will be supported. It is not the intention of this study to attempt to pass judgment on the integrity of mankind, nor is it felt that such a judgment would be justified on the basis of the acceptance or rejection of this hypothesis. There are many reasons why a difference might exist; but, no effort will be made to determine the reason, or reasons. If the auditor knew that one direction of error is more likely to elicit an improper response, he might use this information in estimating the account balances. For example, if the auditor knew that recipients are more likely to respond improperly to errors in their favor, then he could assume that his estimate of the account balance was more apt to be over the true amount than under the true amount.

Hypothesis D7 - The proportion of nonresponses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is equal to the proportion of nonresponses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is not equal to the proportion of nonresponses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records.

The discussion concerning hypothesis D5 applies equally to this hypothesis. The assumption that is generally made, though implicitly, is that these proportions are equal. Any inequality that might in fact exist should certainly raise some serious questions concerning the present evaluations of internal control and estimations of account balances. If errors in accounts were consistently in the same direction as the direction associated with the greater proportion of nonresponses, then the auditor would be more influenced towards overestimating the effectiveness of the internal control and the estimate of the account balance would be further from the true value than would be the case if the proportions of nonresponses were equal.

Hypothesis D8 - The proportion of responses to confirmation requests is independent of the form or content (wording) of the confirmation requests. The alternative hypothesis against which the null hypothesis is tested is that the proportion of responses to confirmation requests is dependent upon the form or content (wording) of the confirmation requests.

There are many confirmation forms in general use. It would seem reasonable to assume that in this age of

great interest in packaging, the form of the confirmation request would influence the proportion of responses. If this is true, the auditor should seek to discover the "best" confirmation request form, thus deriving the greatest possible benefit from the effort expended. If, on the other hand, the form and content of the confirmation request has no effect upon the amount of responses, the auditor might just as well use that form which minimizes the cost of the circularization procedure. The only justification for additional costs is that the results will be better. Norman Lenhart and Philip Defliese contend that "Experience has shown that a form of positive request which requires of the recipient a minimum of effort will produce the greatest percentage of replies."¹

Hypothesis D9 - The proportion of responses to confirmation requests which ask the recipients to confirm the account information provided on the requests is equal to the proportion of responses to confirmation requests which ask the recipients to provide the information concerning their accounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of responses to confirmation requests which ask the recipients to confirm the account information provided on the requests is not equal to the proportion of responses to confirmation requests which ask the recipients to provide the information concerning their accounts.

Assuming that the major cause of improper responses is the unwillingness of recipients to compare the data on the confirmation requests with their records, or viewed another way, the willingness of the recipients to acknowledge the amount as correct (or incorrect) without

¹Op. cit., p. 176.

comparing the data on confirmation requests with their records, the use of a form which required the recipients to examine their records in order to complete the requests would tend to reduce (and perhaps even eliminate) the amount of improper responses. One must, however, be aware that the recipients may seek the required information from the very source being audited.

Hypothesis D10 - The proportion of proper responses to the first requests of confirmation requests which reflect amounts that are not correct is equal to the proportion of proper responses to the second requests of confirmation requests which reflect amounts that are not correct. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to the first requests of confirmation requests which reflect amounts that are not correct is greater than the proportion of proper responses to the second requests of confirmation requests which reflect amounts that are not correct.

It seems reasonable to expect that if recipients react differently to first and second requests, the proportion of proper responses might be greater on the first requests. If the recipient is the type of individual who would respond to the circularization as he was asked, it would seem that he would generally respond to the first request. It would follow, also, that there would be a smaller proportion of improper responses to the first requests. To moderate this greater improper response to second requests are those respondents who on the first requests deliberately respond improperly in the hopes that there is an error in the company's records but that this error will go undetected if they acknowledge that the amount is correct. This latter reaction would apply only

if the error were in the respondent's favor.

Hypothesis D11 - The proportion of proper responses to confirmation requests is independent of the age of the recipient. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to confirmation requests is dependent upon the age of the recipient.

The spectacular growth of the auditing profession in recent years and the growing awareness of the business environment might lead one to suppose that a particular age group would be more knowledgeable or more concerned about business related occurrences. Or, one might contend that with increased age and maturity one becomes more aware of the purposes behind the many items with which he is called upon to deal. The various reasons why one age group might respond better is of little importance to the auditor, he is more concerned with the resulting facts (i.e., which age group, if any, respond better).

Hypothesis D12 - The proportion of proper responses to confirmation requests is independent of the size of the account balances. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses is dependent upon the size of the account balances.

If the size of the account balance influences the recipient's response, the auditor should stratify his population and sample accordingly. If, on the other hand, the proportion of proper responses is independent of the size of the account balances, then any scheme of stratifying must be less efficient for attribute sampling. Stratified samples may still be more efficient for variable sampling.

Hypothesis D13 - The proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts is equal to the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records. The alternative hypothesis against which the null hypothesis is tested is that the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts is less than the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records.

If the number of telephone calls or visits from recipients is independent of the correctness (or incorrectness) of the confirmation requests, the auditor would have no reason to become suspicious if such calls or visits occur. On the other hand, if incorrect confirmation requests generate significantly more calls or visits, the auditor should become suspicious if he learns of such calls or visits.

Hypothesis D14 - The proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts is equal to the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records. The alternative hypothesis against which the null hypothesis is tested is that the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts is less than the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records.

This hypothesis is the same as hypothesis D13 except that the direction of error is reversed. The discussion concerning hypothesis D13 is equally applicable here.

Hypothesis D15 - The proportion of proper responses among confirmation request recipients who call or visit (the office being audited) concerning their accounts is equal to the proportion of proper responses among confirmation request recipients who do not call or visit (the office being audited) concerning their accounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses among confirmation request recipients who call or visit (the office being audited) concerning their accounts is not equal to the proportion of proper responses among confirmation request recipients who do not call or visit (the office being audited) concerning their accounts.

If recipients who call or visit subsequently respond properly, auditors would not have to be concerned about these calls or visits. However, if the recipients substitute the calls or visits for proper responses, auditors would need some means of controlling these calls or visits.

2.2.2 Hypotheses Concerning Loan Account Confirmation Requests:

Seven hypotheses concerning loan account confirmation requests were formulated. These are presented in the same order as the comparable deposit account hypotheses.

Hypothesis L1 - The proportion of proper responses to the first requests of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is 0.70. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to the first requests of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records is less than 0.70.

The 0.70 criterion was established under the assumption that if incorrect confirmations elicited proper responses of seventy percent on both the first and second requests, the proportion of proper responses for the two

would be slightly over ninety percent, $(1 \times 70\%) + [1 - (1 \times 70\%)]$
 $70\% = 91\%$.¹ Ninety percent was the criterion established
 for the deposit account hypothesis D1. The assumption
 that the proportion of proper responses to second requests
 is the same as the proportion of proper responses to first
 requests was tested via deposit account hypothesis D10.
 The discussions concerning deposit account hypotheses D1
 and D2 are applicable to this hypothesis and will not be
 repeated here.

Hypothesis L2 - The proportion of improper responses
 to the first requests of confirmation requests which reflect
 amounts that are greater than the amounts shown on the
 recipients' records is 0.05. The alternative hypothesis
 against which the null hypothesis is tested is that the
 proportion of improper responses to the first requests of
 confirmation requests which reflect amounts that are
 greater than the amounts shown on the recipients' records
is more than 0.05.

Unlike hypothesis L1 there was no attempt to adjust
 the criterion established for the comparable deposit
 account hypotheses to allow for the fact that second
 requests were not employed. The reason for this is that
 it is felt that the five percent criterion is the lowest
 that can be meaningfully tested and also that there is no
 reason to adjust the criterion for one percent. The dis-
 cussion concerning deposit account hypotheses D3 and D4
 are applicable here.

Hypothesis L3 - The proportion of nonresponses to
 confirmation requests which reflect incorrect amounts is
 equal to the proportion of nonresponses to confirmation

¹It should be noted that this computation is made
 under the assumption that there is no improper response.

requests which reflect correct amounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to confirmation requests which reflect incorrect amounts is not equal to the proportion of nonresponses to confirmation requests which reflect correct amounts.

This hypothesis is comparable to deposit account hypothesis D5. The discussion concerning hypothesis D5 is applicable here and will not be repeated.

Hypothesis L4 - The proportion of nonresponses to confirmation requests is independent of the form or content (wording) of the confirmation requests. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to confirmation requests is dependent upon the form or content (wording) of the confirmation requests.

This hypothesis is comparable to deposit account hypothesis D8. The discussion concerning deposit account hypothesis D8 is applicable here and will not be repeated.

Hypothesis L5 - The proportion of nonresponses to confirmation requests which ask the recipients to confirm the account information provided on the confirmation requests is equal to the proportion of nonresponses to confirmation requests which ask the recipients to provide the information concerning their accounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to confirmation requests which ask the recipients to confirm the account information provided on the confirmation requests is not equal to the proportion of nonresponses to confirmation requests which ask the recipients to provide the information concerning their accounts.

This hypothesis is comparable to deposit account hypothesis D9. The discussion concerning hypothesis D9 is applicable here and will not be repeated.

Hypothesis L6 - The proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect correct amounts is equal to the proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect incorrect amounts. The alternative hypothesis against which the null hypothesis is tested is that the

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proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect correct amounts is less than the proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect incorrect amounts.

This hypothesis is comparable to hypothesis D13.

The discussion concerning hypothesis D13 is applicable here and will not be repeated.

