A STUDY OF FACTORS WHICH AFFECT AUDIT EVIDENCE ACCUMULATION

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JOHN NEAL KISSINGER

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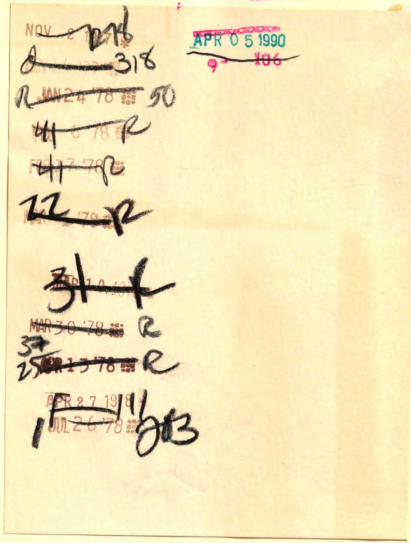
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ABSTRACT

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John Neal Elsea, [illegible]

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1. development of a normative framework for audit evidence accumulation decisions,
2. detailed discussion of certain individual factors incorporated by that framework as relevant to such decisions, and
3. empirical evaluation of the relative influence of a number of these factors in actual audit situations.

Development of a Normative Framework for Audit Evidence Accumulation Decisions

The first section of the dissertation actually presents two such frameworks. The first framework suggests that ideally, with regard to the client's financial statements as a whole, the auditor's objective should be to select that collection of evidential matter which maximizes his net expected utility (a function of the audit fee, the costs of obtaining evidence, and the risk of sanctions for failing to detect material error existing in the client's reports) within the bounds of minimum evidential support requirements and available time and staff.

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The purpose of this dissertation is to examine the auditor's decision process with regard to questions of evidence accumulation. Effectively, the study consists of three sections:

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2. detailed discussion of certain individual factors indicated by that framework as relevant to such decisions, and
3. empirical evaluation of the relative influence of a number of these factors in actual audit situations.

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The purpose of this initial framework is to facilitate the identification and classification of factors which logically should affect audit evidence accumulation.

If it is to serve as a practical guide to audit program development, however, the framework must be modified to overcome the inherent difficulties associated with the measurement of utility and to take into account the fact that financial statements are actually a complex set of individual assertions which the auditor must verify. The "second best" normative framework which results from such modification suggests that the auditor should determine the nature, extent, and timing of his audit tests in such a manner as to minimize the cost of obtaining evidence within the bounds of minimum evidential support requirements (for each material assertion in the client's financial statements), available time and staff, and within the bounds of some maximum acceptable risk of sanctions.

Detailed Discussion of Certain Individual Factors
Indicated by the Framework as Relevant to Such Decisions

The second section of the dissertation deals with three specific categories of factors which affect audit evidence accumulation decisions:

1. factors which define the evidential support function for a given type of audit evidence obtained at a given time,
2. factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion, and
3. factors which influence the probability that the auditor will incur sanctions for failing to detect a material error given that such error exists in his client's records.

The primary focus of discussion in this section is each factor's expected effect on the three parameters of the auditor's evidential collection:

1. the type(s) of evidence included,
2. the time(s) of collection of each type, and
3. the number of units of each type collected at a given time.

Empirical Evaluation of the Relative Influence of a Number of these Factors in Actual Audit Situations

The final section of the dissertation reports an empirical study of the relative influence of a number of factors on evidence accumulation decisions in the areas of sales and accounts receivable. Tentative conclusions of this study (which was based on data extracted from the work papers for fifty-three clients of seven public accounting firms) are as follows:

1. Multiple discriminant analysis indicated that, for the clients observed, Generally Accepted Auditing Standards and individual firm policy were the primary determinants of procedure selection in the area of sales. Furthermore, with the possible exception of client internal check and internal control, no other independent variable seems to have had any significant effect on the sample auditors' decisions in this area. With respect to accounts receivable, the primary determinant of test selection appears to have been Generally Accepted Auditing Standards. Additionally, however, the evidence suggests that four factors largely influenced whether a given receivable would be confirmed positively, negatively, or not at all. These factors were the size of the receivable relative to

others in the trial balance, the age of the receivable, the total number of receivables in the trial balance, and the firm performing the audit.

2. An hypothesis test indicated that a general model utilizing the quality of the client's internal control and the date of the client's year-end as its only independent variables predicted the sample auditors' timing decisions (for both sales and accounts receivable tests) significantly better than chance.

3. Multiple linear regression indicated that, for the clients observed, the firm performing the audit, the client's size, the quality of the client's internal control and the distribution of the client's ownership had the greatest association with the auditor's sample size decisions in both the areas of sales and accounts receivable. Additionally, evidence indicated that the mean receivable dollar balance affected the auditor's decision with respect to the smallest dollar balance considered for confirmation (both positive and by any means) and the percentage of receivable coverage (both positive and total).

A STUDY OF FACTORS WHICH AFFECT AUDIT EVIDENCE ACCUMULATION

By

John Neal Kissinger

A DISSERTATION

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To my parents and my brother, Mark, who can never know how much their encouragement and moral support has meant to me throughout the writing of this dissertation, and to John Warren Higgins, my first, and most memorable accounting teacher.

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I owe a debt of gratitude to a great many people for contributions of one sort or another to this dissertation.

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CHAPTER I

INTRODUCTION

The third standard of auditing field work, as set forth by the Committee on Auditing Procedure of the American Institute of Certified Public Accountants, requires that:

> Sufficient competent evidential matter is to be obtained through inspection, observation, inquiries and confirmations to afford a reasonable basis for an opinion regarding the financial statements under examination.[1]

The Committee has noted that:

> The amount and kinds of evidential matter required to support an informed opinion are matters for the auditor to determine in the exercise of his professional judgment after a careful study of the circumstances in the particular case. In making such decisions, he should consider the nature of the item under examination; the materiality of possible errors and irregularities; the degree of risk involved, which is dependent on the adequacy of the internal control and the susceptibility of the given item to conversion, manipulation, or misstatement; and the kinds and competence of evidential matter available.[2]

Until recently, auditing literature has reflected little effort toward further elaboration of specific relationships between

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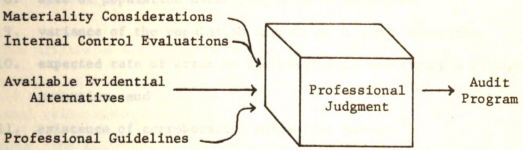
[1] Committee on Auditing Procedure, American Institute of Certified Public Accountants, Statement on Auditing Standards No. 1, New York: American Institute of Certified Public Accountants, 1973, p. 5.

[2] Ibid., p. 57.

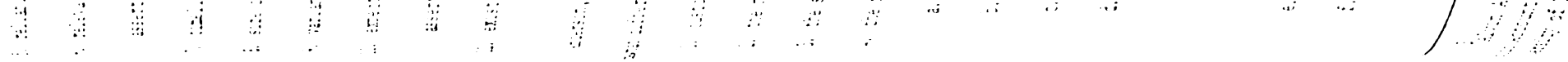
"circumstances" of the audit and audit evidence accumulation. The public accounting profession has apparently been content to live with a "black box" approach (similar to that represented below) with "professional judgment" the "black box."



In an effort to improve this situation, at least two research efforts, one by Arens and the other by Anderson, Giese, and Booker, have focused specifically on factors relevant to audit evidence accumulation decisions, and each has contributed insight into audit program development.

In his doctoral dissertation, Arens identified the following as "variables of the audit":

1. risk:
    a. probability of material error existing in the client's financial statements,
    b. probability that the auditor will incur sanctions if he fails to discover such error, and
    c. probability that the auditor will fail to discover and properly interpret such error,
2. materiality,
3. internal controls,
4. cost of accumulating evidential matter,



5. reliability of various types of evidential matter,
6. relevance of various types of evidential matter to the assertion to be proved,
7. timeliness of evidential matter,
8. size of population underlying a given assertion,
9. variance of the population underlying a given assertion,
10. expected rate of error in the population underlying a given assertion, and
11. existence of corroborative evidential matter.[3]

Anderson, Giese, and Booker, on the other hand, proposed this somewhat different list:

1. custom and authoritative pronouncements,
2. the nature and size of the client's operations,
3. the system of internal control,
4. the relative risk in the engagement,
   a. client's size,
   b. client's rate of growth,
   c. nature of the client's business,
   d. client's issuance of certain types of securities which require reports to regulatory agencies, or maintenance of specified account balances or ratios,
   e. client's trading on the equity,
   f. client's acquisition of other companies through the issuance of junior equities,

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[3]Alvin A. Arens, "The Adequacy of Audit Evidence Accumulation in Public Accounting" (Doctoral thesis, School of Business Administration, University of Minnesota, 1970).

g. longevity of engagement,

h. auditor independence, and

i. general economic conditions,

5. the auditing team, and

6. fee restraints.[4]

The efforts of both Arens and Anderson, Giese, and Booker have greatly expanded the number of identified black box inputs. However, the actual relationship between these inputs and the resulting black box output, the audit program, remains, for the most part, undefined.

The objective of the following dissertation is to explore the black box further -- to probe the auditor's decision process with regard to questions of evidence accumulation. Essentially, the study consists of three parts:

1. development of a conceptual framework for audit evidence accumulation decisions,
2. discussion of certain factors indicated by this framework as relevant to such decisions, including analysis of their potential effect on an audit program, and
3. empirical evaluation of the relative influence of a number of these factors in actual audit situations.

As these three general topics suggest, the research is intended to make both normative and descriptive contributions to the field of auditing.

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[4] H. M. Anderson, J. W. Giese, and Jon Booker, "Some Propositions about Auditing," The Accounting Review 45 (July 1970): 524-31.

The normative contributions lie in the conceptual framework and discussion of relevant variables. While a number of authors have discussed factors which influence or should influence the auditor's accumulation of evidence, no one has yet attempted to relate these "variables of the audit" to audit programs in some sort of functional manner. This study is a first step in that direction -- but only a first step. The functions developed are of a general, abstract nature, intended to identify and place in perspective those factors which should affect the auditor's work. While the functions are not sufficiently specific to operate as audit program "generators," they do suggest a logical framework for the auditor's decision process in questions of evidence accumulation.

The descriptive contribution, on the other hand, lies in the empirical study which identifies a number of relevant factors to which the auditor's program appears relatively insensitive and thus suggests areas where the auditor might improve his approach to evidence accumulation.

The first part of the study, which includes the remainder of Chapter I and Chapter II, suggests the appropriateness of a decision theory or programming framework for audit evidence accumulation decisions and derives two such frameworks. The first (Chapter I) is based upon two fundamental assumptions: (1) for any given engagement, the auditor has before him a number of complete alternative audit programs from which he must select <u>one</u> as a basis for an opinion on the client's financial statements <u>taken as a whole</u>, and (2) the auditor wishes to make his selection in such a manner as to maximize his <u>net expected</u>

utility. The second framework (Chapter II) then relaxes these assumptions one-at-a-time, modifying the model in order: (1) to reflect the notion that an auditor's responsibility for an opinion on his client's financial statements taken as a whole implies a responsibility for the validity of each individual material assertion contained in those statements, and (2) to replace the highly abstract objective of utility maximization with the more practical one of cost minimization.

The frameworks developed in these first two chapters suggest a number of basic categories into which factors relevant to audit evidence accumulation decisions fall. The second part of the dissertation, therefore, considers, in some depth, three of these categories, specifically:

1. factors which define the evidential support function for a given type of audit evidence obtained at a given time (Chapter III),
2. factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion (Chapter IV), and
3. factors which influence the probability that the auditor will incur sanctions for failing to detect a material error given that such error exists in his client's records (Chapter V).

The primary focus of discussion in these chapters is the expected effect of each factor on the three parameters of the auditor's evidential collection:

1. the type(s) of evidence included,
2. the time(s) of collection of each type, and
3. the number of units of each type collected at a given time.

In the dissertation's final section, Chapter VI, attempts to evaluate empirically the relative influence of a number of factors on actual audit practice in the areas of sales and accounts receivable. A summary (Chapter VII) of the results, conclusions, and limitations of the research, as well as suggestions for its extension, closes the dissertation.

Let us now turn to the decision theory framework for audit evidence accumulation which comprises the remainder of this chapter.

Audit Evidence and Evidential Collections

Let us define a unit of audit evidence as any factual item "available to an auditor from which he may know or infer the relative truth or falsity of the assertions in financial statements,"[5] and let us define a "collection" or "accumulation" of audit evidence as any set whose elements are units of evidential matter. In general, such a set will have three parameters:[6]

1. the type of evidential matter included (confirmations, test counts, etc.),
2. the times of collection of each type, and
3. the number of units of each type collected at a given time.

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[5] R. K. Mautz, "The Nature and Reliability of Audit Evidence," The Journal of Accountancy 105 (May 1958): 46.

[6] Arens, pp. 83-84.

Therefore, using set notation, we may represent an auditor's evidential collection as follows:

$$E_k = \{q_{ij}: \ i = 1, 2, \ldots, m; \ j = 1, 2, \ldots, n\}$$

where q_{ij} represents the number of units of type i evidence obtained at time, t_j.

Now, for any given set of financial statements, a wide variety of evidential accumulations is likely to be available to the auditor. Furthermore, since these collections are apt to vary substantially in their composition, they will undoubtedly differ with respect to the following factors:

1. degree of evidential support provided,
2. cost of accumulation,
3. time required for accumulation, and
4. staff required for accumulation.

It seems reasonable to assume that for any audit engagement (i.e., any given set of "audit circumstances") and for any well-defined set of criteria related to the above factors, one particular collection of evidence will be an optimum. This assumption, however, is equivalent to the assumption that a functional relationship exists between the "circumstances" (or variables) of the audit and the composition of the optimum collection of evidence, i.e., that:

$$f(a_h v_h: \ h=1, 2, \ldots, r) = E_{opt} = \{q_{ij}: \ i=1, 2, \ldots, m; \ j=1, 2, \ldots, n\}$$

where: a_h is the relative weight assigned to the h^{th} variable,

v_h is the value assigned to the h^{th} variable,

E_{opt} is the "optimal" evidential collection for the particular engagement and given set of criteria, and

q_{ij} is defined as above.

Presumably, this function would be unique and well-defined if all auditors:

1. were able to identify and measure precisely all possible relevant variables (audit "circumstances" -- see supra, pp. 2-4),
2. assigned the same relative importance to each variable,
3. accepted the same set of evidential accumulation criteria, and
4. performed in a reasonably consistent manner.

To the extent, however, that individual auditors differ in the variables they identify as relevant, to the extent that they assign different degrees of relative importance to specific variables, and to the extent that they adopt different decision criteria, the function cannot be unique. Similarly, to the extent that individual auditors are incapable of precisely measuring such variables as they have identified, and to the extent that they behave inconsistently from engagement to engagement, the function cannot be well-defined.

For these reasons, replacement of the black box of professional judgment with a unique, well-defined function does not appear possible

at the present. On the other hand, identification of a framework which indicates the relevant place of each audit variable (or even each type of audit variable) in the evidential accumulation process does seem both feasible and worthwhile.

A Decision Theory Approach to Audit Evidence Accumulation Decisions

Toward that end, let us consider the audit as an exercise in decision theory -- i.e., let us suppose that, for any given engagement, the auditor has available to him a number of alternative evidential collections from which he must select one as a basis for his opinion, and consider how he might make that selection.

Constraints of the Audit

Before discussing the auditor's decision rule for selecting an evidential collection, let us note that certain factors may restrict that selection. We have previously observed that associated with each collection of audit evidence and a function of its composition are a number of factors, including the degree of evidential support the collection provides, the time required to gather the collection, and the staff required to gather the collection. Each of these factors may be subject to constraint.

The Degree of Evidential Support the Collection Provides

The third standard of auditing field work states that the auditor must obtain "sufficient competent evidential matter . . . to afford a reasonable basis for an opinion regarding the financial

statements under examination."[7] This standard requires (as will be demonstrated later) that the auditor accumulate at least a minimum level of evidential support before he may render a professional opinion. Clearly, then, the auditor must reject all evidential alternatives which do not provide this minimum level of evidential support, i.e., he must select an evidential collection, E_k, such that:

$$B(E_k) \geq B_{min} \qquad \text{(C-1)}$$

where: $B(E_k)$ is the degree of evidential support provided by the collection, and

B_{min} is the minimum evidential support necessary to justify a professional opinion on a given set of financial statements.

The Time Required to Gather the Collection

Let us denote the total time necessary for an auditor to obtain a given evidential collection as $T(E_k)$. This requirement will be a function of the collection's composition and the manner in which the auditor obtains it. Clearly, however, the auditor is constrained in the total amount of time available to him -- the maximum, T_{max}, being the difference between the date he accepts the engagement and the date at which his client requires a report. Thus, the auditor must select a collection, E_k, such that:

$$T(E_k) \leq T_{max} \qquad \text{(C-2)}$$

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[7] Committee on Auditing Procedure, p. 5.

The Staff Required to Gather the Collection

A third function of the composition of any given evidential collection will be the size and expertise of the staff required to obtain it. Obviously, the auditor must eliminate from consideration all collections which are beyond the capabilities of his staff, i.e., he must select a collection such that:

$$SR(E_k) \leq SR_{max} \qquad (C\text{-}3)$$

where: $SR(E_k)$ denotes the staff requirements of the collection, (E_k), and

SR_{max} denotes the limits on size and expertise of the auditor's staff.

The Objective Function

Having rejected any evidential collections which violate one or more of the above constraints, the auditor will, hopefully, still have a number remaining from which to make his final selection. (Otherwise, presumably, he must require a redefinition of one or more constraints, or refuse the audit engagement.) The rational choice from these remaining collections would seem to be the one which affords the auditor a maximum net expected utility with respect to the following:

1. fee revenues,
2. costs of evidence accumulation, and
3. expected disutilities of sanctions (penalties).

In symbolic form, the objective function which represents this selection rule is:

Maximize $U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))]$

where: $U^{+}(R(E_k))$ is the utility of the fee revenue associated with evidential collection E_k,

$U^{-}(C(E_k))$ is the disutility of the cost of gathering collection E_k, and

$E[U^{-}(S(E_k))]$ is the expected disutility of sanctions associated with collection E_k.

Combining this objective function with the constraints gives the following normative model for auditor behavior:

Given a number of alternative evidential collections relevant to a particular audit, choose the collection, E_k, which maximizes:

$$U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))]$$

subject to the constraints:

$$B(E_k) \geq B_{min},$$

$$T(E_k) \leq T_{max}, \text{ and}$$

$$SR(E_k) \leq SR_{max},$$

where all factors are defined as above.

The framework of this general model would seem to suggest that the factors which influence audit evidence accumulation may, in fact, fall into nine basic categories:

1. factors which determine $B(E_k)$, the degree of support a given evidential collection will provide,
2. factors which determine B_{min}, the minimum evidential support necessary to justify a professional opinion on a given set of financial statements,
3. factors which determine $T(E_k)$, the time required to obtain a given collection of audit evidence,
4. factors which determine T_{max}, the maximum time available to the auditor for the collection of evidence,
5. factors which determine $SR(E_k)$, the staff required to obtain a given evidential collection,
6. factors which determine SR_{max}, the staff available for a given audit engagement,
7. factors which determine $R(E_k)$, the audit fee associated with any given evidential collection,
8. factors which affect $C(E_k)$, the cost of obtaining a given evidential collection, and
9. factors which affect $E[U^{-}(S(E_k))]$, the auditor's evaluation of the expected disutility of sanctions associated with a given evidential collection.

Let us now look at these categories individually, identifying the factors relevant to each.

Factors which Determine the Degree of Support a Given Evidential Collection Will Provide

The degree of support a given evidential collection will provide depends upon:

a.

b.

c.

d.

1. the composition of the collection, i.e.,
   a. the types of evidence included,
   b. the times of collection of each type, and
   c. the number of units of each type collected at a given time, and
2. the evidential support function for a given type of evidence obtained at a given time.

The slope of this function, which we may denote as $b(q_{ij})$, and which defines the degree of evidential support provided by q units of type i evidence obtained at time, t_j, depends primarily upon:

1. the relevance of the specific type of evidential matter to the audit engagement,
2. the reliability of the specific type of evidential matter, itself a function of:
   a. the conclusiveness of the given type of evidence, and
   b. the possibility of misinterpreting evidence of this nature,
3. the timeliness of the evidential matter, itself a function of:
   a. the time at which the evidence is obtained, and
   b. the quality and comprehensiveness of the client's internal controls,
4. the statistical parameters of the population underlying the assertion the auditor wishes to evaluate:

a. size,
b. variance,
c. rate of error, and

5. the existence of corroborative evidence.

Chapter III analyzes these factors which influence an auditor's evaluation of the support provided by a unit of any given type of evidence gathered at a given time, and considers their effect on his audit program.

Factors which Determine the Minimum Evidential Support Necessary to Justify a Professional Opinion on a Given Set of Financial Statements

Before identifying the variables in this category, let us consider, in more detail, the concept of "minimum evidential support."

We have previously noted that for any given set of financial statements, a wide variety of evidential accumulations may be available to the auditor. Because of the likelihood of substantial variation in their composition, these collections will undoubtedly exhibit differing degrees of evidential support. Were the auditor able to identify all the possible collections of evidential matter relevant to a particular audit engagement, then conceivably he could rank them according to the relative degree of support provided. Now, even though the auditor is not likely to be able to identify every available collection, the notion that such an ordering is (at least conceptually) possible has important implications.

One of these implications is that associated with each possible collection of evidence, E_k, is a specific level of evidential support,

$B(E_k)$, which is a real-valued function of the collection's composition, and which permits us to denote the hypothetical ordering of collections as follows:

$$E_1, E_2, \ldots, E_n, \ldots \ni B(E_1) \leq B(E_2) \leq \ldots \leq B(E_n) \leq \ldots$$

where the index refers to the collection's location in the overall ranking and where, for all $E_i \neq E_j$ such that $B(E_i) = B(E_j)$, order makes no difference.

At this point, let us consider two collectively exhaustive and mutually exclusive categories for audit evidence accumulations:[8]

1. E°, accumulations which provide insufficient evidential support for an opinion on the financial statements in question, and
2. E^+, accumulations which provide sufficient evidential support for an opinion on the financial statements in question.

Furthermore, in connection with these two categories, let us make the following additional assumption:

> If the auditor considers a collection of evidence, E^*, sufficient in support to allow an opinion on a set of financial statements, then he will also consider all collections providing equal or greater evidential support sufficient for an opinion on those statements, i.e.,

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[8] The equivalent statement in set notation is: $E^\circ, E^+ \ni E^\circ \cup E^+ = E, E^\circ \cap E^+ = \phi$, where E° and E^+ are defined as above, E is the set of all possible collections of evidence and ϕ represents the null set.

$$E^* \in E^+ \rightarrow \forall E_k \in E \ni B(E^*) \leq B(E_k),\ E_k \in E^+.$$

An immediate result of this assumption is that the evidential support associated with any evidential collection of type E° will always be strictly less than the evidential support associated with any evidential collection of type E^+, i.e.,

$$E_i \in E^\circ \text{ and } E_j \in E^+ \rightarrow B(E_i) < B(E_j),\ \forall E_k \text{ and } E_j.$$

(If $B(E_i) \geq B(E_j)$, then E_i must also be sufficient to support an opinion, and hence $E_i \in E^+$. This is impossible, however, since $E_i \in E^\circ$ and $E^\circ \cap E^+ = \phi$.)

Since we have assumed that for all possible collections of audit evidence, $E_k \in E$, $B(E_k)$ is a real value, the set $B^\circ = \{B(E_i) : E_i \in E^\circ \subset E\}$ is a real-valued set, hence any number, b, such that $B(E_i) < b$ for all $E_i \in E^\circ$ will be an upper bound for B°.[9] In other words, by defining a collection of evidence, E^*, which provides adequate evidential support for an opinion on a given set of financial statements, the auditor places an upper bound on the degree of evidential support considered insufficient for any opinion on those statements. This upper bound is, of course, any $B(E_j) \ni E_j \in E^+$, since $E_j \in E^+$ implies that $B(E_i) < B(E_j)$ for all $E_i \in E^\circ$. A defining property of the real number system, however, is that "Every set S of real numbers . . . that has an upper bound has a least upper bound,"[10] i.e., an upper bound, b', which is less than or equal to all the other

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[9] Richard E. Johnson and Fred L. Kiokemeister, Calculus, Boston: Allyn and Bacon, Inc., 1959, p. 128.

[10] Ibid., p. 129.

upper bounds of S. Therefore, E° must have a least upper bound which we may denote B_{min}, such that for all $E_i \in E$ with $B(E_i) < B_{min}$, then $E_i \in E^{\circ}$, and such that for all $E_j \in E$ with $B(E_j) \geq B_{min}$, then $E_j \in E^{+}$. This least upper bound, B_{min}, is the minimum level of evidential support which the auditor will accept as sufficient to allow an opinion on the financial statements under examination. The collection(s) of evidence, $E_{min} \in E^{+}$, which minimize $B(E_{min}) - B_{min} \geq 0$ will be the "minimum collection(s)" for this particular set of statements and the audit program which yields the collection(s), E_{min}, will be the "minimum audit program(s)."[11]

If one examines the above lists of variables identified by Arens and by Anderson, Giese, and Booker, he should note that certain of these factors are directly related to this minimum evidential support requirement. These factors, which will be discussed in detail in Chapter IV include:

1. Generally Accepted Auditing Standards and authoritative pronouncements of the AICPA,
2. authoritative pronouncements of the SEC,
3. regulatory commission requirements,
4. policies of individual public accounting firms,
5. specific terms of the auditor's contract with his client,
6. materiality considerations, and

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[11] The notion of a "minimum audit program" is, of course, not new. Cf. R. K. Mautz and Donald L. Mini, "Internal Control Evaluation and Audit Program Modification," The Accounting Review 41 (April 1966): 283-291. These authors define a "minimum audit program" as "the nature and extent of audit work which would be necessary under conditions of excellent control." (p. 284)

7. the auditor's evaluation of the probability that his client's financial records contain material error,
   a. the auditor's findings during his review of the client's internal control system,
   b. the auditor's findings in actual tests of the client's records,
   c. the auditor's assessment of the general "riskiness" of the client, based on the client's financial health, operating and reporting policies, prior auditor-client relations, etc.

Factors which Determine the Time Required to Obtain a Given Collection of Audit Evidence and Factors which Determine the Maximum Time Available to the Auditor for the Collection of Evidence

The time required to obtain a given collection of audit evidence will depend upon:

1. the composition of the collection,
2. the nature and quality of the client's accounting system, and
3. the efficiency of the staff used to obtain the collection.

For purposes of this dissertation, however, let us consider the last two of these factors as given and constant, and therefore treat $T(E_k)$ as a function solely of the composition of the evidential collection of interest.

Also for purposes of this dissertation, let us define T_{max} as given and constant, and merely the difference between the date at which the auditor accepts the engagement, t_o, and the date at which

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the client requires a report, t_r (i.e., $T_{max} = t_r - t_o$, where all factors are defined as above), and refrain from further analysis of either of these classes of factors.

Factors which Determine the Staff Required to Obtain a Given Evidential Collection and Factors which Determine the Staff Available for a Given Audit Engagement

The staff required to obtain a given evidential collection will depend upon:

1. the composition of the collection, and
2. the nature and quality of the client's accounting system.

Again, for purposes of this dissertation, let us assume that the latter factor is given and constant, and therefore treat $SR(E_k)$ as a function solely of the composition of the evidential collection of interest.

The staff available for a given audit engagement, on the other hand, will depend upon:

1. the size and capabilities of the auditor's firm, and
2. staff requirements of concurrent engagements (in part, a function of the time of year at which the audit is performed).

For purposes of this dissertation, however, let us assume that for any given audit, SR_{max}, is constant and given and refrain from further discussion of the factors relevant to this constraint.

Factors which Determine the Audit Fee Associated with Each Evidential Collection

Anderson, Giese, and Booker have noted that:

> The audit fee is generally determined by multiplying a standard billing rate for each rank (in the audit staff hierarchy) by the number of hours worked by that rank. The standard billing rate is currently between two and three times the direct salary for each rank.[12]

At least up to a limit, then, audit fees (and their related utility) vary directly with audit costs. The limit, of course, is the maximum fee the client will accept before terminating the engagement and finding another auditor. If we denote this maximum fee as R_{max}, we may define $R(E_k)$ as follows:

$$R(E_k) = \begin{cases} R(C(E_k)), & R(C(E_k)) \leq R_{max} \\ R_{max}, & R(C(E_k)) \geq R_{max}, \end{cases}$$

where: $R(C(E_k))$ defines the audit fee associated with evidential collection, E_k, as an increasing function of the cost of obtaining that collection, and

$R(E_k)$ and R_{max} are defined as above.[13]

Since more detailed analysis of the behavior of $R(E_k)$ is unnecessary for purposes of this dissertation, let us also refrain from further consideration of this factor.

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[12] Anderson, Giese, and Booker, p. 530.

[13] Apparently, in many audit engagements, the fee is a matter of negotiation prior to the auditor's work. In such cases, our definition of $R(E_k)$ becomes:

$R(E_k) = R_{max}$ for all E_k,

where $R(E_k)$ and R_{max} are defined as above.

Undoubtedly, however, budgeted costs enter into the bargaining.

Factors which Affect the Cost of Obtaining a Given Evidential Collection

The cost of obtaining a given evidential collection will depend upon:

1. the composition of the collection,
2. the nature and quality of the client's accounting system,
3. the efficiency of the staff used to obtain the collection, and
4. the wage rate of the audit staff.

Again, however, for purposes of this dissertation, let us consider the last three of these factors as given and constant, and therefore treat $C(E_k)$ as a function solely of the composition of the evidential collection of interest. (In any case, this factor should be the dominant one.)

While the topic of audit evidence cost is an interesting one, and one worthy of research, further analysis of this factor is beyond the scope of this dissertation.

Factors which Affect the Auditor's Evaluation of the Expected Disutility of Sanctions Associated with a Given Evidential Collection

Arens has noted that:

> . . . one of the factors that an auditor should consider in deciding upon the adequacy of audit evidence is the sanctions which can be expected if the financial statements are not fairly presented.[14]

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[14] Arens, pp. 35-36.

These sanctions, or penalties, may take a number of forms depending upon who imposes them (the client, the Securities and Exchange Commission, the accounting profession, or society as a whole), and depending upon the cause, type and degree of error in the client's financial statements. The most common forms, in order of apparent increasing severity are:

1. adverse publicity,
2. admonition from the SEC[15] or AICPA,
3. loss of client,
4. lawsuit,
5. loss of right to practice before the SEC,
6. expulsion from the AICPA and/or loss of license to practice, and
7. conviction in criminal action.

Such sanctions are a potential source of disutility to the auditor in terms of lost reputation, lost self-esteem and reduced

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[15] The greater exposure generally afforded an SEC client's financial statements actually affects the auditor's risk of sanctions in at least three ways:

1. it introduces the SEC as a potential source of sanctions,
2. it increases the probability of legal action should the auditor fail to detect material error existing in the client's statements, and
3. it increases the probability of adverse effect on the auditor's public image.

The implications are obvious -- ceteris paribus, the auditor should logically require a greater degree of evidential support for an SEC client than for a non-SEC client. (See infra, pp. 154-156). Compare this conclusion, however, to the fiction frequently espoused by practitioners (and perhaps the official position of the AICPA) that "an audit is an audit" regardless of the client's status.

profits. For example, the disutilities associated with a lawsuit include:

1. adverse publicity (which invariably occurs whether the auditor wins the case, loses the case or settles out of court),
2. defense costs, e.g., fees for lawyers and expert witnesses, court costs, staff time necessary to prepare the defense, and
3. the cost of any settlement the court might impose.[16]

For any given audit, the expected disutility associated with a particular sanction is actually the product of four factors and, for any given collection of evidential matter, E_k, we may define the expected disutility of the i^{th} particular sanction, $E[\bar{U}(S_i(E_k))]$, as:

$$E[\bar{U}(S_i(E_k))] = p(M)\ p(F|M \cap E_k)\ p(S_i|F \cap M \cap E_k)\ E[\bar{U}(S_i|S_i \cap E_k)],$$

where:

$p(M)$ is the probability that the client's records contain material error,

$p(F|M \cap E_k)$ is the probability that the auditor fails to detect such error given that it exists in the client's records and he selects evidential collection, E_k,

$p(S_i|F \cap M \cap E_k)$ is the probability that the auditor will incur sanction S_i, given that, having selected evidential collection E_k, he fails to detect a material error

[16] The auditor can generally shift this cost through professional liability insurance. Lost lawsuits, however, are likely to increase the costs of such insurance.

which exists in his client's records,

and

$E[U^{-}(S_i|S_i \cap E_k)]$ is the expected disutility of sanction S_i, given that, having obtained evidential collection E_k, the auditor incurs that sanction.[17]

Let us look at each of these factors in somewhat more detail.

The Probability that the Client's Records Contain Material Error, p(M)

This probability will be, primarily, a function of the quality and comprehensiveness of the client's internal controls. We have already noted that p(M) is also an important factor in determining the minimum evidential support necessary to justify a professional opinion, and that it will be discussed in detail in Chapter IV. We need not, therefore, analyze it further at this time.

[17] Here we assume that the auditor will not incur a sanction unless material error exists and he fails to discover it. Therefore, S_i, the occurrence of the i^{th} sanction, is equivalent to $S_i \cap F \cap M$, the intersection of the occurrences of the i^{th} sanction, the existence of material error, and the auditor's failure to discover the material error, and $E[U^{-}(S_i|S_i \cap E_k)]$ is equivalent to $E[U^{-}(S_i|S_i \cap F \cap M \cap E_k)]$.

The Probability that the Auditor Fails to Detect Material Error Given that It Exists in the Client's Records and He Selects Evidential Collection E_k, $p(F|M \cap E_k)$

This probability is a decreasing function of the evidential support provided by the auditor's collection,[18] and is hence a function of:

1. the composition of that collection, and
2. the evidential support function for a given type of evidence obtained at a given time.

We have already identified the factors which affect this function and indicated that Chapter III will be devoted to their analysis.

The Probability that the i^{th} Sanction Will Be Imposed Given that, Having Selected Evidential Collection E_k, the Auditor Fails to Detect a Material Error which Exists in His Client's Records, $p(S_i|F \cap M \cap E_k)$

This probability depends primarily upon:

1. the composition of E_k,
2. the nature of the specific error involved,
3. the degree of exposure the client's statements receive, indicated by:
   a. the client's size,
   b. the nature of the client's operations,

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[18] More specifically, let us assume a one-to-one relationship in both directions between $B(E_k)$ and $p(F|M \cap E_k)$, i.e.,

$p(F|M \cap E_k) = f(B(E_k))$ and $B(E_k) = g(p(F|M \cap E_k))$,

such that for all $B(E_i) < B(E_j)$, $p(F|M \cap E_i) > p(F|M \cap E_j)$, and for all $B(E_i) = B(E_j)$, $p(F|M \cap E_i) = p(F|M \cap E_j)$, and conversely.

c. the distribution of the client's ownership, and

d. loan covenants which require the client to maintain specified account balances or ratios,

4. the probability that the client will file bankruptcy subsequent to the audit, indicated by:

a. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:

(1) factors which indicate the client's financial position,

(2) economic conditions related to the availability of external capital,

(3) the client's rate and method of growth, and

b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:

(1) the nature of the client's operations,

(2) economic conditions relevant to the client's marketplace,

(3) the client's method of financing operations.

A more detailed discussion of these variables and their expected influence on the auditor's program forms the basis of Chapter V.

The Expected Disutility of the i^{th} Sanction Given that, Having Obtained Evidential Collection E_k, the Auditor Incurs that Sanction, $E[U^{-}(S_i | S_i \cap E_k)]$

The value which the auditor attaches to this factor will, of course, depend upon the specific sanction. For some sanctions such as

admonition, loss of right to practice before the SEC, expulsion from the AICPA and/or loss of license to practice, and imprisonment, the expected disutility is apt to be a constant, dependent upon characteristics of the auditor, himself, and independent of the specific client involved or the degree of audit evidence which the auditor has accumulated. On the other hand, the expected disutility of losing a given client should be a direct function of that client's size. Likewise, the expected disutility of adverse publicity or lawsuit should depend upon the size of the client, the size and nature of the error, and the degree of support provided by the auditor's evidential collection. A detailed analysis of each of the individual sanctions and the type of disutility it may cause the auditor, however, is beyond the scope of this dissertation.

Summary

While, in general, auditing literature indicates little attempt on the part of the public accounting profession to define the relationship between "circumstances of the audit" and the auditor's program, the efforts of Arens and of Anderson, Giese, and Booker have at least specifically identified many of the factors which appear to bear a logical relationship to audit evidence accumulation. This chapter has outlined a decision theory framework for studying the relationship of such audit variables to the nature, timing, and extent of audit testing.

This framework, in summary, assumes that:

Given a number of alternative evidential collections relevant to a particular audit, the auditor should select that collection E_k, which maximizes:

$$U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))] \qquad (O\text{-}1)$$

subject to the constraints:

$$B(E_k) \geq B_{min} \qquad (C\text{-}1)$$

$$T(E_k) \leq T_{max} \qquad (C\text{-}2)$$

$$SR(E_k) \leq SR_{max} \qquad (C\text{-}3)$$

where:

$U^{+}(R(E_k))$ is the utility of the audit fee associated with evidential collection E_k,

$U^{-}(C(E_k))$ is the disutility of the cost of obtaining evidential collection E_k,

$E[U^{-}(S(E_k))]$ is the expected disutility of sanctions associated with evidential collection E_k,

$B(E_k)$ is the degree of support provided by evidential collection E_k,

B_{min} is the minimum evidential support necessary to justify a professional opinion on a given set of financial statements,

$T(E_k)$ is the time required to accumulate evidential collection E_k,

T_{max} is the maximum time available to the auditor for gathering evidence on a given audit engagement,

$SR(E_k)$ denotes the audit staff required to accumulate evidential collection E_k, and

SR_{max} denotes the staff available for a given audit engagement.

Analysis of each of the parameters of the above framework has indicated three of the categories of factors which influence audit evidence accumulation particularly worthy of further study. These categories are:

1. factors which define the evidential support function for a given type of evidence obtained at a given time:
   a. the relevance of the specific type of evidential matter,
   b. the reliability of the specific type of evidential matter, itself a function of:
      (1) the conclusiveness of the given type of evidence,
      (2) the possibility of misinterpreting evidence of this nature,
   c. the timeliness of the evidential matter, itself a function of:
      (1) the time at which the evidence is obtained, and
      (2) the quality and comprehensiveness of the client's internal controls,

d. the characteristics of the population underlying the assertion the auditor wishes to evaluate:

(1) size,

(2) variance,

(3) rate of error, and

e. the existence of corroborative evidence,

2. factors which determine the minimum evidential support necessary to justify a professional opinion on a given set of financial statements:

a. Generally Accepted Auditing Standards and other authoritative pronouncements of the AICPA,

b. authoritative pronouncements of the SEC,

c. regulatory commission requirements,

d. policies of individual public accounting firms,

e. specific terms of the auditor's contract with his client,

f. materiality considerations, and

g. the auditor's evaluation of the probability that his client's records contain material error, based on:

(1) the auditor's findings during his review of the client's internal control system, and

(2) the auditor's findings in actual tests of the client's records, and

3. factors which influence the probability that the auditor will incur sanctions for failing to find a material error given that such error exists in his client's records:

a. the composition of his evidential collection,

b. the nature of the specific error involved,

c. the degree of exposure the client's statements receive, indicated by:

   (1) the client's size,

   (2) the nature of the client's operations,

   (3) the distribution of the client's ownership, and

   (4) loan covenants which require the client to maintain specified account balances or ratios, and

d. the probability that the client will file bankruptcy subsequent to the audit, indicated by:

   (1) factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:

      (a) factors which indicate the client's financial position,

      (b) economic conditions related to the availability of external capital,

      (c) the client's rate and method of growth, and

   (2) factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:

(a) the nature of the client's operations,

(b) economic conditions relevant to the client's marketplace, and

(c) the client's method of financing operations.

While the above framework is useful for studying factors relevant to audit evidence accumulation decisions it is virtually useless for any other applications. Therefore before we look in depth at the factors and attempt to determine their specific effects on the auditor's evidential collection, let us consider further the framework, itself, and its underlying assumptions in an attempt to develop a modified construct which provides more useful guidelines for actual auditing situations.

CHAPTER II

A CONSTRUCT OF AUDITOR BEHAVIOR

The decision theory model of the audit presented in Chapter I assumed that the auditor had before him a number of different possible evidential collections from which he must select one to support his overall opinion on the financial statements under examination. While this assumption reflects conceptually what happens in an audit, and while it leads to a useful framework for the identification and consideration of factors which influence audit evidence accumulation, it does not, nor does it intend to, describe the physical process involved in the development of an audit program. In actual practice, the auditor obviously does not, at one fell swoop, attempt to define a collection of evidence sufficient to support an overall opinion on the financial statements under examination. The amount and variety of evidence necessary to support an overall opinion precludes such an approach. Instead, the auditor typically divides his work into a number of distinct audit areas (e.g., cash, sales and accounts receivable, fixed assets, etc.), performs tests on the fairness of presentation within each area, and, based on the results of these area tests, renders an opinion on the financial statements taken as a whole.