Hypothesis L7 - The proportion of proper responses among confirmation request recipients who call (the office being audited) concerning their accounts is equal to the proportion of proper responses among confirmation request recipients who do not call (the office being audited) concerning their accounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses among confirmation request recipients who call (the office being audited) concerning their accounts is not equal to the proportion of proper responses among confirmation request recipients who do not call (the office being audited) concerning their accounts.

This hypothesis is comparable to hypothesis D15.

The discussion concerning hypothesis D15 is applicable here and will not be repeated.

2.2.3 Hypotheses Relating Loan Account Confirmation Requests to Deposit Account Confirmation Requests:

Five hypotheses were formulated relating loan account confirmation requests to deposit account confirmation requests. These hypotheses are meaningful for two reasons. First, if there is no significant difference between the results of the loan account experiment and the deposit account experiment, the inferences drawn from the more comprehensive experiment (on the deposit accounts) may be applicable to the other. Second, if there is no significant difference, the auditor may apply the same techniques to the confirmation procedure, without regard

to the type of accounts being circularized; if there is a difference, the auditor must apply different techniques to the confirmation procedure, depending on the type of account.

Hypothesis DL1 - The proportion of proper responses to loan account confirmation requests is equal to the proportion of proper responses to deposit account confirmation requests. The alternative hypothesis against which the null hypothesis is tested is that the proportion of proper responses to loan account confirmation requests is not equal to the proportion of proper responses to deposit account confirmation requests.

There are three reasons why the proportion of proper responses to loan account confirmation requests may be different from that of deposit account confirmation requests. First, the confirmation procedure may not be equally suitable for loan accounts and for deposit accounts. Second, the population of respondents may be different in the way in which they respond to confirmation requests. And third, the attitude of the recipients towards the firm may influence the amount of response. It is not within the scope of this research project to attempt to determine the reason for any differences that might exist. It should be kept in mind that these causes may result in reactions which negate each other in total so that the null hypothesis is not rejected because of differences between the populations or because of the influences of the companies concerned.

Hypothesis DL2 - The proportion of nonresponses to loan account confirmation requests which reflect incorrect amounts is equal to the proportion of nonresponses to deposit account confirmation requests which reflect incorrect amounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of

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nonresponses to loan account confirmation requests which reflect incorrect amounts is not equal to the proportion of nonresponses to deposit account confirmation requests which reflect incorrect amounts.

The auditor needs to know the effectiveness of the confirmation procedure to disclose errors regardless of the type of account. If the proportions of nonresponses differ, the auditor may not be able to place equal reliance upon each. The discussion concerning hypothesis DL1 is also applicable here.

Hypothesis DL3 - The proportion of improper responses to loan account confirmation requests which reflect incorrect amounts is equal to the proportion of improper responses to deposit account confirmation requests which reflect incorrect amounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of improper responses to loan account confirmation requests which reflect incorrect amounts is not equal to the proportion of improper responses to deposit account confirmation requests which reflect incorrect amounts.

The discussions concerning hypotheses DL1 and DL2 are equally applicable here.

Hypothesis DL4 - The proportion of nonresponses to loan account confirmation requests which ask the recipients to provide the data concerning their accounts is equal to the proportion of nonresponses to deposit account confirmation requests which ask the recipients to provide the data concerning their accounts. The alternative hypothesis against which the null hypothesis is tested is that the proportion of nonresponses to loan account confirmation requests which ask the recipients to provide the data concerning their accounts is not equal to the proportion of nonresponses to deposit account confirmation requests which ask the recipients to provide the data concerning their accounts.

This hypothesis relates hypothesis D9 with hypothesis L5.

2.2.4 Corollary to Hypotheses:

In addition to knowing whether one rejects or accepts a hypothesis one may also want to have some notion about the true value of the parameter being examined. This can be satisfied by making a point estimate or an interval estimate of the parameter. In this particular case, point estimates would have little meaning; however, interval estimates may be very meaningful.

For this reason, confidence intervals were estimated for the percentages of: proper responses, improper responses, and nonresponses on loan account confirmation requests which reflected amounts that were greater than the correct amounts, on deposit account confirmation requests which reflected amounts that were less than the correct amounts, and on deposit account confirmation requests which reflected amounts that were greater than the correct amounts.

The estimated confidence intervals are presented along with the tests of hypotheses in chapter 4.

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CHAPTER III

DESCRIPTION OF EXPERIMENTS

3.1 Description of Credit Union Experiment

This section is a discussion of the experiment conducted on the time deposit accounts of the MSU Employees Credit Union.

3.1.1 Participant:

The management of the MSU Employees Credit Union recognized the usefulness of a study of this type and felt a certain responsibility to participate in research conducted at Michigan State University. It was felt that the Supervisory Committee should be consulted since it is the Committee's responsibility to act in the capacity of auditors for the members. The Supervisory Committee is charged with the responsibility of engaging external auditors for the annual audit and periodically performing such examinations as they deem advisable. The Supervisory Committee gave its approval and the study was conducted under its auspices.

The MSU Employees Credit Union, founded in 1936, had approximately 10,000 members with assets totaling \$10,715,887 as of December 31, 1967. It is the thirteenth largest credit union in the state of Michigan and the

largest university affiliated credit union in the United States. An indication of the relationship between the members and the credit union can probably best be shown by the fact that approximately 3,500 members attend the annual meetings.

3.1.2 Accounts Used:

The experiment was conducted on time deposit accounts as of February 29, 1968. Certificates are issued to the members, thus providing the members with some tangible evidence of their account. The balance of the account represents principal only. Interest is accrued monthly; but, it is not credited to the account until the end of the quarter. Quarterly or annually, whichever the member chooses, the accrued interest is paid to the depositor. All depositors had received their accrued interest as of December 31, 1967, at which time the balance of these accounts totaled \$1,669,473, and also a statement reporting the balance in the account as of that date. It was this same balance which was used in the experiment plus any additional deposits and minus any withdrawals. A report is prepared monthly by a data processing service in Lansing, which reports the beginning balance, additions, deletions, accrued interest, and the ending balance for each account.

The monthly report was obtained for February 29, 1968. A review of the accounts was made with the chairman of the Supervisory Committee to delete those members

to whom the committee preferred that a confirmation not be sent. There were 478 members listed on the report. Twenty-two of these members were deleted, leaving a total of 456 in the population to be sampled. Of the 456 accounts in the population some were members of the same family. It is recognized that this might tend to bias the results but no consideration was given to this condition, each account was treated individually and independently. Any bias that might result is considered so small as to be negligible.

The accounts were numbered sequentially because the numbering system used by the credit union is coded to indicate the location of the member (i.e., whether at East Lansing or the Oakland extension of M.S.U.) and also for children's accounts and because the numbers are so large as to increase the amount of work involved in drawing a sample.

3.1.3 Confirmation Forms:

There were three different confirmation forms used in the experiment; a copy of each is presented in Appendix A. The standard confirmation form and the short form are modifications of confirmation forms used by one of the national CPA firms for credit unions and banks. The third form was prepared specifically for the purpose of this experiment without reference to any source.

The standard confirmation form provided the recipient with information concerning his account number (this is the individual member's number, not the number of the

certificate), the date of the certificate (in some cases the members had two or more certificates, this problem was overcome by using the oldest and latest dates separated by a hyphen), and the amount of the certificate account (if the account represented two or more certificates, the total was entered). The standard form was prepared on MSU Employees Credit Union letterhead stationery. The form was prepared so as to inform the recipient under whose auspices the audit was being conducted and the purpose of the audit. The member was asked to compare the information provided with his records and to respond directly to the Supervisory Committee. A return envelope was enclosed as is typically done in the confirmation procedure. Proper authorization for the request was affixed. The recipient was provided with space to indicate his exceptions (if any) and for his signature. The recipient was put on notice that this was not a statement, this was done to reduce the chance that the recipient of one of the adjusted accounts would use the confirmation in a claim that the balance of his account was more than was actually the case. These confirmations were mailed in MSU Employees Credit Union envelopes.

The short form provided the recipient with the same information concerning the account as the standard form. The size of the short form confirmation was considerably less than that of the standard form, requiring

only one-third of a sheet of $8\frac{1}{2}$ x 11 bond paper. The description was brief and did not indicate the purpose of the confirmation nor did it explicitly state that the confirmations were sent under the auspices of the Supervisory Committee. There was no authorization indicated on the form. Rather than providing the recipient with room for exceptions he was asked to use the back of the confirmation. A return envelope was provided and the confirmations were mailed in MSU Employees Credit Union envelopes.

The third form employed in the experiment did not provide the member with any information concerning his account. This form will be called the "blank" form for the purpose of identification. The recipient was asked to disclose his account number, the amount of the balance of his account, and to sign the form. He was told the purpose of the request and that it was being conducted under the auspices of the Supervisory Committee. Proper authorization was indicated. The style was similar to the standard form and MSU Employees Credit Union letterhead stationery was used. A return envelope was provided and the confirmations were mailed in MSU Employees Credit Union envelopes.

3.1.4 Description of Samples:

A random number table was used to select the accounts which would be circularized. The accounts were divided into five samples as follows:

- k_1 - a sample of fifty accounts which were circularized without adjusting the balances of the accounts. This sample represented the control group and the accounts therein were confirmed using the standard confirmation form.
- k_2 - a sample of thirty accounts, the balances of which were adjusted by a positive adjustment in the amount of ten percent of the balances of the accounts (rounded to the nearest fifty dollars) with a maximum adjustment of \$500. The standard confirmation form was used to circularize the accounts in this sample. The purpose of this sample was to test the effect of an error in the member's favor upon the amount of nonresponses and improper responses. One of the recipients of these confirmations was informed that the confirmation request was part of a study, therefore, that account had to be deleted from the sample, leaving twenty-nine accounts in the sample.
- k_3 - a sample of thirty accounts, the balances of which were adjusted by a negative adjustment in the amount of ten percent of the balances of the accounts (rounded to the nearest fifty dollars) with a maximum adjustment of \$500. The standard confirmation form was used to circularize the accounts in this sample. The

purpose of this sample was to test the effect of an error in the credit union's favor upon the amount of nonresponse and improper responses.

k_4 - a sample of fifty accounts which were circularized without adjusting the balances of the accounts. The short form confirmation was used to circularize the accounts in this sample. The purpose of this sample was to test the effects of the use of a simpler and shorter form upon the amount of nonresponses.

k_5 - a sample of fifty accounts which were circularized using the blank confirmation form. The purpose of this sample was to test the effects on nonresponses of a form which required the recipients to consult their records in order to answer the requests.

3.1.5 Confirmation Procedure:

Having selected the sample, the confirmations were prepared and mailed. The addressing was done by means of the addressograph. The information concerning the accounts was typed for samples k_1 , k_2 , k_3 , and k_4 .

It was recognized that some recipients might contact the office of the credit union either by telephone or in person. The employee who maintained the time deposit account records was instructed (1) to attempt to talk the callers into confirming the adjusted accounts without

taking exception to the amount and (2) to keep a record of those who contacted the office. The rationale behind these instructions was that if the recipient of a confirmation request of a misstated account contacted the employee responsible for the misstatement, that employee would attempt to persuade the recipient that the account was in order and that he should either disregard the confirmation or return it without taking exception. Unfortunately, the employee to whom these instructions were given was absent from work during the period of time that the contacts were made by the recipients. As things actually worked out, the employees who handled the complaints instructed the recipients to follow the instructions provided on the confirmation form. One would expect, then, that the proportions of nonresponses and improper responses would be less than they would be in an audit where the accounts were misstated. The employees were asked to prepare a list of the calls which they handled. In order to make certain that the list was reasonably complete the employees were asked to scrutinize a schedule of the confirmation recipients for any names which they might recognize.

Fourteen days after the first requests were mailed, second requests were mailed. The second requests were clearly marked as such. After a reasonable time all confirmations received were treated as second requests even if they were physically the first requests. The reason for treating all returns as second requests was that it

was assumed that the second request was the stimulus which brought about the completion and return of the first request.

Upon the mailing of the second requests the employees were again instructed to tell all callers to disregard the confirmation. They were to tell the caller that the matter would be brought to the auditor's attention and therefore it was not necessary for him to trouble himself further. Fortunately, these instructions were not needed because no one called or visited the office in response to the second requests.

3.1.6 Additional Data:

Personal data were obtained on the age of each of the recipients. Where possible the data were extracted from the addressograph plates maintained in the mail room. Those individuals for whom the data were not available on the addressograph plates were listed and the list was given to the manager of the credit union who obtained the missing data. The purpose in obtaining these data was so that analyses could be made to determine whether age had any effect upon the amount of nonresponses or improper responses.

3.1.7 Follow Up:

Letters were sent to those members who noted exceptions. This letter acknowledged the error and thanked the respondent for his cooperation. The respondent was

not informed that he had participated in a study. The letter was worded as if there had simply been an error on the part of the auditor.

3.2 Description of Bank Experiment

This section is a discussion of the experiment conducted on loan accounts of the Continental Illinois National Bank and Trust Company of Chicago.

3.2.1 Participant:

The management of the Continental Illinois National Bank and Trust Company of Chicago agreed to participate in the study as a means of assisting academic research. The Continental Illinois National Bank and Trust Company of Chicago is one of the largest banks in the United States. As of December 31, 1967 it ranked seventh in amount of permanent capital funds (\$459,864,000) and eighth in amount of deposits (\$5,419,388,122). On December 31, 1967 the balance in the loans and discounts accounts was \$3,544,078,570.

3.2.2 Accounts Used:

The accounts which were used in the study were direct personal loan accounts and direct automobile loan accounts. The samples were drawn from approximately fifteen hundred of these accounts.

3.2.3 Confirmation Forms:

There were three different confirmation forms used

in the experiment. A copy of each of these forms is included in Appendix B. The characteristics which were common to each of these forms were: (1) Continental Illinois National Bank and Trust Company of Chicago letterhead stationery was used, (2) the requests were made under the auspices of "auditor", (3) proper authorization, via signature, was affixed, and (4) the recipient was asked to sign the request and provision was made for his signature.

The standard confirmation form was a modification of a form used by a national CPA firm and of forms illustrated in auditing texts. In addition to the common characteristics already mentioned, the standard form informed the recipient of the purpose of the request and noted that it was not a request for payment. The recipient was provided with the following data concerning his account: the unpaid balance, the date of the note, the amount of the note, the date of the last payment, and the amount of the last payment. The recipient was asked to compare the given data with his records, note any discrepancies on the reverse side, and return the request.

The blank confirmation form was developed for the specific purpose at hand. In addition to the common characteristics the blank form informed the recipient of the purpose of the request and noted that it was not a request for payment. The recipient was asked to provide the following data concerning his account: date of note,

amount of note, date of last payment, amount of last payment, and the unpaid balance.

The short confirmation form was a modification of a confirmation form used by a national CPA firm. Unlike the standard form and the blank form the short form did not inform the recipient of the purpose of the request but simply asked him to compare the given data with his records, note any exceptions, and return the request. The recipient was provided the following data concerning his account: the amount of the note, the date of last payment, and the present balance.

The confirmation requests were mailed in Continental Illinois National Bank and Trust Company of Chicago envelopes and return envelopes were enclosed with each request as is customary.

3.2.4 Description of Samples:

Four random samples were drawn from the available accounts. The average balance of personal loans in the samples was \$1,200 and the average balance of the automobile loans in the samples was \$1,800. The accounts were divided into four samples as follows:

b₁ - a sample of one hundred accounts which were circularized without adjusting the balances of the accounts. This sample represented the control group and the accounts therein were confirmed using the standard confirmation form.

- b_2 - a sample of thirty accounts, the balances of which were adjusted by a positive adjustment in the amount of approximately ten percent of the balances of the accounts. The standard confirmation form was used to circularize the accounts in this sample. The purpose of this sample was to test the effect of an error upon the amount of nonresponses and improper responses.
- b_3 - a sample of one hundred accounts which were circularized using the blank confirmation form. The purpose of this sample was to test the effects on nonresponses of a form which required the recipients to consult their records in order to answer the requests.
- b_4 - a sample of one hundred accounts which were circularized without adjusting the balances of the accounts. The short form confirmation form was used to circularize the accounts in this sample. The purpose of this sample was to test the effects of the use of a simpler and shorter form upon the amount of nonresponses.

3.2.5 Procedure:

Instructions were submitted to the consumer credit manager who executed the experiment. The experiment was conducted during March and April 1968, with second requests

being mailed about two weeks after the first requests were mailed. However, because of the adverse reaction by some of the recipients to the first requests, second requests were not sent on those accounts which were adjusted.

The results of the experiment were summarized by the bank's personnel and transmitted for analysis and inclusion in the thesis.

CHAPTER IV

RESULTS OF EXPERIMENTS AND ANALYSES OF RESULTS

4.1 Results of Experiments

The first part of this chapter presents the results of the experiments. Some of the data presented is for the general information of the reader and is not used in the statistical analysis which follows. The data which are not used in the statistical analysis are considered important and relevant for a thorough understanding of the results of the experiments; but, they are of a general nature and not amenable to analysis.

4.1.1 Results of Credit Union Experiment:

The experiment of the deposit account confirmation requests yielded a great deal of data. Actual results of each of the samples will be presented first, then the additional information will be presented.

Sample k_1 - A sample of fifty unadjusted accounts using the standard confirmation form, generated forty proper responses to the first requests and eight to the second requests.

Sample k_2 - A sample of twenty-nine accounts which were positively adjusted by an amount

of ten percent of the account balance (rounded to the nearest \$50), subject to a maximum adjustment of \$500, generated thirteen proper responses and four improper responses to the first requests. The second requests generated seven proper responses and two improper responses.

Sample k_3 - A sample of thirty accounts which were negatively adjusted by an amount of ten percent of the account balance (rounded to the nearest \$50), subject to a maximum adjustment of \$500, generated twenty-three proper responses and three improper responses to the first requests. The second requests yielded two proper responses but no improper responses.

Sample k_4 - A sample of fifty unadjusted accounts, using the short confirmation request form, generated thirty-six proper responses to the first requests. The second requests generated ten proper responses and one response stating an inability to comply with the request.

Sample k_5 - A sample of fifty accounts, for which the data concerning the accounts were

not furnished to the recipients, generated thirty-one proper responses to the first requests and eight proper responses to the second requests. Two respondents stated that they were unable to provide the requested data and two failed to provide the amount of their accounts.

The results of the credit union experiment are summarized in Table 1.