Now, evaluation of any given audit area is, in itself, likely to be a complex matter since, as Mautz has noted, each area consists of a number of individual assertions or propositions concerning the client's activities or records.[1] Presumably, falsity or material error in even one of these propositions may lead to material error in the financial statements taken as a whole. Therefore, before he can accept an audit area as fairly presented, the auditor must attempt to identify and evaluate all the material assertions relevant to that area. As Mautz puts it:

> . . . an audit report is a composite and a complex opinion . . . based upon and made up of a host of subsidiary opinions or judgments. The financial statements which the independent auditor examines and about which he expresses an opinion are themselves composed of a large number of individual propositions on which he must make judgments and form opinions.[2]

Therefore:

> The procedure of judgment formation in auditing must of necessity commence with the individual propositions which in the aggregate make up the financial statements. Only after these have been reviewed and judged is an auditor in position to make his important, over-all judgment.[3]

Apparently, then, "theoretical" as well as practical considerations require the auditor to approach an audit examination from the standpoint of the individual assertions contained in his client's financial statements. Therefore, the purpose of this chapter will be to

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[1] R. K. Mautz, "Evidence, Judgment, and the Auditor's Opinion," The Journal of Accountancy 107 (April 1959): 40.

[2] Ibid.

[3] Ibid., p. 42.

expand and revise our model of audit evidence accumulation so that it incorporates Mautz' "propositions" approach. As we shall see, the resulting construct, while more closely aligned to the physical process of audit evidence accumulation, will still be normative in nature -- and, unfortunately, will be virtually impossible of any practical application. Because of the model's lack of applicability, the chapter will conclude with suggestions as to how an auditor might at least approximate the ideal which the normative construct represents.

The basic framework for the revised model consists of the following steps:[4]

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[4]This framework is essentially a combination of Mautz and Sharaf's outline of "auditing methodology for dealing with problems or issues of fact:

1. Recognition (acceptance) of the composite problem (the audit assignment).
2. Observation of facts relevant to the problem.
3. Subdivision of the composite problem into individual problems.
4. Determination of available evidence pertinent to each individual problem.
5. Selection of applicable audit techniques and development of appropriate procedures.
6. Performance of procedures to obtain evidence.
7. Evaluation of evidence
   a. With respect to pertinence and validity.
   b. For indications of any additional problems.
   c. With respect to adequacy for judgment formation.
8. Formulation of judgment
   a. On individual propositions.
   b. On the composite problem." (p. 27)

and their outline of "the procedure of judgment formation:

1. Recognition of the proposition to be proved.
2. Evaluation of the proposition as one requiring evidence of a high or moderate degree of probability.
3. Collection of evidence within the given limits of time and cost.
4. Evaluation of the evidence obtained as valid or not valid.

1. identify all the material propositions contained in the set of financial statements under examination,
2. for each proposition:
   a. determine the degree of evidential support required to justify an opinion on the proposition,
   b. select the kind(s) and estimate the quantity(ies) of evidential matter necessary to provide the required degree of evidential support,
   c. design the audit procedure(s) necessary to yield the desired kind(s) and quantity(ies) of evidence,
   d. apply the procedure(s) and amass a collection of evidential matter, and
   e. evaluate the collection of evidence (If the evidence provides sufficient justification, render an opinion on the proposition. If not, either gather more evidence or disclaim an opinion on that proposition.),
3. based upon the results of the individual proposition evaluations, render (or disclaim) an opinion on the financial statements as a whole.

A Propositions Approach Construct for Audit Evidence Accumulation

Before looking at the above framework in depth, let us consider how the requirement that the auditor evaluate each individual proposition in a set of financial statements would alter our Chapter I model.

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5. Formulation of judgment as to the proposition at issue." (p. 103)

R. K. Mautz and Hussein A. Sharaf, The Philosophy of Auditing, Menasha, Wisconsin, George Banta Company, Inc., 1964, pp. 27, 103.

Clearly, regardless of whether the auditor defines his evidential requirements "at one fell swoop" or proposition by proposition, the overall time and staff requirements for obtaining any resulting collection may not exceed the time and staff available for the engagement. Therefore, as in the case of the original model, the following constraints hold:[5]

$$T(E_k) \leq T_{max}, \text{ and} \tag{C-2}$$

$$SR(E_k) \leq SR_{max}. \tag{C-3}$$

Likewise, since it seems reasonable to assume that, regardless of how he determines his evidential requirements, the auditor's goal is to maximize his net expected utility from the audit, our model's objective function remains unchanged, i.e.:

$$\text{Maximize } U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))]. \tag{O-1}$$

In fact, the only difference between our original model and one which requires the auditor to identify and evaluate each material proposition is that, in the first case, the evidential collection must

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[5] At this point, let us note that the time and staff constraints, as set forth above, are symbolic, representing the notion that time and staff requirements may not, in any way, exceed the time and staff available for the audit. In this respect, each of the constraints actually represents a number of sub-constraints. Enumeration of these sub-constraints, however, is unnecessary for the purposes of the present discussion.

We might also note that, in general, the time and staff available for an engagement can affect all three parameters of the auditor's evidential collection. With one exception, however (the effect of staff availability on audit timing), actual testing of the relative influence of these constraints on audit evidence accumulation is beyond the scope of this dissertation.

satisfy an overall support constraint while, in the second case, it must satisfy a support constraint for each assertion to be tested -- the presumption being that if the auditor has identified all the material propositions in the financial statements and if he has accumulated sufficient evidential matter to support or refute each proposition, then he has also met the evidential requirements for an opinion on the financial statements taken as a whole. In this case, then, we must replace the single constraint:

$$B(E_k) \geq B_{min}, \qquad \text{(C-1)}$$

with the set of r constraints:

$$b_a(E_k) \geq b_{amin}, \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1a)}$$

where: $b_a(E_k)$ is the degree of support provided by evidential collection E_k for the auditor's opinion on the a^{th} assertion of his client's financial statements,

b_{amin} is the minimum evidential support necessary for a professional opinion on that a^{th} assertion, and,

both $b_a(E_k)$ and b_{amin} are determined by the same factors that determine, respectively, $B(E_k)$ and B_{min} in the original model.[6]

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[6]Note that a factor which affects b_{amin} for any given assertion is thus that assertion's relative materiality. Furthermore, a factor which contributes to $b_a(E_k)$ is the existence of corroborative evidence. In a piecemeal opinion, the financial statement item of interest is logically of greater relative materiality than it would be as part of a complete set of financial statements. Also, in a piecemeal opinion, the auditor does not have the degree of corroborative evidence normally available in an overall audit. For both of these reasons, then,

At this point, let us recall that, in Chapter I, we assumed that the probability that an auditor will fail to detect material error which exists in his client's financial records given that he has selected evidential collection, E_k, and the evidential support provided by that collection bear a one-to-one inverse relationship to one another, i.e.:

$$p(F|M \cap E_k) = f(B(E_k)) \text{ and } B(E_k) = g(p(F|M \cap E_k))$$

such that for all $B(E_i) < B(E_j)$, $p(F|M \cap E_i) > p(F|M \cap E_j)$, and for all $B(E_i) = B(E_j)$, $p(F|M \cap E_i) = p(F|M \cap E_j)$, and conversely. (Supra, footnote 18, p. 27.)

The analogous case for our current model is:

$p(F|M_a \cap E_k) = f(b_a(E_k))$, and $b_a(E_k) = g(p(F|M_a \cap E_k))$,
such that for all $b_a(E_i) < b_a(E_j)$,
$p(F|M_a \cap E_i) > p(F|M_a \cap E_j)$, and
for all $b_a(E_i) = b_a(E_j)$, $p(F|M_a \cap E_i) = p(F|M_a \cap E_j)$,
and conversely,

where: $p(F|M_a \cap E_k)$ is the probability that the auditor will fail to discover material error which exists in the a^{th} assertion of the client's records, given that he selects evidential collection E_k.

It follows from this assumption that a set of constraints equivalent to:

$$b_a(E_k) \geq b_{amin} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1a)}$$

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the auditor must normally test an item more extensively for a piecemeal opinion than for an overall opinion on the financial statements of which that item is a part.

would be:

$$p(F|M_a \cap E_k) \leq p_{amax} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1b)}$$

where: p_{amax} is the maximum allowable probability that the auditor will fail to detect material error which exists in the a^{th} assertion of his client's statements (obtained, at least conceptually, by substituting b_{amin} for $b_a(E_k)$ in the function, $f(b_a(E_k))$),[7]

and we may write our revised model as:

$$\text{Maximize:} \quad U^+(R(E_k)) + U^-(C(E_k)) + E[U^-(S(E_k))] \qquad \text{(O-1)}$$

$$\text{subject to:} \quad T(E_k) \leq T_{max} \qquad \text{(C-2)}$$

$$SR(E_k) \leq SR_{max} \qquad \text{(C-3)}$$

$$b_a(E_k) \geq b_{amin} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1a)}$$

or

$$p(F|M_a \cap E_k) \leq p_{amax} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1b)}$$

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[7] Given statistical sampling techniques, this alternative set of constraints would appear, in most cases, to be more easily quantifiable than "degree of evidential support."

Unfortunately, neither formulation of the above model is of much practical use to the auditor (except insofar as it identifies or places in proper perspective variables relevant to his evidential accumulation problem). Even though the various parts of the model are conceptually quantifiable, in practice their quantification would be difficult and, in many cases, arbitrary (e.g., quantification of the expected disutility of sanctions as a function of the evidential collection selected). Therefore, until the accounting profession performs considerably more extensive research on the relationships between evidential matter and evidential support, and until auditors agree on quantifiable operational definitions of the factors relevant to evidence accumulation, simultaneous solution of the massive system of equations proposed above seems beyond reach.

The obvious question which arises, then is whether it is possible to construct an approximation to the ideal represented by the above model -- either a system of equations which auditors could solve or estimate the solution of, or at least a set of guidelines they might follow to relate relevant factors to the audit evidence accumulation process.

The following is an attempt to modify the "propositions approach" model to arrive at such an approximation. One should keep in mind that even though this approximation may relax some of the conditions of the original model, it must remain normative in nature since it suggests an approach auditors <u>might</u> follow in determining evidential requirements rather than attempting to describe the process they actually <u>do</u> follow.

An Approximation of the Ideal

The primary hindrance to applying the "propositions approach" model as it now stands would seem to be the objective function. Auditors appear reasonably able to identify and work within time and staff constraints, and, while their estimates of such requirements may be crude, they also seem able to satisfy evidential support constraints (even if only through considerable "overauditing"). The objective function, however, poses two barriers to practical application:

1. measurement of the expected disutility of sanctions as a function of audit evidence obtained, and
2. assumption that net utility is the factor to be maximized and the difficulties inherent in any attempt to measure utility.

Overcoming the second barrier is, of course, a simple matter. One need merely adopt "revenue" and "cost" as surrogates for "utility" and "disutility," and thus change the objective function to:

$$\text{Maximize } R(E_k) - C(E_k) - E[C(S(E_k))] \qquad \text{(O-1a)}$$

where: $R(E_k)$ is the audit fee associated with evidential collection E_k,

$C(E_k)$ is the cost of obtaining evidential collection E_k, and

$E[C(S(E_k))]$ is the expected cost of sanctions associated with collection E_k.

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Certainly $R(E_k)$ and $C(E_k)$ are more objectively measurable than their respective utilities. For $E[C(S(E_k))]$, however, the case is not so clear. Some sanctions are difficult indeed to assign a dollar cost -- conceptually, let alone practically. For example, one may question whether it even makes sense to view admonition, loss of license, expulsion from the AICPA, or imprisonment in terms of dollars and cents. Thus, even relaxing the assumption that net utility is the factor to be maximized does not render the objective function applicable to actual audit situations.

Suppose, however, that we eliminate for the moment the expected cost (or disutility) of sanctions from consideration. The objective function would then become:

$$\text{Maximize } R(E_k) - C(E_k). \tag{O-2}$$

Profit maximization, however, seems somehow inappropriate as an objective for a service professional such as the public accountant. Certainly where the auditor's charges are a function of his direct expenses, professional ethics should prevent his performing tests for the sole purpose of increasing his fee. Furthermore, for many engagements, the auditor's fee is a fixed amount -- the result of negotiations prior to any actual field work. Therefore, if we omit the expected cost of sanctions from the objective function, let us assume <u>cost minimization</u> as the auditor's objective rather than profit maximization. We may then write the objective function as simply:

$$\text{Minimize } C(E_k). \tag{O-3}$$

Now, even though reasons of practicality may require the auditor to omit the expected disutility of sanctions from his objective function, he cannot completely ignore this relatively important factor and still hope to approximate any "ideal" model. Therefore, since he cannot include the expected disutility of sanctions in his objective function, he must introduce it as a constraint of the form:

$$E[\bar{U}(S(E_k))] \leq \bar{U}_{max}(S) \qquad (C\text{-}4)$$

where: $E[\bar{U}(S(E_k))]$ is the expected disutility of sanctions associated with evidential collection E_k, and

$\bar{U}_{max}(S)$ is the maximum expected disutility of sanctions the auditor is willing to accept and is strictly a function of firm policy and individual auditor preference.

The expected disutility of sanctions proves to be much easier to handle in this form. In the first place, the auditor need not measure it with the precision he would require were it part of his objective function. Instead, he may simply offset any lack of precision in the factor's measurement by obtaining sufficient evidence to insure slack in the constraint -- i.e., a margin of safety -- at least equal to his lack of precision.[8] Of even greater importance, however, is the fact that treating the expected disutility of sanctions as a constraint

[8]The general effect of this constraint (discussed more fully on pp. 61-63) is to increase the auditor's evidential support requirement beyond the "minimum necessary for a professional opinion" on any given assertion.

removes the restriction that it be combinative with revenues and costs and, as we shall see, enables the auditor to replace it with an equivalent set of constraints even easier to handle from a practical standpoint.

The first step toward this proposed simplification is to replace the overall disutility constraint with a set of similar constraints -- one corresponding to each material assertion in the client's financial statements. Recall that in our "propositions approach" construct, we have assumed that the auditor's responsibility for an opinion on any set of financial statements extends to a responsibility for evaluating each individual material proposition or assertion contained in those statements. Because of this responsibility, an auditor faces the risk of incurring sanctions for failure to detect material error in each proposition he evaluates. We may denote the expected disutility of sanctions associated with any particular assertion, a, as $E[\bar{U}(S(E_k,a))]$, and note that, in general:

$$E[\bar{U}(S(E_k,a))] = p(M_a)\ p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)\ E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]],$$

where:

$p(M_a)$ is the probability that the a^{th} assertion is materially misstated,

$p(F|M_a \cap E_k)$ is the probability that the auditor fails to detect such error given that it

exists and he selects evidential collection E_k,

$p(S_i | F \cap M_a \cap E_k)$ is the probability that the auditor will incur sanction, S_i, given that, having selected evidential collection E_k, he fails to detect a material misstatement which exists in the a^{th} assertion, and

$E[U^{-}(S_i | S_i \cap F \cap M_a \cap E_k)]$ is the expected disutility of sanction S_i, given that, having obtained evidential collection E_k, the auditor incurs the sanction for failing to detect a material error which exists in the a^{th} assertion.

Now, presumably, the expected disutility of sanctions for failure to detect material error in the financial statements as a whole is merely the sum over all propositions of the expected disutility of sanctions for failure to detect material error in each proposition. Therefore, we may rewrite our constraint:

$$E[\bar{U}(S(E_k))] = \sum_a E[\bar{U}(S(E_k,a))]$$

$$= \sum_a [p(M_a)\ p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)$$

$$E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]]]$$

$$\leq \bar{U}_{max}(S) \qquad (i = 1, 2, \ldots, s;\ a = 1, 2, \ldots, r)$$

One way of assuring that the auditor will satisfy constraint, (C-4), is to require that for each assertion, a:

$$p(M_a)\ p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)$$

$$E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]] \leq \frac{\bar{U}_{max}(S)}{r} \qquad \text{(C-4a)}$$

where: r is the number of assertions contained in the financial statements.

Therefore, a set of constraints, one for each material assertion in the financial statements can replace the original overall disutility constraint.

Evaluation of the right side of each of these constraint inequalities is relatively simple once the auditor has determined $\bar{U}_{max}(S)$ (which we previously noted will be a function of firm policy and individual auditor preference). Evaluation of the left side, however, is complicated because of the number of factors the auditor must take into account:

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1. $p(M_a)$, a function of the quality and comprehensiveness of the client's relevant internal controls,
2. $p(F|M_a \cap E_k)$, a function of the composition of evidential collection, E_k,
3. $p(S_i|F \cap M_a \cap E_k)$, a function of:
   a. the composition of evidential collection E_k,
   b. the nature of the specific error involved,
   c. the degree of exposure the client's statements will receive, indicated by the client's: (1) size, (2) nature of operations, (3) ownership distribution, (4) issuance of covenanted securities, and
   d. the client's general health, indicated by the client's: (1) general financial condition, (2) rate and method of growth, (3) method of financing operations, and (4) general economic environment, and
4. $E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]$, a function of:
   a. the specific sanction, and the auditor's utility function,
   b. (in some cases) the composition of evidential collection E_k, and
   c. (in some cases) the size and nature of the misstatement.

Clearly, it would be far more convenient if the left side of the inequality were a function solely of the composition of E_k, and the right side incorporated all the other relevant factors. Then the auditor would only have to consider these factors once, rather than once

for each evidential collection evaluated. Fortunately, we can construct such a set of constraints.

Toward that end, let us note first of all, that since $p(M_a)$ is independent of E_k, we may divide both sides of the inequality by this factor, leaving:

$$p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)$$

$$E[U^-(S_i|S_i \cap F \cap M_a \cap E_k]] \leq \frac{U^-_{max}(S)}{r[p(M_a)]}. \qquad \text{(C-4b)}$$

We have previously assumed that $p(F|M_a \cap E_k)$ is a decreasing function of $b_a(E_k)$, the evidential support provided by collection E_k for the auditor's evaluation of the a^{th} assertion in the client's financial statements. Since no a priori reason exists for us to believe that the auditor's probability of incurring sanctions or his expected cost for sanctions incurred should <u>increase</u> as his evidential support increases, let us also assume that, for each sanction, S_i, $p(S_i|F \cap M_a \cap E_k)$ and $E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]$ are decreasing or constant functions of $b_a(E_k)$. Then it must follow that:

$$p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)\ E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]]$$

is not only also a decreasing function of $b_a(E_k)$, but is an <u>increasing</u> function of $p(F|M_a \cap E_k)$, i.e., for $p(F|M_a \cap E_h) \leq p(F|M_a \cap E_j)$,

$$p(F|M_a \cap E_h) \sum_i [p(S_i|F \cap M_a \cap E_h)\ E[U^-(S_i|S_i \cap F \cap M_a \cap E_h)]]$$

$$\leq p(F|M_a \cap E_j) \sum_i [p(S_i|F \cap M_a \cap E_j)\ E[U^-(S_i|S_i \cap F \cap M_a \cap E_j)]],$$

with equality holding in this statement if and only if:

$$p(F|M_a \cap E_h) = p(F|M_a \cap E_j).$$

Now, suppose that the auditor could identify the collection, E', for which:

$$p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k) \; E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]] \leq \frac{U^-_{max}(S)}{r[p(M_a)]}$$

takes its maximum value. Then clearly, any other collection, E_k, he might wish to evaluate would satisfy constraints, C-4b, if and only if:

$$p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k) \; E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]]$$

$$\leq p(F|M_a \cap E') \sum_i [p(S_i|F \cap M_a \cap E') \; E[U^-(S_i|S_i \cap F \cap M_a \cap E')]].$$

Since, however, $p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k)$ $E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]]$ is an increasing function of $p(F|M_a \cap E_k)$, the auditor need only insure that his collection satisfies: $p(F|M_a \cap E_k) \leq p(F|M_a \cap E')$ to satisfy this condition. Therefore, the set of constraints:

$$p(F|M_a \cap E_k) \leq p(F|M_a \cap E') \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-4c)}$$

is equivalent to the set of constraints:

$$p(F|M_a \cap E_k) \sum_i [p(S_i|F \cap M_a \cap E_k) \; E[U^-(S_i|S_i \cap F \cap M_a \cap E_k)]] \leq \frac{U^-_{max}(S)}{r[p(M_a)]} \qquad \text{(C-4b)}$$

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Estimating $p(F|M_a \cap E')$

The advantage of the set of constraints, C-4c, is that the left side factor is a function solely of the evidential collection under consideration, while the other factors relevant to these constraints (<u>supra</u>, p. 50) now exert their influence on the right side. A conceptual problem arises, however, with respect to the calculation of $p(F|M_a \cap E')$. If the value of $\sum_i [p(S_i|F \cap M_a \cap E') \; E[U^-(S_i|S_i \cap F \cap M_a \cap E')]]$ were independent of the value of $p(F|M_a \cap E')$, then solving the inequality for this latter factor would be a simple matter of dividing both sides of the constraint by the summation. Since, however, $\sum_i [p(S_i|F \cap M_a \cap E') \; E[U^-(S_i|S_i \cap F \cap M_a \cap E')]]$ may be a function of $p(F|M_a \cap E')$, the auditor cannot use this approach. In fact, in order to calculate the value of $p(F|M_a \cap E')$, he must first know the actual composition of E' -- but it is most unlikely that he will ever have this information in an actual audit situation. If, however, he could approximate $\sum_i [p(S_i|F \cap M_a \cap E') \; E[U^-(S_i|S_i \cap F \cap M_a \cap E')]]$ with an appropriate constant, he might still be able to obtain a useful estimate of $p(F|M_a \cap E')$ which does not require specific knowledge of the composition of E'.