TABLE 1
SUMMARY OF RESPONSES TO DEPOSIT
ACCOUNT CONFIRMATION REQUESTS

	Sample				
	k_1	k_2	k_3	k_4	k_5
Sample Size	50	29	30	50	50
Proper Responses					
1st requests	40	13	23	36	31
2nd requests	8	7	2	10	8
Total	48	20	25	46	39
Improper Responses					
1st requests		4	3		
2nd requests		2	0		
Total		6	3		
Nonresponses	2	3	2	3	7
Data not Supplied					2
Unable to Comply				1	2
	50	29	30	50	50

Three people in sample k_2 went to the office to check on their accounts; one of these also called the office. Two people from sample k_3 went to the office; one of these, with an account balance of \$5,000, stated that he did not know he had an account. One person from sample k_4 and one from sample k_5 also went to the office. The person from sample k_5 , with an account balance of \$600, stated that he did not know he had an account balance.

There is a possible explanation for those who did not know they had an account. They may have been confused about the account being a time deposit account, thinking that it was a regular account.

Telephone calls were received from one person in sample k_1 , four people in sample k_3 , and the one person already mentioned in k_2 .

Confirmation requests were mailed or delivered to the credit union by one person in sample k_1 , and two people in sample k_3 .

All of those who visited or called the credit union properly confirmed with one exception, the person in sample k_5 who visited the credit union.

Table 2 is a summary of the calls and visits to the credit union.

TABLE 2

SUMMARY OF TELEPHONE CALLS
AND VISITS TO CREDIT UNION

	Sample				
	k_1	k_2	k_3	k_4	k_5
Visited credit union		3		1	1
Called credit union	1	1*	4		
Mailed or delivered confirmation to credit union	1		2		
Properly responded	2	3	6	1	-0-

* Also included in visited credit union.

The amount of the adjustments to the accounts of those who responded improperly ranged from \$150 to \$500. The average amount of the adjustments of the nine improper responses was \$423.75.

4.1.2 Results of Bank Experiment:

The results of the experiments concerning the loan account confirmation requests will be presented in sample order.

Sample b_1 - A sample of one hundred unadjusted accounts, using the standard form, generated forty-nine proper responses to the first requests and twenty-three proper responses to the second requests.

Sample b_2 - A sample of thirty accounts, whose amounts were positively adjusted by an amount of approximately ten percent of the account balances with an average adjustment of \$120, generated thirteen proper responses. Five of those classified as proper responses stated that they didn't know the correct amount but felt that the figure was too high. There were six "antagonistic" phone calls of which four knew the correct amount. Those who called did not subsequently return the confirmation requests. There were no improper responses.

Sample b_3 - A sample of one hundred accounts, for which the data concerning the accounts were not furnished, generated forty-six replies. Forty-three of the forty-six replies furnished the correct balance (four reported only the number of payments made) and three omitted the balance. Approximately sixty percent of the responses were incomplete in some respect. The first requests generated twenty-eight replies and the second requests generated eighteen replies.

Sample b_4 - A sample of one hundred unadjusted accounts, which used the short form confirmation requests, generated forty-five proper responses to the first requests and twenty-four proper responses to the second requests.

The results of the bank experiment are summarized in Tables 3 and 4.

TABLE 3
SUMMARY OF RESPONSES TO LOAN ACCOUNT
CONFIRMATION REQUESTS

	Sample			
	b_1	b_2	b_3	b_4
Sample Size	100	30	100	100
Proper Responses				
1st requests	49	13		45
2nd requests	23			24
Total	72	13	43	69
Improper Responses	----- none -----			
Incomplete Responses			3	
Nonresponses	28	17	54	31
	100	30	100	100

TABLE 4

SUMMARY OF TELEPHONE CALLS
TO BANK

	Sample			
	b_1	b_2	b_3	b_4
Called bank	0	6	0	0
Properly responded	0	0	0	0

4.2 Analysis of Results of Experiments

The analysis of the results of the experiments will be presented in the order of the credit union, the bank, and then the relationship between the two.

The following notation will be used throughout this section.

H_0 = null hypothesis

H_a = alternative hypothesis

p = proportion of sample which responded properly, responded improperly, or did not respond

P = proportion of the population that would respond properly, respond improperly, or not respond

P^* = expected value of the proportion of the population which would respond properly, respond improperly, or not respond

An asterisk superscript to a statistic symbolizes that the statistic is the observed value of the statistic.

For example, t^* means the observed value of the t statistic.

y = number of successes in the sample.

4.2.1 Analysis of Results of Credit Union Experiment:

The analysis of the results of the credit union experiment will be presented first as it relates to the testing of hypotheses and second as it relates to the computing of confidence intervals.

A major problem was encountered in analyzing the results of the credit union experiment. The distributions of the sample parameters obeyed the hypergeometric probability law. The ratio of population to sample was so small as to invalidate estimates (such as the binomial estimate) of the probability distribution. The size of the population was 456 and the smallest sample size was twenty-nine. It was necessary to compute tables for the hypergeometric distribution against which tests were conducted. The confidence intervals were computed in a similar fashion. For some tests a binomial test was employed, but not until it had been tested against the confidence intervals to determine that it was reasonable. Several transformations were employed, these are discussed as they are first employed.

Tests of significance¹ were conducted at the 0.05

¹Significance level is the probability of rejecting the null hypothesis when it is in fact true.

level and confidence intervals were computed at the 0.95 confidence level.

4.2.1a Test of hypothesis D1

$$H_0: P = 0.90$$

$$H_a: P < 0.90$$

Where P = the proportion of proper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$y = 20$$

$$p = 0.67$$

The hypothesis was tested by using a table developed for a sample of twenty-nine, a population of 456, and a probability of 0.90. The table revealed that:

$$\sum_{x=0}^{20} p(x) = 0.00106$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.1b Test of hypothesis D2

$$H_0: P = 0.90$$

$$H_a: P < 0.90$$

Where P = the proportion of proper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$y = 25$$

$$p = 0.83$$

The hypothesis was tested by using a table developed for a sample of thirty, a population of 456, and a probability of 0.90. The table revealed that:

$$\sum_{x=0}^{25} p(x) = 0.17361$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1c Test of hypothesis D3

$$H_0: P = 0.05$$

$$H_a: P > 0.05$$

Where P = the proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$y = 6$$

$$p = 0.21$$

The hypothesis was tested by using a table developed for a sample of twenty-nine, a population of 456, and a probability of 0.05. The table revealed that:

$$\sum_{x=6}^{29} p(x) = 0.00184$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.1d Test of hypothesis D4

$$H_0: P = 0.05$$

$$H_a: P > 0.05$$

Where P = the proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$y = 3$$

$$p = 0.10$$

The hypothesis was tested by using a table developed for a sample of thirty, a population of 456, and a probability of 0.05. The table revealed that:

$$\sum_{x=3}^{30} p(x) = 0.18630$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1e Test of hypothesis D5

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to confirmation requests which reflect incorrect amounts (samples k_2 and k_3) and

P_2 = the proportion of nonresponses to confirmation requests which reflect correct amounts (sample k_1).

$$y_1 = 5$$

$$y_2 = 2$$

$$p_1 = 0.08$$

$$p_2 = 0.04$$

The hypothesis was tested by using the t test for count data proposed by Bennett and Franklin.¹ The test transforms the data so that the difference between the statistics $(t_2 - t_1)$ "is approximately distributed as the range of 2 normally distributed variables for which the upper 5% and 1% points are 2.77 and 3.64 respectively."² This statistic was suggested for counts from a binomial probability distribution; however, a comparison of the results from using this statistic to compute the confidence intervals for some parameters in this study yielded no difference from the confidence intervals computed in the exact manner.

The test statistic is $t_2 - t_1$ where:

$$t_1 = 2 \left(\sqrt{(x_1 + 1)(1 - \bar{p})} - \sqrt{(n - x_1)\bar{p}} \right)$$

$$t_2 = 2 \left(\sqrt{x_2(1 - \bar{p})} - \sqrt{(n - x_2 + 1)\bar{p}} \right)$$

where x_1 = the number of successes in the sample
with the smaller proportion of successes,
 x_2 = the number of successes in the other
sample, and
 $\bar{p}$ = the proportion of successes of the combined samples.

For this test: $x_1 = 2$

¹Carl A. Bennett and Norman L. Franklin, Statistical Analysis in Chemistry and the Chemical Industry, (New York: John Wiley & Sons, Inc., 1954), pp. 611-12.

²Ibid., p. 612.

$$x_2 = 5$$

$$\bar{p} = 7/109 = 0.06$$

$$t_1 = -0.04$$

$$t_2 = 0.70$$

$$t_2 - t_1 = 0.74$$

The value of the statistic is less than the 2.77 criterion noted by Bennett & Franklin at the 0.05 significance level. Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1f Test of hypothesis D6

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2) and

P_2 = the proportion of improper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$y_1 = 6$$

$$y_2 = 3$$

$$p_1 = 0.21$$

$$p_2 = 0.10$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test: $x_1 = 3$

$$x_2 = 6$$

$$\bar{p} = 9/59 = 0.15$$

$$t_1 = -0.34$$

$$t_2 = 0.72$$

$$t_2 - t_1 = 1.06$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1g Test of hypothesis D7

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2) and P_2 = the proportion of nonresponses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$y_1 = 3$$

$$y_2 = 2$$

$$p_1 = 0.10$$

$$p_2 = 0.07$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test:

$$x_1 = 2$$

$$x_2 = 3$$

$$\bar{p} = 5/59 = 0.08$$

$$t_1 = 0.33$$

$$t_2 = 0.38$$

$$t_2 - t_1 = 0.05$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1h Test of hypothesis D8

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of responses to confirmation requests using the standard form (sample k_1) and

P_2 = the proportion of responses to confirmation requests using the short form (sample k_4).