In fact, a useful approximation of $\sum_i [p(S_i|F \cap M_a \cap E') \; E[U^-(S_i|S_i \cap F \cap M_a \cap E')]]$ does exist. Recall that the auditor's evidential collection must already satisfy another set of constraints with respect to $p(F|M_a \cap E_k)$, specifically:

$$p(F|M_a \cap E_k) \leq p_{amax} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-3a)}$$

where: p_{amax} is determined by: (1) generally accepted auditing standards and authoritative pronouncements of the AICPA, (2) authoritative pronouncements of the SEC, (3) commission requirements (for regulated industries), (4) policies of individual public accounting firms, (5) specific terms of the auditor-client contract, (6) materiality considerations, and (7) the auditor's evaluation of the probability that the a^{th} assertion of his client's financial records contains material error.

Now presumably, if the auditor's evidential collection satisfies this requirement, then for each sanction, S_i, $p(S_i|F \cap M_a \cap E_k)$ will be quite low (in most cases = 0), and hence not extremely sensitive to further decreases in $p(F|M_a \cap E_k)$. Furthermore, for most sanctions (the main exception being lawsuits), $E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]$ is apt to be <u>generally</u> insensitive to changes in $p(F|M_a \cap E_k)$. Therefore, $\sum_i [p(S_i|F \cap M_a \cap E_k)\ E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]]$ should not vary drastically with changes in $p(F|M_a \cap E_k) \leq p_{amax}$. For this reason,

$$\sum_i [p(S_i|F \cap M_a \cap (E_k : p(F \cap M_a \cap E_k) = p_{amax}))$$
$$E[\bar{U}(S_i|S_i \cap F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))]]$$

where: $p(S_i|F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))$ is the probability that the auditor will incur sanction, S_i, given that, having obtained the minimum evidential

support necessary for a professional judgment on the a^{th} assertion in his client's financial statements, he fails to discover a material misstatement existing in that assertion, and $E[U^{-}(S_i|S_i \cap F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))$ is the expected disutility of sanction, S_i, given that, having obtained the minimum evidential support necessary for a professional judgment on the a^{th} assertion in his client's financial statements, the auditor fails to discover a material misstatement existing in that assertion and therefore incurs the sanction,

suggests itself as an approximation of $\sum_i [p(S_i|F \cap M_a \cap E') E[U^{-}(S_i|S_i \cap F \cap M_a \cap E')]]$.

Adopting this approximation permits at least a conceptual estimate of $p(F|M_a \cap E')$ (without requiring actual knowledge of the composition of E') as follows:

$$p(F|M_a \cap E') \approx \frac{U^{-}_{max}(S)}{r[p(M_a)] \sum_i [p(S_i|F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax})) E[U^{-}(S_i|S_i \cap F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))]]}$$

To the auditor, $p(F|M_a \cap E')$ represents the maximum acceptable probability (based upon his evaluation of the expected disutility of sanctions) that he will fail to detect a material error existing in the a^{th} assertion of his client's financial statements. Therefore,

let us denote our estimate of this probability as $p_{amaxrisk}$. If the auditor is to be able to replace the set of constraints:

$$p(F|M_a \cap E_k) \leq p(F|M_a \cap E') \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-4c)}$$

with a similar set:

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-4d)}$$

he must first be sure that $p_{amaxrisk}$ is a conservative estimate, i.e.,

$$p_{amaxrisk} \leq p(F|M_a \cap E').$$

If, and only if, this condition holds, any evidential collection which satisfies the C-4d constraints will also satisfy the C-4c constraints, since, in this case, $p_{amaxrisk}$, will obviously be the tighter constraint.

To see whether this condition indeed holds, we must consider two possible cases, (1) $p(F|M_a \cap E') \leq p_{amax}$, and (2) $p(F|M_a \cap E') > p_{amax}$. We have previously assumed $\sum_i [p(S_i|F \cap M_a \cap E_k)$ $E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]]$ to be a decreasing or constant function of $p(F|M_a \cap E_k)$. Therefore, if $p(F|M_a \cap E') \leq p_{amax}$, obviously:

$$\sum_i [p(S_i|F \cap M_a \cap E')\ E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E')]]$$

$$\leq \sum_i [p(S_i|F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))$$

$$E[\bar{U}(S_i|S_i \cap F \cap M_a \cap (E_k : p(F|M_a \cap E_k) = p_{amax}))]],$$

in which case, since division of $\frac{\bar{U}_{max}(S)}{r[p(M_a)]}$ by the latter factor must

yield a smaller probability than division by the former factor:

$$p_{amaxrisk} \leq p(F|M_a \cap E').$$

If, however, $p(F|M_a \cap E') > p_{amax}$, the senses of the above inequalities are all reversed and:

$$p_{amaxrisk} > p(F|M_a \cap E').$$

Therefore, $p_{amaxrisk}$ is a conservative estimate of $p(F|M_a \cap E')$ if, and only if,

$$p(F|M_a \cap E') \leq p_{amax}.$$

This situation is actually sufficient, however, since where $p(F|M_a \cap E') > p_{amax}$, the p_{amax} constraint will govern the auditor's behavior, and the fact that $p_{amaxrisk} > p(F|M_a \cap E')$ will not matter since the C-4c (or C-4d) constraint will be superfluous anyway.

Now, admittedly, substitution of the somewhat tighter C-4d constraints for the C-4c constraints may result in overauditing. If, however, $p(S_i|F \cap M_a \cap E_k)$ and $E[\bar{U}(S_i|S_i \cap F \cap M_a \cap E_k)]$ are, in fact, relatively insensitive to changes in $p(F|M_a \cap E_k) < p_{amax}$ (as we have assumed), the overauditing due to this substitution will not be extensive.

A Modified Propositions Approach Construct for Audit Evidence Accumulation

Substitution of the objective function:

$$\text{Minimize } C(E_k), \tag{O-3}$$

and the set of constraints:

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r) \tag{C-4d}$$

for the objective function:

$$\text{Maximize} \quad U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))] \qquad (O\text{-}1)$$

leaves the following modified (normative) "propositions approach" model:

$$\text{Minimize} \quad C(E_k)$$

subject to the constraints:

$$T(E_k) \leq T_{max}$$

$$SR(E_k) \leq SR_{max}$$

$$p(F|M_a \cap E_k) \leq p_{amax}, \text{ or } b_a(E_k) \geq b_{amin} \qquad (a=1, 2, \ldots, r)$$

$$p(F|M_a \cap E_k) \leq p_{amaxrisk}, \text{ or } b_a(E_k) \geq b_{aminrisk}^{9} \qquad (a=1, 2, \ldots, r)$$

To show how this modified "propositions approach" model relates to actual audit situations, the remainder of this chapter explores the model's implications for the following steps in audit judgment formation (originally introduced <u>supra</u>, p. 38):

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[9] Since we have assumed $b_a(E_k)$ a decreasing function of $p(F|M_a \cap E_k)$, the set of constraints:

$$b_a(E_k) \geq b_{aminrisk} \qquad (a = 1, 2, \ldots, r) \qquad (C\text{-}4e)$$

is equivalent to the set of constraints:

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r) \qquad (C\text{-}4d)$$

where $b_{aminrisk}$ signifies to the auditor the minimum evidential support necessary for an opinion on the a^{th} assertion of his client's financial statements given the client's "health" and the exposure his statements will receive. The value of $b_{aminrisk}$ is obtained, at least conceptually, by substituting $p_{amaxrisk}$ for $p(F|M_a \cap E_k)$ in the function, $b_a(E_k) = g(p(F|M_a \cap E_k))$, or as a direct function of the factors which determine $p_{amaxrisk}$ (<u>supra</u>, p. 50).

1. identify all the material propositions contained in the set of financial statements under examination (pp. 59-60),
2. for each proposition:
   a. determine the degree of evidential support required to justify an opinion on the proposition (pp. 61-63),
   b. select the kind(s) and estimate the quantity(ies) of evidential matter necessary to provide the required degree of evidential support (pp. 64-68),
   c. design the audit procedure(s) necessary to yield the desired kind(s) and quantity(ies) of evidence (p. 68),
   d. apply the procedure(s) and amass a collection of evidential matter (p. 68),
   e. evaluate the collection of evidence (If the evidence provides sufficient justification, render an opinion on the proposition. If not, either gather more evidence or disclaim an opinion on that proposition.), (pp. 69-71),
3. based upon the results of the individual proposition evaluations, render (or disclaim) an opinion on the financial statements as a whole (pp. 71-72).

Identify All the Material Propositions Contained in the Set of Financial Statements under Examination

Identifying all of the important propositions comprising a given financial statement item will usually require great care on the auditor's part since such propositions are often subtle. For example, consider the following:

Marketable Securities . . . . . $20,000.

According to Mautz, this typical balance sheet item contains "at least four propositions requiring competent evidential matter for their disposition:

1. That the company owns the investments.
2. That the amount shown is reasonable and determined in accordance with generally accepted principles of accounting.
3. That the investments are actually marketable.
4. That they are classified appropriately in the financial statements."[10]

Important as the task of proposition identification is, however, further discussion of this phase of the auditor's work is beyond the scope of this dissertation, which is primarily concerned with the auditor's approach to verifying such propositions as he is able to identify.

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[10]R. K. Mautz, "The Nature and Reliability of Audit Evidence," The Journal of Accountancy 105 (May 1958): 44.

For Each Proposition:

a. Determine the Degree of Evidential Support Required for Evaluation of that Proposition,
b. Select the Kind(s) and Estimate the Quantity(ies) of Evidential Matter Necessary to Provide the Required Degree of Evidential Support,
c. Design the Audit Procedure(s) Necessary to Yield the Desired Kind(s) and Quantity(ies) of Evidence,
d. Apply the Procedure(s) and Amass a Collection of Evidential Matter, and
e. Evaluate the Collection of Evidence (If the Evidence Provides Sufficient Justification, Render an Opinion on the Proposition. If Not, Either Gather More Evidence or Disclaim an Opinion on that Proposition)

Determine the Degree of Evidential Support Required

The relationship between this step in the performance of an audit engagement and the modified "propositions approach" model should be obvious. This is the point at which the auditor determines b_{amin} and $b_{aminrisk}$ (or, equivalently, p_{amax} and $p_{amaxrisk}$). We have already identified the factors which determine these constraints (supra, pp. 19-20, 50), and will discuss them further in Chapters IV and V, respectively.

Ideally, of course, the auditor would obtain quantitative measurements for each of these factors, substitute their values in appropriate mathematical functions, and thereby derive quantitative constraints. In actual practice, however, virtually none of the relevant factors lend themselves to meaningful quantification. Furthermore, the appropriate functions for relating these factors to b_{amin}, $b_{aminrisk}$, p_{amax}, and $p_{amaxrisk}$ are not apt to be well defined. These constraints, therefore, must, at least for the present, remain subjective in nature. Even if the auditor is unable to place quantitative measures on the degree of evidential support necessary for him to

judge the validity of a particular financial statement assertion, however, he can define what, in terms of evidential matter, he needs to support an opinion on the assertion's truth or falsity, and even if he is unable to define precisely the maximum acceptable probability that he will fail to find a material error which exists in a particular assertion of his client's financial statements, he should be able to arrive at a rough estimate of that probability.

At any rate, regardless of the form these constraints take, the basic approach to their determination is the same. Ideally, the auditor should first define his minimum evidential requirements based upon:

1. Generally Accepted Auditing Standards and other authoritative pronouncements of the AICPA,
2. authoritative pronouncements of the SEC,
3. commission requirements for regulated industries,
4. policies of his accounting firm,
5. specific terms of his contract with his client,
6. materiality considerations, and
7. his evaluation of the probability that his client's records contain material error, based on:
    a. his findings during his review of the client's internal control system,
    b. his findings in actual tests of the client's records,
    c. his evaluation of the "general" riskiness of the client.

When he has established these minimum requirements, he should then evaluate their adequacy in the light of such risk factors as:

1. the degree of exposure the client's statements will receive, indicated by:
   a. the client's size,
   b. the nature of the client's operations,
   c. the distribution of the client's ownership, and
   d. loan covenants which require the client to maintain specified account balances or ratios,
2. the probability that the client will file bankruptcy subsequent to the audit, indicated by:
   a. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:
      (1) factors which indicate the client's financial position,
      (2) economic conditions related to the availability of external capital,
      (3) the client's rate and method of growth, and
   b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:
      (1) the nature of the client's operations,
      (2) economic conditions relevant to the client's marketplace,
      (3) the client's method of financing operations.

Select the Kind(s) and Estimate the Quantity(ies) of Evidential Matter Necessary to Provide the Required Degree of Evidential Support

Having determined the evidential support requirements for a particular financial statement assertion, the auditor's next step is to convert these requirements into specific evidential requirements, i.e., convert from b_{amin} and $b_{aminrisk}$ (or p_{amax} and $p_{amaxrisk}$) to q_{ij}. At this point, let us note that, in general, any unit of evidential matter displays one of the following mutually exclusive characteristics:

1. it tends to support the proposition in question ("positive"),
2. it tends to refute the proposition in question ("negative"),
3. it neither supports nor refutes the proposition in question ("neutral").

The evidential support provided by a given evidential collection, E_k, will be a function of the number of positive and negative units of each type of evidence included in the collection and the degree of support provided for an opinion on that assertion by a unit of positive or negative evidence of a given type,[11] i.e.:

$$b_a(E_k) = b_a(\{q^+_{ija}, q^-_{ija} : i = 1, 2, \ldots, m; j = 1, 2, \ldots, n\}) \qquad (a = 1, 2, \ldots, r)$$

[11] Thus we assume that "neutral" units or types of evidential matter contribute evidential support = 0.

where: q^{+}_{ija} denotes the number of units of type i evidence gathered at time, t_j, which are "positive" with respect to the a^{th} assertion in the client's financial records, and

q^{-}_{ija} denotes the number of units of type i evidence gathered at time, t_j, which are "negative" with respect to the a^{th} assertion in the client's financial records.

Now, if each individual proposition in a set of financial statements were entirely independent of all other propositions in those statements, and if each proposition required entirely different types of evidential support for its verification, the auditor's attempts at minimizing audit costs would consist of minimizing the cost of gathering sufficient evidence to verify each assertion individually. To be sure, he would have to consider a number of factors, including:

1. requirements of Generally Accepted Auditing Standards and other authoritative pronouncements of the AICPA, SEC, and other relevant regulatory commissions,
2. staff constraints,
3. time constraints,
4. the evidential support function for each available type of evidence obtained at each possible time of collection, a function including the following variables in addition to the number of units involved:

a. the relevance of the specific type of evidential matter to each proposition,

b. the reliability of the specific type of evidential matter, itself a function of:

(1) the conclusiveness of the given type of evidence, and

(2) the possibility of misinterpreting evidence of this nature,

c. the timeliness of the evidential matter, itself a function of:

(1) the time at which the evidence is obtained, and

(2) the quality and comprehensiveness of the client's internal controls,

d. the statistical parameters of the population underlying the assertion he wishes to evaluate:

(1) size,

(2) variance,

(3) rate of error, and

e. the existence of corroborative evidence,

5. the cost function of each type of evidential matter.

Nevertheless, for each assertion, the auditor would probably not be concerned with more than a few relevant types of evidence, and he would not have to handle the decision complications posed by situations in which certain types of evidence provided support for more than one assertion.

This pure state, however, does not exist since, as Leight has noted:

> . . . an audit is like the piecing together of a jigsaw puzzle, one piece gives us the outline for the next piece. When we audit one account, we get some information about another account, and when we are finished auditing all the accounts they will fit together and form a picture . . .[12]

Therefore, if the auditor tests each assertion separately without reference to any other assertions, he will undoubtedly be guilty of grossly "overauditing." On the other hand, because of the large number of assertions, available types of evidence, and extent and timing alternatives, finding the specific collection which absolutely minimizes audit costs (except purely by accident) is undoubtedly beyond the auditor's capacity. Nevertheless, the norm suggests some basic guidelines which might aid him to reduce the extent of overauditing.

First of all, as the auditor attempts to identify types of evidence relevant to a given assertion, he should keep in mind three potential sources of evidential support for his opinion:

1. evidential matter specifically selected for evaluation of the assertion in question,
2. evidential matter specifically selected for evaluation of some other assertion, and
3. the actual status of other assertions.

Secondly, because "an audit is like the piecing together of a jigsaw puzzle," when determining the type, extent, and timing of

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[12]Lester A. Leight, "Recommended Opinions and Disclaimers," The New York Certified Public Accountant 33 (June 1963): 412.

specific tests he will perform on any particular proposition, the auditor should remain aware of the possibility that, by the time he comes to judge that proposition, he may already have a fair amount of evidential support on which to base his judgment -- support obtained during the evaluation of other propositions. Furthermore, when selecting the type, extent and timing of tests he wishes to perform (in addition to considering Generally Accepted Auditing Standards and time and staff constraints, and in addition to evaluating each potential test with respect to its cost and the degree of evidential support it should provide for his opinion on the assertion of interest), the auditor should also evaluate each potential test on the basis of evidential support it may provide for his opinion on other assertions in the client's financial statements.

Design the Audit Procedures Necessary to Yield the Desired Kind(s) and Quantity(ies) of Evidence

This step merely involves translating evidential requirements into specific tests and procedures capable of yielding the desired kinds and quantities of evidential matter and further discussion of it is unnecessary for the purposes of this dissertation.

Apply the Procedures and Amass a Collection of Evidential Matter

This step is self-explanatory.

Evaluate the Collection of Evidence. (If the Evidence Provides Sufficient Justification, Render an Opinion on the Proposition. If Not, Either Gather More Evidence or Disclaim an Opinion on that Proposition.)

In this step, the auditor essentially looks at his collection, identifies the set, $\{q^{+}_{ija}, q^{-}_{ija} : i = 1, 2, \ldots, m; j = 1, 2, \ldots, n\}$, and solves the function introduced in the previous section to determine $b_a(E_k)$. If $b_a(E_k) \geq \begin{cases} b_{amin}, & b_{amin} \geq b_{aminrisk} \\ b_{aminrisk}, & b_{aminrisk} \geq b_{amin} \end{cases}$, then presumably the auditor will accept assertion a. Likewise, if $|-b_a(E_k)| \geq \begin{cases} b_{amin}, & b_{amin} \geq b_{aminrisk} \\ b_{aminrisk}, & b_{aminrisk} \geq b_{amin} \end{cases}$, then presumably he will reject the assertion. If, however, $|b_a(E_k)| < b_{amin}$, or $|b_a(E_k)| < b_{aminrisk}$, then he must either obtain more evidential support or disclaim any opinion on that assertion.

That this third (inconclusive) situation is possible points up an important fact which we shall return to in Chapter IV, i.e., in steps (b) and (c), the auditor only estimates the evidential collection which should satisfy his evidential requirement, $b_a(E_k)$. Until he actually gathers and evaluates that collection, however, he cannot know whether his estimate actually does satisfy his requirement. Clearly, when an auditor eventually evaluates his collection, if:

$$|b_a(E_k)| > \begin{cases} b_{amin}, & b_{amin} \geq b_{aminrisk} \\ b_{aminrisk}, & b_{aminrisk} \geq b_{amin} \end{cases},$$

he will have overaudited, and, if the cost of collecting and

evaluating a unit of the audit evidence selected is greater than zero, he will have incurred excess costs. Of course, he can avoid over-auditing by collecting and evaluating one unit of evidence at a time until he achieves his desired degree of evidential support. As a matter of fact, in the absence of effective constraints on time and staff, if the marginal cost of collecting and evaluating a particular type of audit evidence is constant, this approach is the optimal one from a cost standpoint. In most cases, however, the marginal cost of collecting and evaluating a particular type of audit evidence will probably <u>not</u> be constant, but rather will be a decreasing function (over the relevant range) of the number of units collected and evaluated in a "batch." Therefore, if the auditor obtains his collection one unit at a time, or, more generally, if he obtains a collection such that:

$$|b_a(E_k)| < b_{amin}, \text{ or } |b_a(E_k)| < b_{aminrisk},$$

he stands to incur excess costs due to "underauditing." At any rate, cost may not be the only relevant factor since constraints on time and/or available staff may exist, e.g., time constraints would undoubtedly preclude an auditor's collecting receivable confirmations one-at-a-time (though evaluation of receivable confirmations could be a sequential type process). Therefore, the auditor must weigh the costs and risks of overauditing against the costs and risks of underauditing when he initially determines his plan for collecting and evaluating evidence. A certain degree of "programmed" overauditing may be quite rational on the auditor's part, if, as seems likely, the

per unit costs of underauditing a particular proposition exceed those of overauditing that proposition.[13]

Based upon the Results of the Individual Proposition Evaluations, Render (or Disclaim) an Opinion on the Financial Statements Taken as a Whole

Mautz has summarized the process by which the auditor moves from his individual evaluations of each assertion contained in a given set

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[13] At this point, some comments concerning overauditing seem in order. So far, we have identified four causes of or reasons for an auditor's obtaining greater evidential support for a given proposition than is strictly necessary in the circumstances:

1. failure or inability to consider all possible sources of evidential support for a given proposition,
2. to justify higher audit fees,
3. to offset the lack of precision inherent in current methods of determining b_{amin} or $b_{aminrisk}$, i.e., to offset the risk that he will underestimate his evidential support requirement for a particular proposition due to his inability to measure that requirement precisely, and
4. to offset the risk of underauditing, i.e., to offset the risk that his initial estimate of an evidential collection sufficient to yield his evidential support requirements will prove to be inadequate, thus leading to excess costs.

For the sake of completeness, let us add a fifth reason occasionally found in practice:

5. because the client requests, and is willing to pay for, the auditor's performing certain tests or procedures deemed unnecessary by the auditor for an opinion on the client's statements.

Of these five reasons for overauditing, the first is to some degree beyond the auditor's control and hence leads to unintentional excesses and the second is clearly unacceptable in the light of professional ethics. At least within limits, however, the third and fourth seem justifiable for the reasons enumerated above. The limits, of course, are where the auditor relies on overauditing to compensate for completely ignoring relevant audit variables. (The fifth reason listed, of course, requires no justification.)

of financial statements to an opinion on that set of statements taken as a whole. He states:

> In forming a composite or over-all opinion as to the fairness of presentation of the financial statements, the auditor is concerned not with evidence, but with the relative weight to be accorded his various judgments on the many subsidiary propositions on which he has acquired evidence and formed opinions. At this point he reviews each of these many propositions and his judgment on them, evaluates their importance, balances them against any contrary judgments, and sums them all up. It is like an algebraic summation with both positive and negative elements, some of which are far more important than others. In those cases in which the "untrue" propositions outweigh the "true," the auditor must refrain from giving a standard opinion. If only a few important propositions are unacceptable and a majority are satisfactory, a qualified opinion may be forthcoming. Even a "clean" opinion, however, does not mean that all propositions were proved true; it means only that no material propositions were found to be unsatisfactory. On balance, and taken in the aggregate, they constitute a fair presentation of events and results as the auditor understands them.[14]

Summary

Chapter I introduced the following as a normative model for audit evidence accumulation:

$$\text{Maximize} \quad U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))] \tag{O-1}$$

$$\text{subject to:} \quad B(E_k) \geq B_{min} \tag{C-1}$$

$$T(E_k) \leq T_{max} \tag{C-2}$$

$$SR(E_k) \leq SR_{max}. \tag{C-3}$$

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[14] Mautz, "Evidence, Judgment, and the Auditor's Opinion," p. 44.

While this construct provided a useful framework for identifying and studying factors which influence audit evidence accumulation, it is of little other practical use.

This chapter, therefore, has considered ways of modifying and, where necessary, approximating the ideal in such a manner as to arrive at a normative construct compatible with the following general framework of audit judgment formation and capable of practical application within this framework:

1. identify all the material propositions contained in the set of financial statements under examination,
2. for each proposition:
    a. determine the degree of evidential support required to justify an opinion on the proposition,
    b. select the kind(s) and estimate the quantity(ies) of evidential matter necessary to provide the required degree of evidential support,
    c. design the audit step(s) necessary to yield the desired kind(s) and quantity(ies) of evidence,
    d. apply the steps and amass a collection of evidential matter, and
    e. evaluate the collection of evidence (If the evidence provides sufficient justification, render an opinion on the proposition. If not, either gather more evidence or disclaim an opinion on that proposition.),

3. based upon the results of the individual proposition evaluations, render (or disclaim) an opinion on the financial statements as a whole.

Essentially, two modifications of the original model are necessary to achieve this goal:

1. replacement of the original constraint:

$$B(E_k) \geq B_{min}, \qquad \text{(C-1)}$$

with the set of constraints:

$$b_a(E_k) \geq b_{amin}, \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1a)}$$

or their equivalent:

$$p(F|M_a \cap E_k) \leq p_{amax}, \qquad (a = 1, 2, \ldots, r) \qquad \text{(C-1b)}$$

where: $b_a(E_k)$ is the degree of support provided by evidential collection E_k for the auditor's opinion on the a^{th} assertion of his client's financial statements,

b_{amin} is the minimum evidential support necessary for a professional opinion on that a^{th} assertion,

$p(F|M_a \cap E_k)$ is the probability that the auditor will fail to detect material error which exists in the a^{th} assertion of his client's records given that he selects evidential collection E_k,

p_{amax} is the maximum allowable probability that the auditor will fail to discover material error which exists in the a^{th} assertion of the client's statements,

$b_a(E_k)$ and $p(F|M_a \cap E_k)$ are determined by the same factors which determine $B(E_k)$ in the original model, and

b_{amin} and p_{amax} are determined by the same factors which determine B_{min} in the original model,

2. replacement of the original objective function:

$$\text{Maximize} \quad U^+(R(E_k)) + U^-(C(E_k)) + E[U^-(S(E_k))] \qquad (O\text{-}1)$$

with the objective function:

$$\text{Minimize} \quad C(E_k) \qquad (O\text{-}3)$$

and the set of constraints:

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r) \qquad (C\text{-}4d)$$

or their equivalent:

$$b_a(E_k) \geq b_{aminrisk}, \qquad (a = 1, 2, \ldots, r) \qquad (C\text{-}4e)$$

where: $p(F|M_a \cap E_k)$ and $b_a(E_k)$ are defined as above,

$p_{amaxrisk}$ represents to the auditor, the maximum acceptable probability (based upon his evaluation of the expected disutility of

sanctions) that he will fail to detect a material error existing in the a^{th} assertion of his client's financial statements, and

$b_{aminrisk}$ represents, to the auditor, the minimum evidential support necessary for an opinion on the a^{th} assertion of his client's financial statements (based upon his evaluation of the expected disutility of sanctions).

These modifications result in the following normative construct of auditor behavior with respect to evidence accumulation:

$$\text{Minimize} \quad C(E_k) \tag{O-3}$$

$$\text{subject to:} \quad b_a(E_k) \geq b_{amin} \qquad (a = 1, 2, \ldots, r) \tag{C-1a}$$

or

$$p(F|M_a \cap E_k) \leq p_{amax} \qquad (a = 1, 2, \ldots, r) \tag{C-1b}$$

$$T(E_k) \leq T_{max} \tag{C-2}$$

$$SR(E_k) \leq SR_{max} \tag{C-3}$$

$$b_a(E_k) \geq b_{aminrisk} \qquad (a = 1, 2, \ldots, r) \tag{C-4e}$$

or

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r) \tag{C-4d}$$

One of the primary problems with constructs of human behavior is that one can seldom test them directly. Unfortunately, the above

normative models of auditor behavior are no exception. The best one can usually do with such constructs is to measure the behavioral variables which they suggest, observe behavior under conditions represented by these variables, and attempt to determine whether the observed behavior has been consistent with the construct's predictions.

Each of the next three chapters considers factors which the above constructs of auditor behavior have identified as relevant to audit evidence accumulation. Their objectives will be to justify inclusion of each factor in its particular class of audit variables, and to indicate how each factor should influence audit evidence accumulation. Chapter VI will then compare a number of these predictions with observations taken from actual audit situations to determine whether auditor behavior is, in fact, sensitive to the selected factors.

Let us, therefore, now look in more depth at the "factors which define the evidential support function for a given type of audit evidence obtained at a given time."

CHAPTER III

FACTORS WHICH DEFINE THE EVIDENTIAL SUPPORT FUNCTION FOR A GIVEN TYPE OF AUDIT EVIDENCE OBTAINED AT A GIVEN TIME

Chapter I identified the following as factors which define the evidential support function for a given type of audit evidence obtained at a given time:

1. the relevance of the specific type of evidential matter to the audit engagement,
2. the reliability of the specific type of evidential matter, itself a function of:
   a. the conclusiveness of the given type of evidence, and
   b. the possibility of misinterpreting evidence of this nature,
3. the timeliness of the evidential matter, itself a function of:
   a. the time at which the evidence is obtained, and
   b. the quality and comprehensiveness of the client's internal controls,
4. the statistical parameters of the population underlying the assertion which the auditor wishes to evaluate:

a. size,

b. variance,

c. rate of error, and

5. the existence of corroborative evidence.

This chapter will examine these factors in some depth and identify each factor's logical effect on the three parameters of the auditor's evidential collection:

1. the type(s) of evidence included,
2. the time(s) of collection of each type, and
3. the number of units of each type collected at a given time.

The Relevance of the Specific Type of Evidential Matter to the Audit Engagement

For the purposes of this discussion, let us define a type of audit evidence as relevant (or pertinent) to an audit engagement if that type is a valid basis for inference concerning:

1. the truth or falsity of one or more financial statement assertions (direct relevance), and/or
2. the degree of evidential support provided for one or more financial statement assertions by a unit of some other type of evidential matter (indirect relevance).

Mautz emphasizes the importance of the auditor's exercising great care in evaluating evidential matter with respect to this property since, ". . . there is often a considerable risk of unconscious inference that may lead one to accept evidence that is not at all

pertinent."[1] He attributes this risk, at least in part, to "the difficulty of separating the several propositions to be proved with respect to a given item in the financial statements and questioning each of these propositions separately,"[2] and therefore concludes that "the auditor must be wary in his use of evidential material. Unless it is pertinent to the precise point at issue, it cannot be considered competent for his purposes."[3]

Mautz makes an important point in this last statement. If a given type of audit evidence is not relevant to a particular financial statement proposition, then regardless of its reliability, timeliness, and degree of corroboration, it can provide no support whatsoever for an opinion on that proposition. Therefore, in his attempt to estimate the degree of evidential support provided for a particular financial statement assertion by a given number of units of a given type of audit evidence, the first factor the auditor must ascertain is whether or not the type is relevant to, and hence at all capable of providing evidential support for, an opinion on that assertion. Only then does it make sense for him to consider such evidence in terms of reliability, timeliness, population characteristics, and the extent to which corroborative evidence exists.

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[1] R. K. Mautz, "The Nature and Reliability of Audit Evidence," The Journal of Accountancy 105 (May 1958): 44.

[2] Ibid.

[3] Ibid.

Expected Influence on Audit Program

Relevance, as defined above, reflects Arens' notion that this property is an absolute rather than a relative, i.e., "that evidence is either relevant to the assertion or not relevant."[4] We have defined this factor as exclusively a "measure" of whether or not a unit of a given type of audit evidence is capable of providing any degree of support at all for an opinion on a particular financial statement item. As such a measure, it takes on only two values: zero (0) if the particular type of evidence is not relevant to the assertion in question, and one (1) if it is. The value it will assume depends entirely upon the type of evidence involved and neither changes in timing nor in the number of units obtained will affect that value. Therefore, the only parameter of the auditor's evidential collection which this factor may influence is the type of evidence included.

The Reliability of the Specific Type of Evidential Matter

For purposes of this discussion, let us adopt a modified version of Arens' definition of reliability as it pertains to audit evidence -- "the extent or degree to which a type of evidence can be considered an accurate representation of reality"[5] at the time that evidence is obtained. In connection with his definition, Arens further notes that:

> In auditing the measure of reliability can be considered a continuum ranging from almost complete

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[4]Alvin A. Arens, "The Adequacy of Audit Evidence Accumulation in Public Accounting" (Doctoral Thesis, School of Business Administration, University of Minnesota, 1970), p. 123.

[5]Ibid., p. 106.

> undependability, as in the case of rumor, to near certainty, as in the case of some kinds of physical evidence.[6]

Of all the factors which influence the degree of evidential support provided by a unit of a given type of audit evidence, "reliability" has undoubtedly received the greatest attention in the professional literature. Therefore, before considering the effect of evidential reliability on the auditor's program, let us briefly review a number of studies pertinent to this factor -- specifically those of Stettler,[7] Mautz,[8] Windal,[9] and Arens.[10]

The earliest of these studies was that of Stettler. He suggested, as the major classes of evidence, in order of generally decreasing reliability: "physical evidence, documentary evidence originating outside the client's organization, evidence originating within the client's organization, the client's books of record, and ratios and comparisons."[11] He concluded, however, that while "some indication of the reliability of an item of evidence is apparent from the classification into which it falls, . . . there is great variation

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[6] Ibid.

[7] Howard F. Stettler, "Auditing Standards and Competence of Evidential Matter," The Accounting Review 29 (January 1954): 121-26.

[8] Mautz, pp. 40-47.

[9] Floyd W. Windal, "Standards of Reliability for Audit Evidence," The New York Certified Public Accountant 31 (June 1961): 394-400.

[10] Arens, pp. 106-122.

[11] Stettler, p. 126.

in the reliability of items within any given classification . . .,"[12] and, as factors influencing this variation, he identified:

1. the independence of the evidence from the client's control,
2. the susceptibility of the evidence to suppression, manipulation, alteration, or counterfeiting by members of the client's organization,
3. the degree of judgment required for evaluation of the evidence,
4. the qualifications of the person evaluating the evidence, and
5. the quality of the client's internal control.[13]

In a similar study, Mautz adopted a somewhat more abstract set of evidential categories:

> . . . "real evidence," for examination of the thing itself; "testimonial evidence," for assertions of human beings; and "indirect evidence," for all other facts . . .[14]

Relating these classifications to audit techniques, he suggested that:

> Real evidence is provided by:
> Physical examination and count
> Recomputation
> Retracing bookkeeping procedures
> Testimonial evidence is provided by:
> Confirmation
> Inquiry

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[12] Ibid.

[13] Ibid., pp. 123-26.

[14] Mautz, p. 43.

> Indirect evidence is provided by:
> Examination of authoritative documents
> Scanning
> Examination of subsidiary records
> Correlation with related information.[15]

Then with respect to his three-way classification, he argued:

> Real evidence is material which convinces one of the truth of the proposition to be proved without the necessity of an inference . . .
> Testimonial evidence is obtained through statements from others and requires an inference by the auditor . . .
> Indirect evidence is the "all other" category, composed of a great variety of information all of which requires an inference by the auditor.[16]

Like Stettler, Mautz maintained that, "Audit evidence varies considerably in reliability among the major classes of evidence and also within each class,"[17] and, in addition to the pertinence of the particular type of evidence to the proposition to be proved, and the timeliness of the evidence (both of which we are considering separately), he identified the following factors as influencing the reliability of a particular type of evidential matter:[18]

1. the possibility of the auditor's misinterpreting the evidence,
2. the conclusiveness of the evidence,
3. the knowledge of the ones providing testimonial evidence,
4. the "responsibility and integrity"[19] of the ones providing testimonial evidence,

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[15] Ibid.

[16] Ibid.

[17] Ibid., p. 47.

[18] Ibid., pp. 44-46.

[19] Ibid., p. 44.

5. the "extent of bias or self interest on the part of"[20] the ones providing testimonial evidence,
6. "the possibility of manipulation or falsification"[21] of the type of evidence,
7. the qualifications of the person obtaining the evidence,
8. the quality of the client's internal control.

Windal's approach to the evaluation of audit evidence reliability differed somewhat from that of Stettler and Mautz. This author set forth three general "standards of reliability for audit evidence":[22]

1. Evidence which is obtained from a source independent of the enterprise being audited tends to be more reliable than evidence obtained from a source within that enterprise.
2. Evidence which is objective in nature tends to be more reliable than evidence which reflects personal judgment or bias.
3. Evidence obtained by the auditor himself or by his representative tends to be more reliable than evidence supplied by another, except where the auditor is not qualified to obtain that evidence.[23]

He then evaluated each of Mautz' nine audit techniques (supra, pp. 83-84) with respect to these standards. He summarized his findings in the following table:

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[20] Ibid.

[21] Ibid.

[22] Windal, p. 394.

[23] Ibid., p. 395.

APPLICATION OF GENERAL STANDARDS

	General Standard No. 1 Independent	General Standard No. 2 Objective	General Standard No. 3 First Hand
Physical examination and/or count . . .	A	A	A
Confirmation	A	A	C
Examination of original documents and comparison with the record	B	A	A
Recomputation	B	A	A
Retracing bookkeeping procedures . .	C	A	A
Correlation with related information	B	B	A
Examination of subsidiary records . .	C	B	A
Scanning	C	C	A
Inquiry	C	B	C

Legend: A - independent, objective, or first hand
B - partly independent, objective, or first hand
C - not independent, objective, or first hand.[24]

Like the previously mentioned authors, Windal concluded that reliability could vary substantially between the specific techniques in any given class and suggested that one could explain this variance, at least in part, through the following "special" standards:

1. Evidence based on internal data which have been derived from an accounting system containing adequate internal control tends to be more reliable than evidence based upon data derived from a system without such control.
2. Evidence obtained from outside sources which maintain formal accounting records and/or have a sense of public or personal responsibility tends to be more reliable than evidence obtained from

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[24] Ibid., p. 400.

an outside source with inadequate records and/or little or no sense of public or personal responsibility.

3. The examination of items which are relatively more susceptible to fraud tends to give less reliable evidence than the examination of items less susceptible to fraud.
4. In those special situations where the auditor is not qualified to apply a particular technique, the evidence obtained from such application is relatively unreliable.
5. Confirmations which can be handled without effort by the party confirming tend to be less reliable than confirmations which require effort.[25]

The final study of evidential reliability which we shall review is from Arens' doctoral dissertation. This author evaluated the following modified version of Mautz' classification system:

1. Real evidence.
   a. Physical examination.
   b. Recomputation.
2. Testimonial evidence.
   a. Statements by independent third parties.
   b. Statements by officers and employees.
3. Documentary evidence.
   a. Authoritative documents originating outside the client's organization.
   b. Authoritative documents originating within the client's organization.
4. Other.
   a. Calculations or correlations.
   b. Subsidiary or detailed records,[26]

with respect to three general standards adapted from Windal's "general" and "special" standards (supra, pp. 85-87):

1. Independence. Evidence which is obtained from a source outside the organization being audited is more reliable than evidence obtained from within the organization.

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[25] Ibid., p. 395.

[26] Arens, p. 108.

2. Qualification. Evidence obtained from a person who is qualified to give the correct information is more reliable than the information obtained from an unqualified person.
3. Judgment. Evidence obtained which requires considerable judgment to determine the correctness of the information is less reliable than evidence which requires little judgment.[27]

Arens summarized his conclusions in the following table (also adapted from Windal):[28]

	Types of Evidence*		
	Independence	Qualifications	Judgment
Real evidence			
Physical examination	A	A	A-B
Recomputation	A	A	A
Testimonial evidence			
Statements by third parties	B	A-C	A-C
Statements by officers and employees	D	A-C	A-C
Documentary evidence			
Originating outside the organization	C	A-B	A-B
Originating within the organization	D	A-B	A-B
Others			
Calculation and correlation	A	A	C
Subsidiary or detailed record	D	A-B	A-B

*A - Obtained by the auditor.
B - Obtained directly from a third party by the auditor.
C - Obtained from the client but originally prepared by a third party.
D - Obtained from the client and prepared by the client.

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[27] Ibid., p. 109.