$$y_1 = 48$$

$$y_2 = 46$$

$$P_1 = 0.96$$

$$P_2 = 0.92$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test: $x_1 = 46$

$$x_2 = 48$$

$$\bar{p} = 94/100 = 0.94$$

$$t_1 = -0.62$$

$$t_2 = -0.62$$

$$t_2 - t_1 = 0.00$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1i Test of hypothesis D9

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of responses to confirmation requests which provide the recipients with the data concerning their accounts (sample k_1) and

P_2 = the proportion of responses to confirmation requests which ask the recipients to provide the data concerning their accounts (sample k_5).

$$y_1 = 48$$

$$y_2 = 39$$

$$p_1 = 0.96$$

$$p_2 = 0.78$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test: $x_1 = 39$

$$x_2 = 48$$

$$\bar{p} = 87/100 = 0.87$$

$$t_1 = -1.63$$

$$t_2 = 1.76$$

$$t_2 - t_1 = 3.39$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.1j Test of hypothesis D10

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of proper responses to the first requests of confirmation

requests which reflect incorrect amounts
(samples k_2 and k_3) and

P_2 = the proportion of proper responses to
the second requests of confirmation
requests which reflect incorrect amounts
(samples k_2 and k_3).

$$y_1 = 36$$

$$y_2 = 9$$

$$p_1 = 36/59 = 0.61$$

$$p_2 = 9/16 = 0.56$$

The t test described in section 4.2.1e was used to
test this hypothesis. For this test: $x_1 = 9$

$$x_2 = 36$$

$$\bar{p} = 45/75 = 0.60$$

$$t_1 = -0.10$$

$$t_2 = 0.00$$

$$t_2 - t_1 = 0.10$$

Therefore, the null hypothesis is not rejected at
the 0.05 significance level.

4.2.1k Test of hypothesis D11

$$H_0: P_1 = P_2 = P_3$$

$$H_a: P_1 \neq P_2 \neq P_3$$

Where P_1 = the proportion of proper responses by
age group 1 (20-39) to confirmation
requests (samples k_1 , k_2 , k_3 , k_4 , and
 k_5), and

P_2 = the proportion of proper responses by
age group 2 (40-59) to confirmation

requests (samples k_1 , k_2 , k_3 , k_4 , and k_5), and

P_3 = the proportion of proper responses by age group 3 (60 and over) to confirmation requests (samples k_1 , k_2 , k_3 , k_4 , and k_5).

$$y_1 = 48$$

$$y_2 = 83$$

$$y_3 = 44$$

$$p_1 = 48/57 = 0.84$$

$$p_2 = 83/95 = 0.87$$

$$p_3 = 44/53 = 0.83$$

Those recipients who were less than twenty years old were omitted from the analysis because a parent may have completed the form. Variance analysis was used to test this hypothesis. In order to use variance analysis the data were transformed via Bartlett's transformation for a binomial distribution.¹ The particular transformation employed was $g(x) = \arcsin \sqrt{x}$. The "two variables of classification" scheme presented by Dixon and Massey² was employed in the analysis. The analysis of variance yielded an observed value for the F statistic of:

$$F^* = 0.20$$

$$F_{.05(2,8)} = 4.46$$

¹M. S. Bartlett, "The Use of Transformations," Biometrics, Vol. 3, No. 1, (March 1947), pp. 39-52.

²Wilfrid J. Dixon and Frank J. Massey, Jr., Introduction to Statistical Analysis, Second Edition, (New York: McGraw-Hill Book Company, Inc., 1957), pp. 157-8.

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.11 Test of hypothesis D12

$$H_0: P_1 = P_2 = P_3$$

$$H_a: P_1 \neq P_2 \neq P_3$$

Where P_1 = the proportion of proper responses to confirmation requests from recipients with account balances of \$2,000 or less (samples k_1, k_2, k_3, k_4 , and k_5), and
 P_2 = the proportion of proper responses to confirmation requests from recipients with account balances of \$2,001 to \$5,000 (samples k_1, k_2, k_3, k_4 , and k_5), and
 P_3 = the proportion of proper responses to confirmation requests from recipients with account balances of over \$5,000 (samples k_1, k_2, k_3, k_4 , and k_5).

$$y_1 = 69$$

$$y_2 = 57$$

$$y_3 = 52$$

$$p_1 = 69/78 = 0.88$$

$$p_2 = 57/64 = 0.89$$

$$p_3 = 52/67 = 0.78$$

The transformation and variance analysis described in section 4.2.1k was used to test this hypothesis. The observed value of the F statistic was: $F^* = 1.06$

$$F_{.05(2,8)} = 4.46$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1m Test of hypothesis D13

$$H_0: P_1 = P_2$$

$$H_a: P_1 < P_2$$

Where P_1 = the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts (sample k_1) and

P_2 = the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$y_1 = 1$$

$$y_2 = 3$$

$$p_1 = 0.02$$

$$p_2 = 0.10$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test: $x_1 = 1$

$$x_2 = 3$$

$$\bar{p} = 4/79 = 0.05$$

$$t_1 = -0.37$$

$$t_2 = 1.05$$

$$t_2 - t_1 = 1.42$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.1n Test of hypothesis D14

$$H_0: P_1 = P_2$$

$$H_a: P_1 < P_2$$

Where P_1 = the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect correct amounts (sample k_1) and

P_2 = the proportion of telephone calls or visits (to the office being audited) from recipients of confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$y_1 = 1$$

$$y_2 = 4$$

$$p_1 = 0.02$$

$$p_2 = 0.13$$

The t test described in section 4.2.1e was used to test this hypothesis. For this test:

$$x_1 = 1$$

$$x_2 = 4$$

$$\bar{p} = 5/80 = 0.06$$

$$t_1 = -0.69$$

$$t_2 = 1.33$$

$$t_2 - t_1 = 2.02$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.10 Test of hypothesis D15

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of proper responses among confirmation request recipients who call or visit (the office being audited) concerning their accounts (samples k_2 and k_3) and

P_2 = the proportion of proper responses among confirmation request recipients who do not call or visit (the office being audited) concerning their accounts (samples k_2 and k_3).

$$y_1 = 7$$

$$y_2 = 38$$

$$p_1 = 7/7 = 1.00$$

$$p_2 = 38/52 = 0.73$$

Samples k_2 and k_3 were used for this test because confirmation requests which reflect incorrect amounts are the ones of greatest concern to the auditor. The t test described in section 4.2.1e was used to test this hypothesis. For this test: $x_1 = 38$

$$x_2 = 7$$

$$\bar{p} = 45/59 = 0.81$$

$$t_1 = -7.86$$

$$t_2 = 0.86$$

$$t_2 - t_1 = 8.72$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.1p Confidence intervals for samples k_2 and k_3

Confidence intervals were computed by determining the smallest value of p such that:

$$P_r (x \leq y) = \sum_{x=0}^y \frac{\binom{N_p}{x} \binom{N_q}{n-x}}{\binom{N}{n}} \leq \frac{\alpha}{2}$$

and the largest value of p such that:

$$P_r (x \geq y) = \sum_{x=y}^n \frac{\binom{N_p}{x} \binom{N_q}{n-x}}{\binom{N}{n}} \leq \frac{\alpha}{2}$$

Where N_p = number of successes in population

N = number of items in population

$N_q = N - N_p$

α = 1-confidence level

n = number of items in sample

By trial and error the following confidence intervals were computed at the 95% confidence level.

$$0.50 \leq P_1^* \leq 0.84$$

Where P_1 = the proportion of proper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$0.66 \leq P_2^* \leq 0.94$$

Where P_2 = the proportion of proper responses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$0.02 \leq P_3^* \leq 0.27$$

Where P_3 = the proportion of nonresponses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$0.01 \leq P_4^* \leq 0.22$$

Where P_4 = the proportion of nonresponses to confirmation requests which reflect amounts that are less than the amounts shown on the recipients' records (sample k_3).

$$0.08 \leq P_5^* \leq 0.39$$

Where P_5 = the proportion of improper responses to confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample k_2).

$$0.02 \leq P_6^* \leq 0.26$$

Where P_6 = the proportion of improper responses to confirmation requests which reflect amounts that are less than

the amounts shown on the recipients' records (sample k_3).

4.2.2 Analysis of Results of Bank Experiment:

The analysis for the testing of the hypotheses is presented first, then the confidence intervals are presented. Because of the high ratio of population to samples and the large size of the samples, it is assumed that the normal distribution is a good approximation for the hypergeometric distribution which correctly applies.

4.2.2a Test of hypothesis L1

$$H_0: P = 0.70$$

$$H_a: P < 0.70$$

Where P = the proportion of proper responses to the first requests of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample b_2).

$$y = 13$$

$$p = 0.43$$

Responses from recipients who stated that they thought the amount was too high but that they didn't know the correct amount were treated as proper responses. The z test was used to test the hypothesis.

$$P^* = 0.43$$

$$z^* = \frac{y - nP^*}{\sqrt{nP^* (1 - P^*)}} = 3.19$$

$$z_{.05} = 1.64$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.2b Test of hypothesis L2

$$H_0: P = 0.05$$

$$H_a: P > 0.05$$

Where P = the proportion of improper responses to first requests of confirmation requests which reflect amounts that are greater than the amounts shown on the recipients' records (sample b_2).

$$y = 0$$

$$p = 0.00$$

The z test was used to test the hypothesis.

$$z^* = 1.25$$

$$z_{.05} = 1.64$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.2c Test of hypothesis L3

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to confirmation requests which reflect correct amounts (sample b_1) and

P_2 = the proportion of nonresponses to confirmation requests which reflect incorrect amounts (sample b_2).