[28] Ibid., p. 121.

Taken together, the four above mentioned studies appear to identify the factors most relevant to the evaluation of evidential reliability. At this point, therefore, it seems appropriate to combine and summarize these studies' findings. Toward that end, let us first note that two factors identified by Mautz: (1) the possibility of the auditor's misinterpreting the evidence, and (2) the conclusiveness of the evidence, are actually at a higher level of abstraction than the others. In fact, these two may serve as defining classes into which all the others fall -- the first concerned with the auditor's ability to reason correctly from evidence at hand to the "reality" represented by that evidence, and the second concerned with the extent to which a particular type of evidence compels the auditor's mind to a decision on a given proposition's validity, if he assumes his interpretation of that evidence to be correct.

Adopting these two defining classes, we may summarize the factors which should influence the auditor's evaluation of evidential reliability as follows:

1. factors which affect the auditor's possibility of misinterpreting a particular type of evidence:
    a. the degree of judgment required for interpretation of the evidence, and
    b. the qualifications of the one interpreting the evidence,
2. factors which affect the auditor's evaluation of the conclusiveness of a particular type of evidence:

a. the degree of inference required to establish a relationship between the evidence and the proposition in question,

b. the possibility that the evidence may be intentionally misleading, itself a function of:

   (1) independence of the evidence from the client's control,

   (2) general susceptibility of the particular type of evidence to suppression, manipulation, alteration, or counterfeiting,

   (3) aspects of the client's internal controls which may affect the susceptibility of the particular type of evidence to suppression, manipulation, alteration or counterfeiting, or which might affect the likelihood of motivation for such tampering with the particular type of evidence,

   (4) quality of the evidential source with respect to:

      (a) responsibility and integrity, and

      (b) extent of bias or self-interest, and

c. the possibility that the evidence may be unintentionally misleading, itself a function of:

   (1) qualifications of the evidential source (knowledge), and

   (2) qualifications of the one gathering the evidence.

Unfortunately, no one has yet devised a method for combining the individual measures of these "sub-factors" into an overall measure of evidential reliability. However, of primary interest to this dissertation are the implications of evidential reliability (however measured) for audit evidence accumulation, rather than specific methods of evaluating this factor. Therefore, and because of the enormity of the problem, development of any such measure is beyond the scope of this dissertation. For this reason, let us assume that the auditor is capable of evaluating evidential reliability and consider which of the parameters of his evidential collection such evaluations may logically affect.

Expected Influence on Audit Program

We have defined evidential reliability as "the extent or degree to which a type of evidence can be considered an accurate representation of reality at the time that evidence is obtained." (Supra, p. 81). This factor may, to some extent, affect all three parameters of the auditor's evidential collection; however, its greatest effect should be on the types of evidence included.

Ideally, in order to determine the lowest-cost means of satisfying his evidential support requirements the auditor would consider both the marginal cost and marginal support functions for each available evidential alternative. Clearly, however, ceteris paribus, the marginal support provided by the n^{th} unit of a given type of audit evidence will be greater the more reliable is that type. Therefore, subject to time and staff limitations and cost considerations, the auditor should, as Ray puts it, "examine the most reliable evidence

first in order that he may get to the point of audit satisfaction in the quickest and easiest manner."[29] Thus "reliability" does logically affect the types of evidence included in the auditor's collection.

Likewise, this factor may affect the extent parameter of that collection. Clearly, the less reliable is a particular type of evidential matter, the more units of that type the auditor will require to reach a given level of assurance. Even if he examines every existing unit of a particular type of evidence, however, to the extent that the type is less than one hundred per cent reliable, the auditor cannot be certain he has an accurate representation of the underlying reality. In other words, inherent reliability sets an upper bound on the total evidential support which a given type of evidential matter can provide. For this reason, for most financial statement assertions, no single type of evidence is likely to be sufficient of itself to satisfy the auditor's support requirements. Presumably, however, the proportion in which the auditor obtains different types of evidential matter will depend upon the relative marginal reliability and cost of each type. Thus, again, reliability may logically affect the extent parameter of his evidential collection.

The effect of inherent evidential reliability on the third parameter of the auditor's collection, timing, is less straightforward and perhaps even more limited. Note that the auditor's opinion is concerned with the "fairness" of his client's financial statements at a particular point in time -- the opinion date. To the extent that

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[29] J. C. Ray, "Classification of Audit Evidence," The Journal of Accountancy 117 (March 1964): 45.

the auditor obtains any evidence prior to this date, he must project its support forward. For this reason, the evidential support provided by interim tests depends not only upon the inherent reliability (as defined above) of evidence resulting from such tests, but also upon the extent to which "reality" at the interim test date reflects "reality" at the later opinion date (the timeliness of the evidence).

If the status of a particular financial record assertion (i.e., the quality of the financial record population of entries or aggregations of entries as a surrogate for some real world population of events or physical items) were constant over time, the degree of support provided by the n^{th} unit of a particular type of relevant audit evidence would be solely a function of the reliability of that type of evidence and would be independent of the point in time at which the auditor obtained such evidence. In this case, reliability could have no effect on the auditor's timing decision. If, at the other extreme, the assertion in question were such that its status at any one point in time would provide no indication whatsoever of its status at any other point in time, then this fact would dominate the auditor's timing decision, he would test the assertion at the year's end regardless of the type of evidence available, and hence evidential reliability would again have no effect on his timing decision.

Both of these extremes are unlikely, however, and between them lies the majority of situations faced by the auditor -- the probability of change over time in the status of the given assertion being positive and of a magnitude dependent upon the quality and comprehensiveness of the client's internal controls. (See the discussion in Chapter IV of

the expected influence of the auditor's evaluation of the probability that his client's financial records contain material error on the timing of evidential accumulation, infra, pp. 136-139.) It is conceptually possible that over a given time interval, the possibility of change in a particular financial record assertion's status will be sufficiently small that this factor does not dominate the auditor's timing decisions, yet sufficiently large that the support provided by any given type and quantity of evidence obtained within that interval varies with the actual collection time. In this case, since the inherent reliability of a particular type of evidence is important in defining that type's marginal evidential support function at a given point in time, this factor can affect the timing parameter of the auditor's evidential collection.

The Timeliness of the Evidential Matter

In the previous section, we have defined "timeliness" as the extent to which "reality" at the time an auditor obtains evidential matter reflects "reality" at the auditor's opinion date. The importance of this factor is obvious. To the extent that the status of any given financial statement assertion is subject to drastic change over time, evidence gathered at an interim date may prove invalid as support for the auditor's evaluation of that assertion as of his opinion date.

As we shall see in Chapter IV, evidential "timeliness" is closely related to the quality and comprehensiveness of the client's internal controls. Therefore, with the exception of looking at its influence on the auditor's program, let us defer further discussion of this factor until Chapter IV.

Expected Influence on Audit Program

To some extent, "timeliness," as defined above, may affect all three parameters of the auditor's evidential collection. This particular factor's most pronounced influence, however, should be on timing decisions. We have already indicated this effect above. Let us consider it here, however, in somewhat different terms. As Mautz and Mini have noted, accounting systems are probabilistic rather than deterministic in nature.[30] Therefore, however small it may be, the probability of change over time in the status of a particular financial record assertion is mathematically positive and the auditor must assume that a given type and quantity of evidence gathered at an interim date will never provide a more accurate reflection of that assertion's opinion date "reality" than the same type and quantity of evidence actually obtained at some later date. In other words, the auditor must assume that evidential support is a decreasing function of the length of the time interval between the date at which he obtains evidence and his opinion date.[31] The slope of this function is determined by the quality and comprehensiveness of the client's internal controls.

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[30] R. K. Mautz and Donald L. Mini, "Internal Control Evaluation and Audit Program Modification," The Accounting Review 41 (April 1966): 284.

[31] More specifically, for all h and k such that $(t_h - t_{op}) > (t_k - t_{op})$, then $b_a(q_{ih}) \leq b_a(q_{ik})$

where: t_h and t_k are two alternative dates for the accumulation of audit evidence,

t_{op} is the opinion date, and

$b_a(q_{ih})$ and $b_a(q_{ik})$ are the degrees of support provided for the a^{th} assertion by q units of type i evidence gathered at times, t_h and t_k, respectively.

The effect of "timeliness" as defined above, on the auditor's timing decisions is that this factor interacts with the inherent "reliability" of available evidential alternatives to determine the earliest date at which the auditor may obtain evidence adequate to satisfy opinion date support requirements. In the extreme case, where the "reality" of a financial record assertion is subject to drastic change over time, this factor will actually dominate the auditor's selection of a date for testing that assertion -- compelling him to obtain his evidence at year end.

With respect to the influence of "timeliness" on the type and extent parameters of the auditor's evidential collection, the analysis is similar. If one accepts the assumption that, for any particular financial record assertion, the support provided by a given type and quantity of evidential matter is a decreasing function of the time interval between the date at which the auditor obtains such evidence and his opinion date, then one must conclude that the earlier an auditor tests that assertion, the greater precision he must require in his test. Furthermore, the degree to which the auditor's precision requirements will vary over time depends upon the slope of the function relating "timeliness" to the length of the interval between test date and opinion date.

The Statistical Parameters of the Population Underlying the Assertion the Auditor Wishes to Evaluate

In the strictest sense, every financial statement assertion is an inference drawn from some underlying population whose elements are entries or aggregations of entries (existing at a given point in time)

in the client's financial records. Such underlying populations are, in turn, surrogates for "real-world" populations whose elements are occurrences or physical items. For example, financial statement assertions concerning (perpetual) "Merchandise Inventory" are inferences drawn from a population whose elements, specific aggregations of certain client acquisitions, and dispositions, are surrogates for the population of merchandise actually available for sale. Likewise, assertions concerning "Accounts Receivable" are inferences drawn from a population whose elements, the records of amounts due the client for goods or services rendered, are surrogates for the client's right to receive such amounts.

To the extent that inferences are properly drawn and financial record populations are "good" surrogates for their "real-world" counterparts, financial statement assertions will accurately reflect "reality." Therefore, the auditor has two primary responsibilities in evaluating any particular financial statement assertion:

1. he must determine whether the assertion is a valid inference from its underlying financial record population, and
2. he must determine whether or not that financial record population is a "good" surrogate for its "real-world" counterpart.

The first of these determinations is primarily a matter of evaluating the client's logic and/or his clerical accuracy. Therefore, we need not consider it in further detail. The second determination is, however, of interest here.

Essentially an auditor has two approaches to determining whether or not a financial record population is a "good" surrogate for a "real-world" population. The "direct" approach (applicable, e.g., in the case of inventories) is to actually observe the "real-world" population and compare it with the surrogate, either on an item-by-item basis or in some form of aggregation. Where the "real-world" population's elements have no concrete physical existence, however (e.g., accounts receivable or transactions which have occurred in the past), the auditor obviously cannot adopt this approach. In such cases, the best he can do is attempt to establish indirectly the extent to which each element in a financial record population represents its "real-world" counterpart by examining documentary, testimonial, and/or whatever other types of relevant evidential matter may be available.

Fortunately for the auditor, statistical theory teaches that one need not observe <u>every</u> element in a population to arrive at fairly accurate conclusions about that population. For this reason, the auditor need not evaluate every entry or aggregation of entries underlying a particular assertion to evaluate the extent to which that assertion reflects "reality." The precise number of elements he must observe varies, not only with the precision and level of confidence he desires, but also with the following statistical parameters of the assertion's underlying population:

1. size,
2. variance, and
3. rate of error.

For an indication of how these factors interact to determine the number of elements one must evaluate to draw conclusions about a specific population, one need only consider the statistical formulae for "attributes" and "variables" sample size determination. These formulae are, respectively:

$$n = \frac{p(1-p)}{\left(\frac{SE}{t}\right)^2 + \frac{p(1-p)}{N}}, \quad [0 < p < 1,\ t > 0,\ N > 0], \text{ and}$$

$$n = \frac{1}{\left(\frac{SE_{\bar{x}}}{\sigma}\right)^2 \Big/ t^2 + \frac{1}{N}}, \quad [\sigma > 0,\ t > 0,\ N > 0],$$

where: n = sample size,

SE = desired sample precision,

N = population size,

p = per cent of occurrence (error) in population,

t = confidence level factor,

$SE_{\bar{x}}$ = sampling error of average,

σ^2 = variance of population,[32]

and, from them, it follows that for a given precision and confidence level, the required sample size, n:

1. varies directly (but not proportionately) with the population size, N, for both "attributes" and "variables" samples,

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[32]Herbert Arkin, Handbook of Sampling for Auditing and Accounting, New York, McGraw-Hill Book Company, Inc., 1963, pp. 96, 604-05.

2. varies:

   a. directly with $p \leq .5$, and inversely with $p > .5$ for "attributes" samples, and

   b. directly with the variance of the population for "variables" samples.

Expected Influence on Audit Program

The size and variance, or rate of error of populations underlying financial statement assertions can obviously affect the extent parameter of the auditor's evidential collection. Presumably, the more elements of a population the auditor must evaluate to form an opinion on inferences drawn from that population, the more units of any type of evidence relevant to those elements he must observe. This means that, even though the support which a given type of evidential matter provides for evaluation of a particular population's elements may be constant, the degree of support which that unit provides for evaluation of the population as a whole (and hence any inferences drawn from that population) will vary with the number of elements the auditor must evaluate, and hence with such population characteristics as size, variance, and rate of error.

While these statistical parameters may directly affect the number of elements an auditor must evaluate before forming any opinion on a particular population as a whole, they only require that he evaluate the appropriate number. They do not dictate how he must evaluate those elements. Therefore, and since an auditor typically attempts to obtain evidence independent of the population he desires to evaluate, characteristics of the population under examination have no logical

direct relationship to the type of evidence he obtains. Likewise, since the auditor bases timing decisions upon his evaluations of the tendency of "real-world" populations to change over time and the ability of his client's accounting system to adequately reflect such changes, the size and variance (or rate of error) of any financial record population at a fixed point in time have no logical direct relationship to the timing parameter of his evidential collection. (Through their effect on the extent parameter of his evidential collection, however, population characteristics may indirectly influence the other two parameters of that collection if the auditor faces restrictive time or staff constraints.)

The Existence of Corroborative Evidence

When the auditor's evidential collection contains more than one type of evidence relevant to a particular financial statement assertion, the support which all these types provide, in combination, for an opinion on that assertion may differ significantly from the sum of the support which each type would provide individually. This possibility exists because, in addition to directly supporting an opinion on the assertion in question, each individual type of evidence may also affect the reliability of one or more of the other types, i.e., types which corroborate one another will tend to increase each other's reliability while types which conflict with one another will tend to decrease each other's reliability. (Thus, while the existence of satisfactory controls in the area of accounts receivable is, to some extent, evidence in support of the proposition that the items in the client's accounts receivable trial balance reflect valid claims, it

also increases the reliability of confirmations returned in agreement with the client's records and decreases the reliability of confirmations returned in disagreement with those records, and conversely.)

Mautz and Sharaf have recognized the interactive effect of different types of evidential matter relevant to the same assertion. They conclude:

> . . . Although evidence is seldom conclusive, the more kinds of evidence we find in support of a given proposition, the more likely that proposition is to be true. . . .
>
> If some . . . types of audit evidence . . . pertinent to this particular proposition . . . cannot be obtained, we lose by just so much the opportunity of becoming convinced. An attack launched from three directions is not so strong as one from nine directions.[33]

Expected Influence on Audit Program

The degree to which the various types of evidence relevant to a particular financial statement assertion corroborate or conflict with one another may affect all three parameters of the auditor's evidential collection. However, this factor is apt to have its greatest influence on the types of evidence and the number of units of each type he obtains.

When the auditor decides to obtain more than one type of evidential matter to support his opinion on a given financial statement assertion, it seems reasonable that he will expect the various types he selects to corroborate. (If they are all relevant and reasonably reliable, he may assume they will all essentially reflect the same basic

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[33] R. K. Mautz and Hussein A. Sharaf, The Philosophy of Auditing, Menasha, Wisconsin, George Banta Company, Inc., 1964, p. 98.

"reality.") In some cases, however, evidence which provides support for an inference concerning the truth or falsity of a financial statement assertion may also increase (or decrease) the reliability of some other type of relevant evidence to the extent that the auditor decides to include (exclude) such evidence from his collection. In this manner, corroborative evidence may influence the type parameter of his evidential collection. For example, whether credits to customer accounts in the subsidiary ledger will be a reasonably reliable or highly unreliable source of information concerning the validity of receivables depends largely upon whether or not the client's internal controls in this area include an appropriate separation of duties. For this reason, whether the auditor will rely solely on such entries as a follow-up for non-responses to receivable confirmations or whether he will require additional evidence, e.g., remittance advices, may hinge on evidence obtained during his evaluation of the client's relevant internal controls.

Likewise, since the auditor expects that various types of evidence relevant to a particular financial statement assertion will basically corroborate one another, he should expect that the types he collects will each contribute a certain degree of support toward his overall requirement for an opinion on that assertion. Clearly, then, the more different types of evidence the auditor obtains, the fewer units of any given type he should require. Thus, corroborative evidence can influence the extent parameter of his collection. (Note, however, that if, in fact, two or more of the types he collects conflict with one another, these types will, to some extent, cancel each

other's evidential support, and thus require the auditor to obtain either more units of the same types, or some other relevant type, in order to resolve the conflict. In this manner, conflicting evidence can affect both the extent and type parameters of the auditor's evidential collection.)

The existence of corroborative or conflicting types of evidence relevant to a given financial statement assertion should normally exert far less influence on the timing parameter of the auditor's evidential collection than on that collection's other two parameters. We have previously suggested that, where the status of a particular area of a client's financial records as a "real-world" surrogate is not likely to vary greatly over time, the reliability with which the auditor can evaluate that status may, to a limited degree, affect his timing decisions. (Supra, pp. 92-94.) To the extent, therefore, that corroboration or conflict among different types of evidence can affect the overall reliability of the auditor's collection relevant to a given financial statement assertion, such corroboration or conflict may influence the timing parameter of that collection.

Summary

As its title indicates, this chapter is a discussion of factors which define the evidential support function for a given type of audit evidence gathered at a given time. An important part of this discussion has centered around how such factors might logically affect the three parameters of the auditor's program:

1. the type of evidence included,

2. the time of collection of each type, and

3. the number of units of each type collected at a given time.

The following table (of a type which will also appear in the summaries of Chapters IV and V) summarizes the conclusions of this aspect of the chapter.

Table 1.--Expected influence of factors which define the evidential support function for a given type of audit evidence gathered at a given time on the three parameters of the auditor's evidential collection: (1) the type of evidence included, (2) the time of collection of each type, and (3) the number of units of each type collected at a given time

Variable	Type	Timing	Extent
Relevance	●	0	0
Reliability	●	●	◐
"Timeliness"	◐	●	◐
Statistical Parameters	◐	◐	●
Corroborative Evidence	●	◐	●

Key:

● direct influence on this parameter of the auditor's program

◐ indirect or limited influence on this parameter of the auditor's program

0 no influence on this parameter of the auditor's program

Of the factors discussed in this chapter, then, relevance, reliability, and the existence of corroborative evidence are the primary determinants of the <u>type(s)</u> of evidence the auditor will require to

achieve a given degree of evidential support, statistical parameters (size and variance or rate of error), reliability, and the existence of corroborative evidence are the primary determinants of the number of units of each type he will require to achieve that level, and "timeliness" (the extent to which "reality" at the time the auditor obtains evidential matter reflects "reality" at his opinion date) is the primary determinant of the time at which he will obtain his evidence.

This chapter has tacitly assumed that the auditor's overall evidential support requirement for an opinion on any particular financial statement assertion is fixed and given. Actually, however, this requirement will vary from engagement to engagement for a given assertion, and from assertion to assertion for a given engagement. An important group of factors which affect evidential support requirements are those "factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion." Let us, therefore, now turn our attention to the factors in this category.

CHAPTER IV

FACTORS WHICH DETERMINE THE MINIMUM EVIDENTIAL SUPPORT NECESSARY TO JUSTIFY A PROFESSIONAL OPINION ON A GIVEN FINANCIAL STATEMENT ASSERTION

Having identified a material assertion in his client's financial statements, the auditor must determine the degree of evidential support necessary to establich its validity or invalidity, before he can design any specific audit steps to test that assertion. In the previous chapter, we assumed the auditor's evidential support requirements were fixed and given. Actually, however, such requirements are a function of two basic types of factors:

1. factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion, and
2. factors which influence the probability that the auditor will incur sanctions for failing to detect a material error given that such error exists in his client's records.