To test this hypothesis the proportions of responses to the first requests of confirmation requests for samples

b_1 and b_2 were compared. The hypothesis could be restated as:

$$H_0: P_a = P_b$$

$$H_a: P_a \neq P_b$$

Where P_a = the proportion of nonresponses to first requests of confirmation requests which reflect correct amounts and

P_b = the proportion of nonresponses to first requests of confirmation requests which reflect incorrect amounts.

$$y_a = 51$$

$$y_b = 17$$

$$P_a = 51/100 = 0.51$$

$$P_b = 17/30 = 0.57$$

The χ^2 test was used to test the hypothesis.

$$\chi^2_{\text{obs}} = 0.17$$

$$\chi^2_{.05,1} = 3.84$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.2d Test of hypothesis L4

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to confirmation requests which use the standard confirmation form (sample b_1) and

P_2 = the proportion of nonresponses to confirmation requests which use the short form (sample b_4).

$$y_1 = 28$$

$$y_2 = 31$$

$$p_1 = 0.28$$

$$p_2 = 0.31$$

The χ^2 test was used to test the hypothesis.

$$\chi_{\text{obs}}^2 = 0.22$$

$$\chi_{.05,1}^2 = 3.84$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.2e Test of hypothesis L5

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to confirmation requests which provide the recipients with the data concerning their accounts (sample b_1) and

P_2 = the proportion of nonresponses to confirmation requests which ask the recipients to provide the data concerning their accounts (sample b_3).

$$y_1 = 28$$

$$y_2 = 57$$

$$p_1 = 0.28$$

$$p_2 = 0.57$$

$$\bar{p} = 0.42$$

Responses which did not provide the amount of the account were treated as nonresponses. The hypothesis was tested by means of the χ^2 test.

$$\chi^2_{\text{obs}} = 17.21$$

$$\chi^2_{.05,1} = 3.84$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.2f Test of hypothesis L6

$$H_0: P_1 = P_2$$

$$H_a: P_1 < P_2$$

Where P_1 = the proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect correct amounts (sample b_1) and

P_2 = the proportion of telephone calls (to the office being audited) from recipients of confirmation requests which reflect incorrect amounts (sample b_2).

$$y_1 = 0$$

$$y_2 = 6$$

$$p_1 = 0.00$$

$$p_2 = 0.20$$

The χ^2 test was used to test the hypothesis.

$$\chi^2_{\text{obs}} = 19.47$$

$$\chi^2_{.05,1} = 3.84$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.2g Test of hypothesis L7

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of proper responses among confirmation request recipients who call (the office being audited) concerning their accounts (sample b_2) and

P_2 = the proportion of proper responses among confirmation request recipients who do not call (the office being audited) concerning their accounts (sample b_2).

$$y_1 = 0$$

$$y_2 = 13$$

$$p_1 = 0.00$$

$$p_2 = 0.54$$

Sample b_2 was used for this test because confirmation requests which reflect incorrect amounts are the ones of greatest concern to the auditor. The χ^2 test was used to test the hypothesis.

$$\chi^2_{\text{obs}} = 5.14$$

$$\chi^2_{.05,1} = 3.84$$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.2h Confidence intervals for sample b_2

Confidence intervals were computed at the 0.95 confidence level for the proportion of proper responses and nonresponses to the first requests of confirmation requests reflecting incorrect amounts. The confidence interval for improper response was not computed because there were no improper responses. A normal distribution was assumed to

be a good approximation of the sample distribution. The confidence intervals were computed from the formula:

$$\frac{\bar{X}}{n} - z_{\alpha/2} \sqrt{\frac{\bar{X}}{n} (1 - \frac{\bar{X}}{n})/n} \leq P^* \leq \frac{\bar{X}}{n} + z_{\alpha/2} \sqrt{\frac{\bar{X}}{n} (1 - \frac{\bar{X}}{n})/n}$$

The confidence intervals were computed as:

$$0.26 \leq P_1^* \leq 0.61$$

Where P_1 = the proportion of proper responses to first requests of confirmation requests which reflect incorrect amounts.

$$0.39 \leq P_2^* \leq 0.74$$

Where P_2 = the proportion of nonresponses to first requests of confirmation requests which reflect incorrect amounts.

4.2.3 Analysis of Relationship Between Credit Union Experiment and Bank Experiment:

This subsection will present the analysis of the four hypotheses on the relationship between the credit union experiment and the bank experiment. Chapter five will begin with a composite review of the analysis in this chapter and then proceed to propose solutions to correct the deficiencies disclosed by this analysis.

4.2.3a Test of hypothesis DL1

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of proper responses to deposit account confirmation requests which provide the recipients with the

correct data concerning their accounts
(samples k_1 and k_4) and

P_2 = the proportion of proper responses to
loan account confirmation requests which
provide the recipients with the correct
data concerning their accounts (samples
 b_1 and b_4).

The results of these samples were subjected to the
t test described in section 4.2.1e.

y_1 = number of successes in samples k_1 and k_4

y_2 = number of successes in samples b_1 and b_4

$y_1 = 94$

$y_2 = 141$

$\bar{p} = 235/300 = 0.78$

$t_1 = -2.74$

$t_2 = 4.42$

$t_2 - t_1 = 7.16$

Therefore, the null hypothesis is rejected at the
0.05 significance level.

4.2.3b Test of the hypothesis DL2

Ho: $P_1 = P_2$

Ha: $P_1 \neq P_2$

Where P_1 = the proportion of nonresponses to the
first requests of loan account confir-
mation requests which reflect incorrect
amounts (sample b_2) and

P_2 = the proportion of nonresponses to

first requests of deposit account confirmation requests which reflect incorrect amounts (sample k_3).

The results of the first requests of sample k_3 were compared with the results of sample b_2 . Sample k_3 was used because the adjustment was not in the customers' favor and would be comparable to sample b_2 . It might be noted however that hypothesis D7 (the proportion of non-responses to adjustments in the recipients' favor is equal to the proportion of nonresponses to adjustments not in the recipients' favor) was not rejected. The t test described in section 4.2.1e was used to test this hypothesis.

y_1 = number of nonresponses to sample b_2

y_2 = number of nonresponses to the first requests
of sample k_3

$y_1 = 17$

$y_2 = 4$

$\bar{p} = 21/60 = 0.35$

$t_1 = -2.43$

$t_2 = 2.22$

$t_2 - t_1 = 4.65$

Therefore, the null hypothesis is rejected at the 0.05 significance level.

4.2.3c Test of hypothesis DL3

Ho: $P_1 = P_2$

Ha: $P_1 \neq P_2$

Where P_1 = the proportion of improper responses to loan account confirmation requests which reflect incorrect amounts (sample b_2) and

P_2 = the proportion of improper responses to the first requests of deposit account confirmation requests which reflect incorrect amounts (sample k_3).

The test of this hypothesis was performed in the same manner (and for the same reason) as the test of hypothesis DL2.

y_1 = number of improper responses to sample b_2

y_2 = number of improper responses to the first requests of sample k_3

$$y_1 = 0$$

$$y_2 = 3$$

$$\bar{p} = 3/60 = 0.05$$

$$t_1 = -0.50$$

$$t_2 = 1.07$$

$$t_2 - t_1 = 1.57$$

Therefore, the null hypothesis is not rejected at the 0.05 significance level.

4.2.3d Test of hypothesis DL4

$$H_0: P_1 = P_2$$

$$H_a: P_1 \neq P_2$$

Where P_1 = the proportion of nonresponses to loan account confirmation requests which ask the recipients to provide the data con-

cerning their accounts (sample b_3) and
 P_2 = the proportion of nonresponses to deposit
 account confirmation requests which ask
 the recipients to provide the data con-
 cerning their accounts (sample k_5).

This hypothesis was tested by the t test described
 in section 4.2.1e. Those responses which did not provide
 the requested data were treated as nonresponses.

y_1 = number of nonresponses to sample b_3

y_2 = number of nonresponses to sample k_5

$y_1 = 57$

$y_2 = 11$

$\bar{p} = 68/150 = 0.45$

$t_1 = -3.24$

$t_2 = 2.54$

$t_2 - t_1 = 5.78$

Therefore, the null hypothesis is rejected at the
 0.05 significance level.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of Results

The results of the two experiments will be summarized in the order of proper response, nonresponse, and then improper response. In each subsection the discussion will be addressed to the results of each experiment and to the relationship between the two experiments.

5.1.1 Summary of Proper Response:

The proportions of proper responses differ significantly between the bank's loan accounts and the credit union's deposit accounts (DL1). This difference is exemplified by the fact that there was a significantly smaller proportion of proper responses to loan account confirmations which were incorrectly stated in the bank's favor than to deposit account confirmations which were incorrectly stated in the credit union's favor (D2 and L1). Although second requests for incorrect loan confirmations were not sent, the adjustment of test criteria would appear to be valid in view of the fact that no difference was found in the proportion of proper responses between first and second requests to deposit account confirmations reflecting incorrect amounts (D10). There was also a distinct

difference in the proportion of proper responses caused by the direction of error in the confirmation (D1 and D2) with a greater proportion of proper responses to those confirmation requests which were in the credit union's favor. This difference is so pronounced that the lower limit of the interval estimate of proper responses to confirmations which were incorrectly stated in the credit union's favor (0.66-0.94) was only one percentage point below the midpoint of the interval estimate of proper responses to confirmations which were incorrectly stated in the recipients' favor (0.50-0.84).

Neither the age of the recipient nor the size of the account has a significant influence upon the proportion of proper responses (D11 and D12).

There is a marked difference between the two experiments as they relate to telephone calls or visits. In the case of the credit union experiment, there was no significant difference in the proportion of calls or visits between incorrect confirmation requests and correct confirmation requests (D13 and D14). However, the proportion of proper responses among those who did call was significantly greater than among those who did not call (D15). Just the reverse was true for the bank experiment. The incorrect confirmation requests generated significantly more calls than did the correct requests (D16); but, the proportion of proper responses was significantly less among those recipients who called than among those who

did not call (L7).

5.1.2 Summary of Nonresponse:

The results of the experiments supported each other as to the effect of incorrect confirmation requests upon the proportion of nonresponses. There was no significant difference in the proportion of nonresponses to correct confirmation requests and incorrect confirmation requests (D5 and L3). The direction of error also did not significantly affect the proportion of nonresponses (D7). However, the proportion of nonresponses was greater for loan account confirmation requests than for deposit account requests (DL2).

There was no significant difference in the proportion of nonresponses between the short form confirmation requests and the standard form (D8 and L4). However, the blank confirmation form produced a greater proportion of nonresponses than did the standard form (D9 and L5). The proportion of nonresponses to loan account confirmation requests was greater than to deposit account confirmation requests; this difference was significant for blank form requests (DL4) just as it was for requests reflecting incorrect amounts (DL2).

5.1.3 Summary of Improper Response:

The proportion of improper responses to loan account confirmation requests was significantly less than to deposit account confirmation requests (DL3).

This may be due in part to the fact that the proportion of improper responses to deposit confirmation requests which reflect amounts that are greater than the recipients' records is between 0.08 and 0.39, this is somewhat higher than the proportion of improper responses to deposit confirmation requests which reflect amounts that are less than the recipients' records (0.02-0.26).

However, the direction of error on deposit account confirmation requests does not significantly effect the proportion of improper responses (D6). Another reason for the difference is that the proportion of improper responses to loan account confirmation requests which reflect amounts that are greater than the recipients' records is approximately 0.00.

5.2 Conclusions

This study has clearly shown that the assumption of no improper response is totally invalid. While the proportion of improper responses may vary with the circumstances it is nevertheless quite high and there appears to be no basis for assuming that it is affected by the direction of error; therefore, the notion of conservatism (i.e., the auditor is concerned only with overstatement of assets or understatement of liabilities) does not help. In one sample the proportion of improper responses was twenty-one percent and the interval estimate (at a ninety-five percent confidence level) for the population was from eight percent to thirty-nine percent. This pro-

portion is so large as to make current statistical sampling models invalid when applied to confirmation techniques. What is worse, perhaps, is that improper response arises at the very time when the auditor most needs right answers, i.e., when the records are wrong.

The only instances of improper responses were on confirmation requests which reflected incorrect amounts. This result leads to the conclusion that recipients generally neither take exception to amounts which agree with their records nor provide incorrect data concerning their accounts when asked to provide such data.

Although nonresponse is a problem which is recognized by many writers in the field of statistical sampling in auditing, the assumption which is often made that the proportion of nonresponses to correct confirmation requests is equal to the proportion of nonresponses to incorrect confirmation requests appears to be valid. It also appears that the direction of error has no effect on the proportion of nonresponses. Based on these findings the statistical sampling models currently being used in auditing would be quite satisfactory if there were no improper responses.

The particular form used to confirm the accounts seems to have no effect upon nonresponse if the recipients are provided the data concerning their accounts. If the recipients are asked to provide the data, the proportion of nonresponses increases significantly.

The proportion of proper responses appears to be independent of both the ages of the recipients and the size of the accounts being confirmed. This lack of dependence on age should be comforting to auditors since they often are unable to obtain this information and even if they could obtain the information the additional work required to stratify the accounts on the basis of age would be a burden. The lack of dependence of response on the size of the accounts in these experiments tend to refute the assumption made by some that larger accounts are more likely to elicit a response. These two variables, then, probably can be safely ignored by the auditor.

Although age and account size do not affect the proportion of proper responses, there is a difference in the proportion of responses under differing circumstances. This difference may be due to any one or combination of the following factors: (1) the characteristics of the population being sampled, (2) whether the accounts being confirmed are receivables or liabilities, and (3) the attitude of the recipients toward the company being audited.

There appear to be no diminishing returns from first to second requests. The results yielded by the second requests are much the same as those yielded by the first requests. This study did not go into the extent to which this conclusion could be carried. It is possible that third or even fourth requests may continue to yield comparable results.

No definitive conclusions can be drawn concerning telephone calls or visits to the office being audited. It is clear, however, that under certain circumstances the number of calls or visits can be significant. It is quite possible that the direction given to the callers determine whether they respond to the confirmation requests.

5.3 Recommendations

These recommendations are based upon the conclusions of the preceding section and upon the three following assumptions. First, direct communication with the parties concerned is not always the least efficient and least effective means of verifying accounts. Second, each account in the population has an equal probability of being in error. Third, the probability of response from a recipient is independent of the condition of the account. Condition is defined here as any characteristic which differentiates one account from another except the accuracy of the account balance, (e.g., date of last payment, age of account, etc.).

The first assumption is necessary for the study to be of any practical significance to auditing. If alternative procedures are always more efficient and effective than the confirmation procedure, then alternative procedures should be followed; therefore, the effect of improper response or nonresponse would make no difference to the auditor.

The second assumption supposes that errors are made on a random basis and not on a selective basis. If someone were deliberately attempting to misstate the accounts it is possible that he would select the accounts on some basis. This problem is always prevalent, however, and can be circumvented by assigning some ratio of error probability to the different accounts. This in effect is a stratification of the accounts.

The third assumption supposes the actions of the recipients are random phenomena as far as the condition of the account itself is concerned. It does not imply that certain groups of recipients do not react differently but only that if they do react differently to confirmation requests, this difference is in no way caused by the condition of the accounts.

If the proportion of nonresponses is independent of the accuracy of the account balances and if improper response did not exist, then estimates of the population could reasonably be made based on the data which are received. There seems to be no reason to believe that if the recipients were asked to provide the data concerning their accounts, the proportion of nonresponse would be dependent upon the accuracy of the account.¹ The problem of improper response can be avoided by using the blank

¹Note that hypotheses D5 and L3, which in essence stated that in those instances where the recipients were provided the data concerning their accounts the proportion of nonresponses was independent of the accuracy of the account, were not rejected.

confirmation form.¹ It is avoided at the cost of a greater proportion of nonresponses; but, there seems to be no other satisfactory means of avoiding improper responses.

It is therefore recommended that auditors cease using confirmation forms which provide the recipients with the data concerning their accounts and in their place use forms which ask the recipients to provide the data. The statistical models currently advocated in manuals and texts should continue to be used except that where estimates (or conclusions) are based on the total sample size, the size of the response should be substituted for the sample size. By like manner, models for determining sample size should be corrected by multiplying the presently determined sample size by the reciprocal of the proportion of nonresponses anticipated. This anticipated proportion of nonresponses can be determined from prior experience.

An alternative solution, which is not considered generally necessary but, which does not depend upon the second and third assumptions was developed by Morris H. Hansen and William N. Hurwitz.² Their method essentially

¹Although the recipient may provide incorrect data, attention is directed toward the account. Improper responses which most concern auditors are those which arise because the respondents failed to take exception to an incorrect amount. Unless the respondent called the office to get the data, it is unlikely that he would report an incorrect amount which coincides exactly with the companys' records.

²Morris H. Hansen and William N. Hurwitz, "The Problem of Non-Response in Sample Surveys," Journal of the American Statistical Association, Vol. 41, No. 236, (December 1946), pp. 517-529.

estimates the population parameters by estimating the parameters for respondents and for nonrespondents and then combining the two. The estimate of the parameters of the nonrespondents is based on a sample of the nonrespondents to the initial request. This method is explained further in Appendix C.

5.4 Recommendations for Further Research

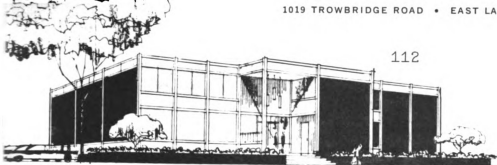
There are four areas where further research should be directed. The first and most important area for further research is in connection with the first assumption in section 5.3; i.e., direct communication with the parties concerned is not always the least efficient and least effective means of verifying accounts. The validity of this assumption should be subjected to critical examination. The second area is improving alternative procedures. Research directed toward improving alternative procedures would be especially needed if alternative procedures are sometimes more effective and efficient than confirmation procedures. The third area is the testing of the second assumption in 5.3; i.e., each account in the population has an equal probability of being in error. The fourth area of additional research is the testing of the third assumption in 5.3; i.e., the probability of a response from a recipient is independent of the condition of the account.

Although the resolution of these questions would not solve all of the auditors' problems concerning con-

firmation of accounts, it would be a major step forward for the auditing profession.

APPENDIX A

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MSU EMPLOYEES CREDIT UNION

Dear Member:

Your supervisory committee is making a routine examination of our records. The committee would like you to compare the amount indicated below with your records and confirm the amount directly to them. This amount represents your time deposit account on February 29, 1968.

Account Number _____

Date of Certificate _____

Amount of Certificate Account _____

Please compare the above amount with your records, note differences in the space below, sign and return this confirmation directly to the Supervisory Committee, P.O. Box 425, East Lansing, Mich. A return envelope is enclosed for your convenience.