In this chapter and Chapter V, we shall adopt an approach similar to that of Chapter III, examining respectively the factors in each of these categories and suggesting how one might logically expect each individual factor to affect an auditor's program. The following factors, identified in Chapter I as determinants of the minimum evidential

support necessary to justify a professional opinion on a given financial statement assertion, form the basis for the remainder of discussion in this chapter:

1. Generally Accepted Auditing Standards and other authoritative pronouncements of the AICPA,
2. authoritative pronouncements of the SEC,
3. regulatory commission requirements (for regulated industries),
4. policies of individual public accounting firms,
5. specific terms of the auditor's contract with his client,
6. materiality considerations, and
7. the auditor's evaluation of the probability that a given financial statement assertion is materially misstated, based upon:
    a. the auditor's findings during his review of the client's internal control system,
    b. the auditor's findings in actual tests of the client's records, and
    c. the auditor's assessment of the general "riskiness" of the client, based on the client's financial health, operating and reporting policies, prior auditor-client relations, etc.

Generally Accepted Auditing Standards and Other Authoritative Pronouncements of the AICPA

The standard form scope paragraph of the auditor's report reads as follows:

> We have examined the balance sheet of X Company as of December 31, 19 . . ., and the related statements of income and retained earnings and changes in financial position for the year then ended. Our examination was made in accordance with generally accepted auditing standards [italics mine], and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.[1]

Clearly, this specific reference to generally accepted auditing standards indicates the auditor's obligation to abide by such standards and guidelines as the profession has adopted.

In recognition of this obligation, Grinaker has written:

> The specific reference to generally accepted auditing standards in the scope paragraph . . . indicates that these standards represent the official position of the profession as to the means of establishing reasonable grounds for belief concerning the fair presentation of the financial statements. Generally accepted audit standards, promulgated by the American Institute of CPA's committee on auditing procedure, express the underlying principles which control the nature and extent of the evidence to be obtained by means of auditing procedures.[2]

Hill and Jennings have also acknowledged the auditor's responsibility for certain tests because they are prescribed by the profession, stating:

> It is the inescapable responsibility of each accountant to determine the scope of examination which he should make before giving his opinion on financial statements under review. In reaching this determination, the examining accountant must necessarily give the most serious weight to the fact that the profession has adopted auditing standards which require the application of the extended procedures specified in Auditing Statement No. 1

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[1]Committee on Auditing Procedure, American Institute of Certified Public Accountants, Statement on Auditing Standards No. 1, New York: American Institute of Certified Public Accountants, 1973, p. 81.

[2]Robert L. Grinaker, "The Accountant's Responsibility in Expressing an Opinion," The Journal of Accountancy 110 (November 1960): 66.

> [confirmation of receivables and observation of inventories] whenever they are both practicable and reasonable of application. If, notwithstanding, the examining accountant concludes that he may omit such procedures from his examination and satisfy himself by other means, he must assume the burden of justifying his failure to conduct his examination in accordance with generally accepted standards.[3]

Although Hill and Jennings only refer to two specific procedures above, their observation applies equally well to all facets of an audit. Wherever the profession has adopted standards or guidelines for procedure, the individual accountant must comply, or must bear the burden of justifying his departure from those standards and guidelines.

Expected Influence on Audit Program

In general, the standards, guidelines, etc., adopted by the AICPA and set forth in such pronouncements as the Statements on Auditing Procedure and Industry Audit Guides, are broad in nature and intended to apply to a wide variety of situations. Therefore, while they may require the auditor to collect specific types of evidential matter on any given engagement (e.g., inventory observations), they are not sufficiently specific to affect the extent or timing parameters of his evidential collection.

Authoritative Pronouncements of the SEC

If his client's securities are traded publicly, the auditor must consider requirements of the Securities Exchange Commission when

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[3]Gordon M. Hill and Alvin R. Jennings, "Extensions of Auditing Procedure," The New York Certified Public Accountant 23 (May 1953): 340.

developing his audit program. To the extent that the SEC requires information not normally included in a privately held company's statements, the auditor may have to extend his testing. Furthermore, while the commission normally expects the auditor to follow generally accepted auditing standards, it may, in the future, choose to issue audit guidelines of its own. Such guidelines will, as was the case with generally accepted auditing standards, undoubtedly tend to be broad in nature; therefore, the only parameter of the auditor's evidential collection which they are likely to affect is the type of evidence included.

Regulatory Commission Requirements

Like requirements of the SEC, regulatory commission requirements may call for additional information in the client's statements or oblige the auditor to collect specific types of evidence. Furthermore, however, in some cases, such requirements may also affect the extent parameter of the auditor's evidential collection. For example, audits of brokers require one hundred per cent confirmation of receivables, short and long positions, and securities held for customers.

Policies of Individual Firms

During their discussion of factors which the auditor considers when gathering evidence, Anderson, Giese, and Booker note in passing that "authoritative pronouncements from the home office . . . have

influenced audit programs."[4] In the case of some firms, this may be somewhat of an understatement. Obviously, whenever his firm has adopted specific approaches to the audit, the individual public accountant may be expected to incorporate them into his program. Firm policies may take the form of broad guidelines (e.g., calling for the use of statistically determined sample sizes wherever possible), or they may take the form of specific required procedures (e.g., standard audit programs which are to be used as a starting point for each audit area).

Expected Influence on Audit Program

Firm policies may obviously dictate that certain types of evidence be included in any given audit program. In addition, there is indication that they may, to some degree, influence the extent to which an auditor gathers a given type of evidence. For example, one large national firm which has recently placed emphasis on statistical sampling requires confidence levels of at least 90% and ranges of reliability not in excess of 10%.

One might also argue that firm policy can affect the timing of a given procedure. At least one large national firm does have separate standard programs for interim and year-end work in each audit area. The function of the distinction in this case, however, appears to be merely to indicate which procedures can be performed at an interim date rather than which procedures should be, since in some cases both

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[4] H. M. Anderson, J. W. Giese, and Jon Booker, "Some Propositions about Auditing," The Accounting Review 45 (July 1970): 528.

programs are applied at year end. Furthermore, the items contained in the "year end" program appear to be of the nature that they either cannot be performed at an interim date (e.g., cutoff work) or are used to update interim results (e.g., audit step: "Reconcile the 'Accounts Receivable' trial balance for the period from the confirmation date to year end. Note any unusual or large transactions during this period, and consider confirming new accounts with significant balances.").

Apparently, then, while firm policies may influence the extent and timing parameters of an evidential collection, their impact will be far more pronounced on the type of evidence included.

Specific Terms of the Auditor's Contract with His Client

Strictly speaking, this factor does not affect the minimum evidential support necessary to justify a professional opinion on a given set of financial statements (i.e., the requirements of an "ordinary" audit). Nevertheless, if the auditor's contract with his client contains terms which redefine and extend his responsibilities beyond those of an "ordinary" audit, or which restrict the scope of certain types of testing, then such terms may affect his audit program.

When the auditor accepts responsibilities beyond those of an "ordinary" audit, he increases the evidential support necessary to satisfy the requirements of his engagement, even though the requirements for an opinion on the client's statements remain unchanged.

For example, a contract calling for the auditor to evaluate and recommend improvements in his client's internal control system may well require testing beyond the level anticipated by the Committee on

Auditing Procedure of the American Institute of Certified Public Accountants when they observed:

> The study and evaluation [of internal control] contemplated by generally accepted auditing standards should be performed for each audit to the extent the auditor considers necessary . . . to establish a basis for reliance thereon in determining the nature, extent, and timing of audit tests to be applied in his examination of the financial statements.[5]

Likewise, a contract calling for the auditor to express an opinion on a specific financial statement item in addition to his opinion on the statements as a whole will likely require him to test that item more extensively than usual. In this case, the additional testing becomes necessary because of the increased importance accorded the specific item. Evidential requirements for an opinion on the statements as a whole, however, are unaffected.

The auditor-client contract may also contain provisions which limit the scope of the auditor's examination, requiring that he omit certain types of evidential matter from his collection entirely, or that he restrict, in some manner, the extent or timing of specific tests. Even where such restrictions on the "auditor's freedom to select procedures and examine evidence"[6] do not prevent him from gathering sufficient, competent evidence to allow an opinion on his client's statements, they may incline him to raise the minimum level of support. Certainly the restrictions must influence his means of achieving that level.

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[5]Committee on Auditing Procedure, p. 14.

[6]Ibid., p. 85.

Expected Influence on Audit Program

Specific terms in the auditor-client contract which extend the auditor's responsibilities or restrict the scope of his testing may influence any or all of the three parameters of his evidential collection: types of evidence included, times of collection of each type, and the number of units of each type collected at a given time.

Whenever the auditor accepts extended responsibility, one would logically expect him to obtain a greater amount of evidential support than he would in an "ordinary" audit of the same client. If the extended responsibility is for an area other than the areas of an ordinary audit, it may require him to obtain additional types of audit evidence. If, on the other hand, the additional responsibility is for an "ordinary" audit area, the auditor may be able to satisfy his additional evidential requirements by increasing the sample size of a test he would ordinarily perform, or by shifting that test's timing (e.g., from an interim date to year end) if such a shift increases significantly the degree of evidential support provided by each unit of evidence collected.

We have already noted that the client can contractually restrict, to some extent, any of the parameters of the auditor's evidential collection. Such restrictions are apt to affect the auditor's evidential collection in areas other than those directly involved in the original limitations since, as Leight has noted:

> . . . an audit is like the piecing together of a jigsaw puzzle, one piece gives us the outline for the next piece. When we audit one account, we get some information about another account, and when we are finished auditing all the accounts, they will fit together and form a picture. . . . But when a limited audit is

> made, we do not . . . see the whole picture, but only parts of the picture. Therefore the extent of the auditing tests must be greater to obtain the same level of assurance.[7]

Whenever the client limits the auditor's scope, and the auditor is still able to generate the evidential support necessary for an opinion on the client's statements, then the auditor must have adopted procedures alternative to those the client restricted or he must have extended his tests or altered his timing in other unrestricted areas, or performed some combination of the three.

Materiality Considerations

The American Accounting Association's Committee on Concepts and Standards Underlying Corporate Financial Statements has given the concept "materiality" its most widely accepted definition:

> Materiality, as used in accounting, may be described as a state of relative importance. The materiality of an item may depend on its size, its nature, or a combination of both. An item should be regarded as material if there is reason to believe that knowledge of it would influence the decisions of an informed investor.[8]

According to the Committee on Auditing Procedure:

> The concept of materiality is inherent in the work of the independent auditor. There should be stronger grounds to sustain the independent auditor's opinion with respect to those items which are relatively more important and with respect to those in which the possibilities

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[7] Lester A. Leight, "Recommended Opinions and Disclaimers," The New York Certified Public Accountant 33 (June 1963): 412.

[8] Committee on Concepts and Standards Underlying Corporate Financial Statements, American Accounting Association, Accounting and Reporting Standards for Corporate Financial Statements and Preceding Statements and Supplements, Evanston: American Accounting Association, 1957, p. 8.

> of material error are greater than with respect to those of lesser importance or those in which the possibility is remote.[9]

Because of the importance attached to this factor by the Committee, materiality considerations clearly belong among variables which determine the minimum evidential support necessary to justify a professional opinion on a given set of financial statements.

Behind the Committee's pronouncement on the importance of materiality as an audit variable are two primary considerations: the cost of audit evidence accumulation and the degree of sophistication of the typical financial statement user's decision model.

Arens has recognized the economic importance of the materiality concept, stating:

> The importance of materiality, as it relates to the auditor's determination of whether or not errors or omissions exist in a client's records, results from the fact that there is an economic cost to auditing. The number of hours the auditor spends in accumulating audit evidence is generally directly related to the client's audit fee. If the auditor spends substantial time in verifying information which is not relevant to the statement user's information needs, an unnecessary audit cost results. A CPA performs the audit function most efficiently when the information which is most relevant to the user's needs is emphasized in the audit and the least relevant information is given less attention.[10]

In a similar vein, Mautz and Sharaf have noted:

> Materiality is always of interest in auditing. Because cost and time are so important in the performance of an engagement, transactions, events, and even irregularities of little or no materiality cannot be given the

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[9] Committee on Auditing Procedure, p. 6.

[10] Arens, P. 50.

> attention which must be reserved for material transactions, events and irregularities.[11]

Undoubtedly, financial statement users would prefer to know that the accounting records underlying any given set of financial records were free of all error. Such users, however, would not likely be willing to incur the cost of this ideal situation, even if it were attainable. What is more important, though, is that the typical statement user is not likely to require absolutely error-free financial statements. Rare indeed is the decision model sufficiently sophisticated to include as variables every assertion comprising a set of financial statements, or so sensitive that minor misstatements would alter adversely investment decisions based thereon.

Rather, the typical statement user must screen out numerous assertions as insignificant, if he is to reduce the factors he considers in his final decision to a manageable number. During this screening process (whether done consciously or not), he evaluates each individual item's significance relative to the other items in the financial statements.

If we make the seemingly reasonable assumption that the typical statement user makes such evaluations with reference to his decision model, we are left with two conclusions. First of all, the influence of any item on the output of his decision model will vary directly with his evaluation of that item's significance relative to the other statement items. Secondly, there will be some level of relative

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[11] R. K. Mautz and Hussein I. Sharaf, The Philosophy of Auditing, Menasha, Wisconsin: George Banta Co., Inc., 1964, p. 118.

significance which separates factors to be included in the decision from factors to be ignored.

We may represent these results graphically, as follows:

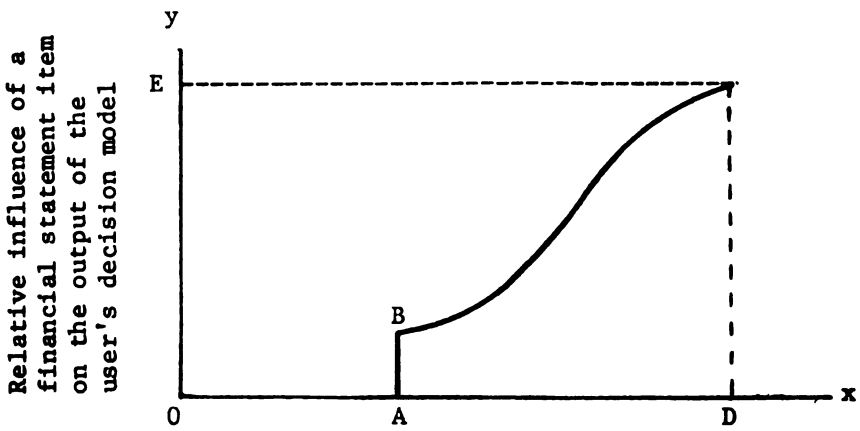

Figure 1. Graphic representation of the relationship between the financial statement user's evaluation of the significance of a given item in the statements relative to all other statement items, and the relative influence of that item on his decision model output.

The function represented by the graph in Figure 1 is simply:

$$y = \begin{cases} 0, & x < OA \\ f(x), & OA \leq x < OD \\ OE, & x \geq OD \end{cases} \qquad (4.1)$$

where: x is the user's evaluation of the significance of a given financial statement item relative to all statement items,[12]

y is the relative influence of a financial statement item on the output of the statement user's decision model, hence:

y = 0 indicates the item has no effect on the user's decision model output, i.e., the item is not material,

y = f(x) indicates the item's relative influence on the user's decision model output, its relative materiality, is a function of its significance relative to all statement items,[13]

y = OE indicates the item completely determines the output of the decision model.[14]

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[12]The x-value assigned to a given financial statement item is, itself, undoubtedly a complicated function of a number of variables, the most important of which are probably:

1. the balance attached to the item,
2. the basic nature of the item, and
3. the importance of the item in combination with other items.

This function is apt to vary from user to user, and when we also consider that the decision model function of Figure 1 is apt to vary from user to user with respect to the values of OA, OD, and the form of f(x), it is easy to see why the auditor, who may not even know the statement users let alone their relevant functions, occasionally finds the determination of an item's materiality a thorny problem.

[13]The form taken by f(x) is restricted only in that it should be monotonically increasing. While it might appear as in Figure 1, undoubtedly a step-function would be more appropriate.

[14]In this case, of course, all the other financial statement items must have relative significance less than OA.

Even though, presumably, an assumption of the above function is that each item included as a variable in the statement user's decision model is "correct" as it appears in the statements, "correctness" need not imply absolute precision. Instead, the typical user of financial statements should be satisfied if: (1) those statements are sufficiently accurate to allow him to correctly identify significant items (i.e., he should have confidence that no apparently immaterial item is so grossly misstated that discovery of the misstatement would render the item material), and (2) the items he selects as variables for his decision model are sufficiently accurate that any subsequently discovered errors will not affect the model's output.

The foregoing discussion of materiality and the audit client's financial records contains reference both to "material items in the financial statements," and to "material errors or misstatements of items in the financial statements." At this point, let us distinguish between the two somewhat different uses of the concept and discuss the implications of each for the auditor's responsibility in audit evidence accumulation. A material item in the financial statements is any item included as a variable in the typical statement user's decision model. A material error or misstatement of an item in the financial statements, on the other hand, is one whose subsequent discovery would alter the output of the user's decision model.

Grinaker has written, "for the auditor to render an unqualified professional opinion that . . . financial statements present fairly, he must believe and have reasonable grounds for his belief that the

statements are free from material misstatement . . ."[15] Now, if a financial statement user considers an item to be immaterial (i.e., ignores it for decision-making purposes), the subsequent discovery of an error in that item should have no effect on the output of his decision model, unless the item has been so grossly misstated that its subsequent correction discloses it to have been sufficiently significant for consideration as a decision variable in the first place. Thus, for apparently immaterial financial statement assertions, the range of allowable error, i.e., error which does not affect the output of the typical statement user's decision model, may be rather large.

The range of allowable error for material financial statement items, i.e., items included as variables in the typical statement user's decision model, on the other hand, should vary directly with these items' relative influence on the decision model output. Thus, even though an item is material, its range of allowable error may be moderately large if its actual influence in the decision process is relatively small. If an item dominates the decision process, however, even a slight error may affect the decision model's output and hence be material.

For the above reasons, we may conclude that the auditor's basic responsibilities differ between immaterial and material items. Specifically, if an item appears immaterial, the auditor's responsibility is to gather sufficient evidential support to satisfy himself that the item is, in fact, immaterial. For a material item, however, he

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[15] Grinaker, p. 64.

requires sufficient evidential support to assure himself that it is accurately stated within the limits of error allowed by the statement user's decision model. This latter requirement is apt to be far more restrictive than the former.

Regrettably, even though materiality is such an important factor, it is extremely difficult to measure. Arens notes the primary reason, stating:

> One of the difficulties in establishing objective measurements of materiality and relating it to evidence accumulation requirements is the lack of knowledge by auditors of the misstatements or omissions which affect the decisions of particular user groups. This results primarily from the large number of diverse user groups which rely upon financial statements, as well as the inability or unwillingness of most specific user groups to specify their maximum materiality error or omission tolerances.[16]

Thus, while, in most cases, the auditor, using past experience as a guide, may believe himself able to distinguish between immaterial and material items in a given set of financial statements, his attempts at measuring (i.e., determining precisely) a particular item's relative materiality can be, at best, crude and highly arbitrary. He simply has too few guidelines to follow, let alone an operational definition of the concept.[17]

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[16] Arens, p. 51.

[17] For a detailed discussion of the problems involved in developing materiality guidelines as well as suggested approaches to these problems, see Arens, pp. 47-74. Specifically, he considers the following factors relevant to useful materiality guidelines: "the individual account," "combination of accounts," "combination of misstatements and omissions," "types of errors or misstatements existing in the accounts," "correct vs. incorrect account balances," "the differences between unknown errors in immaterial accounts and known errors in material accounts," "the nature of the item."

The Financial Accounting Standards Board has also included this topic on its agenda.

In 1964, the editorial board of the Journal of Accountancy summarized perhaps the primary reason for this situation. Recognizing the diverse variety of factors which influence materiality decisions, they concluded:

> Materiality cannot be decided solely on the basis of a percentage of net income or a percentage of some other basic figure. Whether an item is material or not may depend on much more than a financial measurement. It may also depend upon the nature of the item being measured. In some cases, the nature of the item is the principle basis for the decision.[18]

Despite the lack of relevant guidelines, public accountants must make materiality decisions with respect to their clients' financial reports -- decisions which can influence their accumulation of audit evidence. The problem of how they make, or should make, such decisions is easily a research project in itself, and is thus beyond the scope of this dissertation. Therefore, we must bypass that problem and concentrate, instead, on the implications of materiality decisions, however made, for audit evidence accumulation.