Sincerely,

Frances Lesniewski
General Manager

Exceptions (if any) _____

Signature

THIS IS A CONFIRMATION REQUEST, NOT A STATEMENT OF YOUR ACCOUNT

MSU EMPLOYEES CREDIT UNION

TIME DEPOSIT ACCOUNT - CONFIRMATION FORM

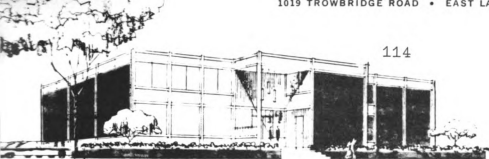
Please compare the information hereon with your records, note any differences on the reverse side, sign, and return this confirmation directly to the Supervisory Committee, P.O. Box 425, East Lansing, Mich. A return envelope is enclosed for your convenience.

Confirmation Date February 29, 1968

<u>Account</u> Number	<u>Date of</u> Certificate	<u>Present</u> Balance
--------------------------	-------------------------------	---------------------------

Signature

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MSU EMPLOYEES CREDIT UNION

Dear Member:

Your supervisory committee is making a routine examination of our records. The committee would like for you to examine your records and provide the information requested below relating to your time deposit account.

Certificate Account Number _____

Amount, as of February 29, 1968 _____

Please sign and return this confirmation request directly to the Supervisory Committee, P.O. Box 425, East Lansing, Mich. A return envelope is enclosed for your convenience.

Sincerely,



Frances Lesnieski
General Manager

Signature

APPENDIX B

**CONTINENTAL ILLINOIS NATIONAL BANK
AND TRUST COMPANY OF CHICAGO**

231 SOUTH LA SALLE STREET CHICAGO, ILLINOIS 60690

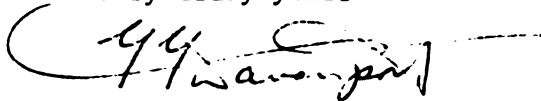
THIS IS NOT A REQUEST FOR PAYMENT

In connection with the examination of our records, your account shows an unpaid balance of \$_____ on_____. Kindly compare this amount and the information below with your records as of _____. If correct, please sign below; but if not correct, supply full information on the reverse side of this letter.

Date of Note	Amount of Note	Date of Last Payment	Amount of Last Payment
-----------------	-------------------	-------------------------	---------------------------

This request is made in the usual course of our regular audit for the purpose of verifying your account. This is not a bill or a statement. An addressed envelope is enclosed for your convenience in furnishing the desired information promptly.

Very truly yours



G. G. Davenport
Auditor

Signed _____

**CONTINENTAL ILLINOIS NATIONAL BANK
AND TRUST COMPANY OF CHICAGO**

231 SOUTH LASALLE STREET CHICAGO, ILLINOIS 60690

THIS IS NOT A REQUEST FOR PAYMENT

In connection with the examination of our records on _____,
please furnish the information requested below from your records.

Date of Note _____

Amount of Note _____

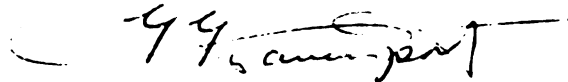
Date of Last Payment _____

Amount of Last Payment _____

Unpaid Balance _____

This request is made in the usual course of our regular audit for the purpose of verifying your accounts. This is not a bill or a statement. An addressed envelope is enclosed for your convenience in furnishing the desired information promptly.

Very truly yours



G. G. Davenport
Auditor

Signed _____

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**CONTINENTAL ILLINOIS NATIONAL BANK
AND TRUST COMPANY OF CHICAGO**

231 SOUTH LA SALLE STREET CHICAGO, ILLINOIS 60690

LOAN ACCOUNT - CONFIRMATION FORM

Please compare the information hereon with your records, note any differences on the reverse side, sign, and return this confirmation directly to me. A return envelope is enclosed for your convenience.

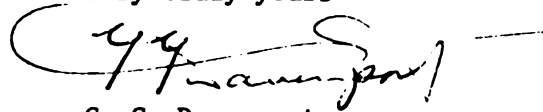
Confirmation Date _____

Amount
of Note

Date of
Last Payment

Present
Balance

Very truly yours



G. G. Davenport
Auditor

Signed _____

APPENDIX C

APPENDIX C

The method developed by Morris H. Hansen and William N. Hurwitz,¹ put in an auditing environment, is simply to (1) take a random sample of the population, (2) send first requests to all those selected, (3) take a random sample of those who do not respond, and (4) obtain a reply from those selected in the second sample. This could easily be extended to taking the sample of nonrespondents after second requests have been sent to the nonrespondents to the first requests. The following is from the Hansen and Hurwitz article.

An unbiased estimate of the population is obtained by computing:

$$x = \frac{N}{n} (x_1 + s\bar{x}_2)$$

Where: N = the number of accounts in the population

n = the size of the original sample

x_1 = total of respondents to initial sample

s = number of confirmations that were not
returned and

$\bar{x}_2$ = the average of the sample of nonrespon-
dents

The sample variance of x is given by:

¹Op. cit., pp. 517-529.

$$\sigma_x^2 = N^2 \frac{N-n}{(N-1)n} \sigma^2 + \frac{N}{n} \left(\frac{s}{r} - 1 \right) \frac{s^2}{s-1} \sigma_b^2$$

Where: σ^2 = the variance in the entire population
between the initial accounts

σ_b^2 = the variance among nonrespondents to
the initial sample

s = the number of accounts in the popula-
tion on which a response would not have
been received to the confirmation
requests

r = the number of accounts in the sample
of the nonrespondents

If $N/(N-1) \doteq s/(s-1) \doteq 1$, the formulas for the
optimum initial sample size (n) and the optimum second
sample size (r) are:

$$n = \frac{N\sigma^2}{\sigma^2 + \epsilon^2 \frac{N-1}{N^2}} \left[1 + \left(\frac{s}{r} - 1 \right) Q \right]$$

Where: ϵ = the average sampling error

Q = the rate of nonresponse to the initial
sample

and

$$r = \frac{s}{\sqrt{\frac{C_2 (1-Q)}{C_1 + C_2 (1-Q)}}}$$

Where: C_1 = the cost of preparing and mailing the
initial sample

C_2 = the cost of processing the responses
to the initial sample

C_3 = the cost of obtaining and processing
data on those accounts in the second
sample

BIBLIOGRAPHY

Books

- Bennett, Carl A. and Franklin, Norman L. Statistical Analysis in Chemistry and the Chemical Industry. New York: John Wiley & Sons, Inc., 1954.
- Dixon, Wilfrid J. and Massey, Jr., Frank J. Introduction to Statistical Analysis. Second ed. New York: McGraw - Hill Book Co., Inc., 1957.
- Hill, Henry P., Roth, Joseph L., and Arkin, Herbert. Sampling in Auditing. New York: The Ronald Press Company, 1962.
- Lenhart, Norman J. and Defliese, Philip L. Montgomery's Auditing. 8th ed. New York: The Ronald Press Company, 1957.
- Stettler, Howard F. Auditing Principles. 2nd ed. Englewood Cliffs, N. J.: Prentice - Hall, Inc., 1961.
- Vance, L. and Neter, J. Statistical Sampling for Auditors and Accountants. New York: John Wiley & Sons, Inc., 1956.

Articles and Periodicals

- Accounting Questions. Answer from an unnamed practitioner, The Journal of Accountancy, LVIII, No. 5 (November 1934), 391.
- Bartlett, M. S. "The Use of Transformations," Biometrics, III, No. 1 (March 1947), 39-52.
- Blough, Carmen G. "Confirmation Procedure Must Be Adapted to the Circumstances," Accounting and Auditing Problems, The Journal of Accountancy, XCVII, No. 3 (March 1954), 345.
- Broadhurst, W. H. "Follow-up of Accounts Receivable Circularization," Canadian Chartered Accountant, LXXXVI, No. 2 (February 1965), 145.

Davis, Gordon B., Neter, John, and Palmer, Roger P. "An Experimental Study of Audit Confirmations," The Journal of Accountancy, CXXIII, No. 6 (June 1967), 36-44.

Hansen, Morris H. and Hurwitz, William N. "The Problem of Non-Response in Sample Surveys," Journal of American Statistical Association, XLI, No. 236 (December 1946), 517-529.

Healy, Robert E. "Sampling in Auditing is for all Auditors," The New York Certified Public Accountant, XXXVI, No. 5 (May 1966), 366.

_____. "Sampling in Auditing: the Whole Story," Price Waterhouse Review, IX (Winter 1964), 40.

Lytle, Richard C. "Accounting and Auditing Problems," The Journal of Accountancy, CXVIII, No. 3 (September 1964), 73.

Maynes, E. Scott. "Minimizing Response Errors in Financial Data: The Possibilities," Journal of the American Statistical Association, LXIII, No. 321 (March 1968), 214-27.

Smith, Alden C. "The Accounting Profession's Growing Interest in Statistical Sampling," The New York Certified Public Accountant, XXVII, No. 7 (July 1957), 452.

Reports

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

Committee on Auditing Procedure. Statements on Auditing Procedure, No. 1, Extensions of Auditing Procedure. New York: American Institute of Accountants, October 1939.

Committee on Bank Accounting and Auditing. Audits of Banks. New York: American Institute of Certified Public Accountants, 1968.

Committee on Practice Review. Departures From Generally Accepted Auditing Standards and Accounting Principles. New York: American Institute of Certified Public Accountants, 1966.

Committee on Statistical Sampling. Statistical Sampling
and the Independent Auditor. New York: American
Institute of Certified Public Accountants, 1961.

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