Expected Influence on Audit Program

According to Mautz and Sharaf:

> In most cases it is relatively easy to determine if a financial statement assertion is material or not, If it is not, the auditor need obtain only sufficient evidence to persuade (as contrasted with assure) him that the assertion involved is or is not valid. Borrowing the terminology of law he should require a preponderance of evidence. If the assertion is one that is material, however, he should require considerably stronger evidence. Here he should attempt to eliminate any reasonable doubt . . . This means that for material assertions, the evidence must be compelling -- and this

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[18]"Materiality," Journal of Accountancy 117 (April 1964): 35-36.

> is possible only for existence of present physical things and for mathematical assertions -- or a combination of types of evidence must be obtained.[19] [Italics mine.]

In general, the auditor can alter his evidential support by altering any or all of the three parameters of his evidential collection: types of evidence included, times of collection of each type, and number of units of each type collected at a given time. As we shall see, materiality considerations may influence all of these parameters.

Expected Influence on Types of Evidence Included

Arens suggests the importance of materiality considerations for this parameter of the auditor's evidential collection when he writes:

> Audit procedures are classified as required procedures and optional procedures. A required procedure must be performed for every audit where the assertion or account being considered is material. Optional procedures are determined by the following variables of auditing: (1) internal control, (2) materiality, (3) reliability, (4) cost, (5) risk of sanctions.[20] [Italics mine.]

Clearly, the implication is that Arens believes certain procedures "required" when an item is material need not be performed when the item appears immaterial. Note, however, that Arens does not imply that the auditor may completely ignore items in the financial records which appear immaterial. Rather, he argues that, even for these items, the auditor requires a certain degree of evidential support, noting:

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[19] Mautz and Sharaf, p. 105.

[20] Arens, p. 128.

> . . . the true or corrected balance is unknown by the auditor before the work is completed. . . . If an item is immaterial as stated on the books, the auditor may not perform any work to verify the account balance. If, however, the correct balance is material, the auditor will have passed up a material item on the basis of immateriality. This results in a paradox that the correct balance is the basis for determining what is a material misstatement, yet the correct balance is unknown. There is no simple solution to the problem. The ultimate answer, however, is that there will be some procedures used in every audit which will aid the auditor in the discovery of this type of misstatement.[21] [Italics mine.]

We have previously suggested that the auditor's responsibility concerning apparently immaterial items in the financial records differs significantly from his responsibility concerning material items in those records. If an item is immaterial, and hence the auditor need only ascertain that it is not grossly misstated, then he may conclude with the Canadian Institute of Chartered Accountants, that the following general tests are sufficient for his needs:

1. learn what the item represents;
2. decide that it appears reasonable;
3. check the amount to the general ledger and scrutinize the relevant account;
4. decide that in comparison to similar items from the previous years it is reasonable;
5. decide that there are no special circumstances that would render material this otherwise immaterial item.[22]

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[21] Arens, pp. 55-56.

[22] Study Group on Audit Techniques, Canadian Institute of Chartered Accountants, Materiality in Auditing, Toronto: Canadian Institute of Chartered Accountants, 1965, pp. 8-9.

If, on the other hand, an item is material and hence the auditor must determine its accuracy within even moderately close tolerances, his testing will most likely have to include more, and considerably more specific, procedures than those listed above.

Expected Influence on the Time of Collection of Each Type of Evidence

In general, the more recent a unit of audit evidence, the more support it is likely to provide. Therefore, and because the auditor requires significantly greater evidential support for material items than for immaterial items, materiality considerations may, in part, determine whether he performs certain tests at an interim date or at year end. As we shall see, however, the better the client's internal control system, the less evidential support he will lose by shifting his testing from year-end to an interim date. Therefore, by themselves, materiality considerations are likely to have relatively little effect on the timing parameter of the auditor's evidential collection.

The Auditor's Evaluation of the Probability that a Given Financial Statement Assertion Is Materially Misstated

The Committee on Auditing Procedure of the AICPA has stated that:

> . . . it should be understood that the ultimate risk against which the auditor and those who rely on his opinion require reasonable protection is a combination of two separate risks. The first of these is that material errors will occur in the accounting process by which the financial statements are

> developed. The second is that any material errors that occur will not be detected in the auditor's examination.[23]

The obvious implication of this statement is that the prudent auditor must require more evidential support for any given financial statement assertion, the greater is the probability of material error in that assertion. At least two factors are likely to affect an auditor's evaluation of this probability:

1. his evaluation of the quality (comprehensiveness and effectiveness) of his client's relevant internal controls, and
2. his assessment of the general "riskiness" of his client, based on the client's financial health, operating and reporting policies, prior auditor-client relations, etc.

The remainder of this chapter is devoted to a study of these factors and their effect on audit evidence accumulation.

The Auditor's Evaluation of the Quality of His Client's Relevant Internal Controls

The Committee on Auditing Procedure suggests the following general definition for internal control:

> Internal control comprises the plan of organization and all of the co-ordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency and encourage adherence to prescribed managerial policies.[24]

As evidence of the importance accorded this factor by the Committee and the AICPA, the second standard of auditing fieldwork requires that:

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[23] Committee on Auditing Procedure, p. 39.

[24] Ibid., p. 15.

> There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.[25]

Perhaps no other variable of the audit has received such extensive exposure in the professional literature -- most of the discussion centering around: (1) the extent of the auditor's responsibility for evaluating his client's internal control system, and (2) the effect of such evaluation on subsequent evidence accumulation. While a detailed analysis of the auditor's responsibility for evaluating his client's internal control system is beyond the scope of this dissertation, a summary of the AICPA's current position on the subject should serve as a useful prelude to the discussion of the effect such evaluation may logically have on the auditor's program.

The Auditor's Responsibility for Evaluating His Client's Internal Controls

In Statement on Auditing Standards No. 1, the Committee on Auditing Procedure discusses both the nature and the scope of the auditor's responsibility under the second fieldwork standard.

The Nature of the Responsibility

According to the Committee on Auditing Procedure:

> The study to be made as the basis for the evaluation of internal control includes two phases: (a) knowledge and understanding of the procedures and methods prescribed and (b) a reasonable degree of assurance that they are in use and are operating as

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[25] Ibid., p. 5.

> planned. These two phases are referred to as the review of the system and tests of compliance, respectively.[26]

Concerning the first phase of the study, the Committee notes:

> The review of the system is primarily a process of obtaining information about the organization and the procedures prescribed and is intended to serve as the basis for tests of compliance and for evaluation of the system. The information required for this purpose ordinarily is obtained through discussion with appropriate client personnel and reference to documentation such as procedure manuals, job descriptions, flowcharts, and decision tables.[27]

Presumably, the auditor must always perform this first phase of the study.

With regard to tests of compliance, however, such is not the case, since the auditor only needs to know that internal control procedures are operating as prescribed if he intends to rely on such procedures as evidence of financial statement assertion validity. In the words of the Committee on Auditing Procedure:

> The purpose of tests of compliance is to provide reasonable assurance that the accounting control procedures are being applied as prescribed. Such tests are necessary if the prescribed procedures are to be relied upon in determining the nature, timing, or extent of substantive tests of particular classes of transactions or balances, . . . but are not necessary if the procedures are not to be relied upon for that purpose. [Italics mine.] The auditor may decide not to rely upon the prescribed procedures because he concludes either (a) that the procedures are not satisfactory for that purpose or (b) that the audit effort required to test compliance with the procedures to justify reliance on them in making substantive tests

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[26] Ibid., p. 27.

[27] Ibid., pp. 27-28.

would exceed the reduction in effort that could be achieved by such reliance.[28]

The Scope of the Responsibility

In defining the scope of the auditor's responsibility under the second fieldwork standard, the Committee on Auditing Procedure subdivides internal control into two categories -- administrative control and accounting control. According to the Committee:

> Administrative control includes, but is not limited to the plan of organization and the procedures and records that are concerned with the decision processes leading to management's authorization of transactions. . . .[29]

while:

> Accounting control comprises the plan of organization and the procedures and records that are concerned with the safeguarding of assets and the reliability of financial records and consequently are designed to provide reasonable assurance that:
>
> a. Transactions are executed in accordance with management's general or specific authorization.
>
> b. Transactions are recorded as necessary (1) to permit preparation of financial statements in conformity with generally accepted accounting principles or any other criteria applicable to such statements and (2) to maintain accountability for assets.
>
> c. Access to assets is permitted only in accordance with management's authorization.
>
> d. The recorded accountability for assets is compared with the existing assets at

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[28] Ibid., p. 28.

[29] Ibid., p. 20.

> reasonable intervals and appropriate action is taken with respect to any differences.[30]

Having made this distinction, the Committee concludes that:

> . . . accounting control is within the scope of the study and evaluation of internal control contemplated by generally accepted auditing standards, while administrative control is not.[31]

Expected Influence on Audit Program

The auditor's evaluation of the comprehensiveness and effectiveness of his client's internal controls is unique among the factors which determine minimum evidential support requirements. This parameter is the only one which is, itself, based on actual audit evidence -- the review of the client's internal control system and tests of compliance. Therefore, as one might expect, the factor has a fundamentally different effect on audit program development. The following normative approach to evaluating a given financial statement assertion indicates this difference. Essentially, the approach consists of four steps:

1. Determine the minimum evidential support required for an opinion by professional standards, regulatory agency requirements, firm policies, auditor-client contract terms, and materiality considerations.
2. Determine the extent to which the risk of sanctions necessitates an increase in this minimum.

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[30] Ibid.

[31] Ibid., p. 27.

3. Determine the degree of evidential support provided by the internal control evaluation and any other existing corroborative evidence.
4. Determine the nature, extent, and timing of substantive tests necessary to provide adequate support to establish (or refute) the assertion at the required level of assurance.

As this approach suggests, the auditor's evaluation of his client's internal control does not actually affect his overall requirement for evidential support. Rather, the evaluation is a potential source of evidential support and therefore, in part, determines the degree to which additional (i.e., substantive) testing is necessary.

The Committee on Auditing Procedure has written:

> The purpose of the auditor's study and evaluation of internal control . . . is to establish a basis for reliance thereon in determining the nature, extent, and timing of audit tests to be applied in his examination of the financial statements. [Italics mine.][32]

Clearly, then, the Committee feels that such "study and evaluation" may affect all three parameters of the auditor's evidential collection. Let us consider the reasoning behind this position.

Effect on the Type of Evidence Obtained

Mautz and Mini argue that:

> Program planning . . . is essentially a problem of allocating audit resources as effectively and economically as possible in an effort to achieve the audit objective. As a basis upon which to allocate these audit resources, the auditor must concern himself with the relative probabilities that an array of possible irregularities, or deviations from fact, will be present

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[32] Ibid., p. 14.

> in the financial data under review; that is, the extent and nature of his audit procedures must be directed primarily at those irregularities that are most probable in his particular client's organization.[33]

For any given financial statement assertion, the presence of an adequate, functioning set of relevant internal controls generally insures a low probability of misstatement. The absence of such controls, on the other hand, while it need not always result in material misstatement, does increase the probability of, or at least the propensity for, errors and irregularities. Therefore, wherever the auditor's evaluation of his client's internal control indicates an inherent inadequacy or chronic lack of compliance, he must perform such substantive tests as are necessary to assure him that no material misstatement has occurred. Since, however, the specific weakness involved determines which tests he must perform, the auditor's evaluation of his client's internal control system will affect the type parameter of his evidential collection. In the words of Mautz and Mini:

> . . . the judgment process by which internal control is related to the audit program . . . takes the form of a line of reasoning illustrated by the following questions:
>
> 1. What features of internal control are missing?
> 2. What irregularities are thereby permitted?
> 3. What modifications in our minimum audit program will be of most help in testing for the occurrence of such irregularities?[34]

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[33] R. K. Mautz and Donald L. Mini, "Internal Control Evaluation and Audit Program Modification," The Accounting Review 41 (April 1966): 287.

[34] Ibid., p. 290.

One should not infer, however, that the auditor need only perform substantive tests where his internal control evaluation has identified an inadequacy. As the Committee on Auditing Procedure points out:

> There are inherent weaknesses that should be recognized in considering the potential effectiveness of any system of accounting control. In the performance of most control procedures, there are possibilities of errors arising from such causes as misunderstanding of instructions, mistakes in judgment and personal carelessness, distraction or fatigue. Furthermore, procedures whose effectiveness depends on segregation of duties obviously can be circumvented by collusion. Similarly, procedures designed to assure the execution and recording of transactions in accordance with management's authorizations may be ineffective against either errors or irregularities perpetrated by managers with respect to transactions or to the estimates and judgments required in the preparation of financial statements.[35]

Because of such limitations on the effectiveness of internal control, the Committee concludes:

> The second standard [of fieldwork] does not contemplate that the auditor will place complete reliance on internal control to the exclusion of other auditing procedures with respect to material amounts in the financial statements.[36]

The obvious implication is, as Mautz and Mini[37] and Arens[38] have both earlier suggested, that there exists a minimum program or minimum set of procedures required for all engagements, even under ideal internal

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[35] Committee on Auditing Procedure, p. 22.

[36] Ibid., p. 34.

[37] Mautz and Mini, pp. 283-289.

[38] Arens, p. 85.

control conditions. Furthermore, it follows that departures from ideal controls require appropriate modification of that minimum.

Effect on the Timing of Evidence Accumulation

Arens has written:

> It is appropriate to perform balance sheet verification tests at a time other than year end only when the auditor believes that the transactions which take place between verification time and the period end will be correctly recorded. Since . . . the internal control in existence does affect the probability of error, it follows that it should also affect the auditor's confidence about the validity of transactions between verification time and year-end time. It is true that if internal controls are weak in the area under consideration, the auditor is not justified in performing the balance verification at a time other than year end.[39]

The auditor attests to the content of a set of financial reports at a particular date. If he has obtained evidential matter on or after the statement date, presumably, any support provided by that evidence relates <u>directly</u> to information contained in those statements. If, however, he has obtained the evidence prior to the actual statement date, he must <u>project</u> its support forward. In general, while evidence that a financial statement item is free from material error on June 30 <u>may</u> support the opinion that the same item is free of material error on December 31, it need not. The degree of reliability with which the auditor may project interim evidential support depends upon: (1) the degree to which the recording of transactions and safeguarding of assets occurs within a well-defined deterministic

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[39] <u>Ibid.</u>

framework, i.e., a perfectly predictable system, and (2) the degree to which this system remains constant over the period of the projection.

Unfortunately for the auditor, as Mautz and Mini note, internal control systems, however well-defined, comprehensive, and normally effective, are not deterministic. Because they contain human elements, such systems are subject to breakdowns and are hence probabilistic.[40] In other words, every activity which takes place within a given client's control system has a probability, however small, of resulting in an error in that client's records. Furthermore, as Mautz and Mini also note, no system is so comprehensive as to govern every possible business activity which may occur -- and, in general, activities beyond systematic control are particularly subject to inconsistent and erroneous treatment.[41] Thus, if an auditor obtains interim-date evidence in support of a given financial statement item, he must accept the possibility that a material error or abstraction will occur with respect to that item between the time of evidence accumulation and the date of his opinion. For this reason, the reliability of interim evidential support must always be somewhat less than perfect.

Clearly, the smaller the probability of "post-testing" error or irregularity, the greater is the reliability with which the auditor can project interim test results forward. For any given financial statement item, however, this probability is, in turn, a function of the following:

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[40] Mautz and Mini, pp. 284-85.

[41] Ibid., p. 286.

1. the probability that activity relevant to the item, but beyond the client's system of internal control will occur,
2. the probability that activity relevant to the item but beyond the client's system of internal control will be improperly handled, given that such activity occurs,
3. the probability that activity relevant to the item and within the client's system of internal control will be improperly handled,
4. the distribution of errors which can occur,
5. the volume of activity (relevant to the given item) between the test date and the statement date (in general, likely to be a function of the length of the period), and
6. the auditor's definition of material error.

Now, if we assume that, with respect to any given statement item, the auditor's definition of material error is a constant, the only variable of the above six over which he has any direct control is the volume of activity which takes place between the testing date and the statement date. Thus, if the auditor is to hold the probability of "post-testing" material error to an acceptable level, he must first evaluate (or, at least, estimate) the other relevant variables and then adjust his timing accordingly.

Of the variables which the auditor must evaluate, two (the probability that activity beyond the client's control system will occur, and the probability that activity within the system will be handled erroneously) are direct functions of the comprehensiveness and effectiveness of the client's internal control system. Thus, the auditor's

evaluation of the internal controls should influence his evaluation of these variables, and hence affect the timing parameter of his evidential collection.

Effect on the Extent of Evidence Accumulation

Material error in a client's financial statements may result from either:

1. a few unacceptably large errors in the client's records, or
2. an unacceptably large number of small errors.

As Arens points out:

> If a single transaction or subsidiary account balance is so large that its misstatement would render the overall financial statements incorrect, the auditor can verify the transaction or subsidiary account regardless of the quality of the internal control in effect. A careful auditor is expected to stratify populations and perform 100 per cent verification procedures on any strata which have a small number of large transactions.[42]

For this reason, we may conclude (with Arens) that:

> . . . internal control evaluation can have no effect on the extent of procedures performed when the auditor is concerned about a small number of large errors.[43]

Where the auditor is concerned about a large number of small errors, however, such is not the case and reference to statistical sampling most clearly illustrates the effect.

In general, use of statistical sampling requires the auditor to specify two parameters: sample precision, "the range or limits within

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[42] Arens, pp. 89-90.

[43] Ibid., p. 90.

which the sample result is expected to be accurate,"[44] and reliability (confidence level), "the mathematical probability of achieving that degree of accuracy."[45] While recognizing that sample precision and reliability "are statistically inseparable," the Committee on Auditing Procedure suggests that:

> . . . one of the ways in which these measures can be usefully adapted to the auditor's purpose is by relating precision to materiality and reliability to the reasonableness for the basis of his opinion.[46]

We have already noted that:

> . . . the ultimate risk against which the auditor and those who rely on his opinion require reasonable protection is a combination of two separate risks. The first of these is that material errors will occur in the accounting process by which the financial statements are developed. The second is that any material errors that occur will not be detected in the auditor's examination.[47]

Clearly, for any given financial statement assertion, the first risk will vary inversely with the quality and comprehensiveness of the client's relevant internal controls while the second risk will vary inversely with the extent of the auditor's testing. Therefore, since:

> The combined risk of both these adverse events occurring jointly is the product of the respective individual risks . . .[48]

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[44] Committee on Auditing Procedure, p. 45.

[45] Ibid.

[46] Ibid., p. 38.

[47] Ibid., p. 39.

[48] Ibid., p. 51.

it follows that if the auditor desires to hold the combined risk to some given acceptable level, the greater is the probability of material error in the client's records, the more extensively he must test for such error.

One may also arrive at the same conclusion in a somewhat more roundabout manner. Note that if the auditor's combined risk of material error in a given financial statement item is, e.g., .05, then his overall degree of assurance that such error does not exist is .95, the complement of the combined risk. One should not, however, confuse nor equate the overall degree of assurance which the auditor will require to establish a financial statement item's validity with the reliability level at which he must perform any given substantive test on that item. The auditor's overall assurance requirement should be a function of the following factors: (1) professional standards, (2) regulatory agency requirements, (3) firm policies, (4) auditor-client contract terms, (5) materiality considerations, and (6) risk factors. This requirement should not, however, vary with the types of evidence which the auditor collects in his attempt to achieve it. Therefore, since the auditor's evaluation of his client's internal control system is essentially evidence, this factor should not affect his overall assurance requirement. On the other hand, the confidence level at which the auditor performs a particular substantive test should depend not only upon his overall assurance requirement, but also upon the extent to which collateral evidence contributes to that requirement. In other words, the auditor's overall degree of assurance is the result of:

> . . . combining the reliability from one or more statistical samples that serve a particular purpose with the "subjective reliance assigned to . . . any other auditing procedures" that serve the same purpose.[49]

Therefore, we may conclude with the Committee on Auditing Procedure that:

> The auditor's judgment concerning the reliance to be assigned to internal accounting control and other relevant factors should determine the reliability level to be used for substantive tests. Such reliability should be set so that the combination of it and the subjective reliance on internal accounting control and other relevant factors will provide a combined reliability level conceptually equal to that which would be used . . . if the auditor's evaluation indicate[d] that little if any reliance should be assigned to internal accounting control for the purpose of particular substantive tests.[50]

The Auditor's Assessment of the General "Riskiness" of His Client

In general, the auditor's assessment of the general "riskiness" of his client, based on the client's financial health, operating and reporting policies, prior auditor-client relations, etc., may affect his audit program in two ways. First of all, to the extent it affects his evaluation of the expected risk of sanctions, this factor may

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[49] Ibid., pp. 51-52.

[50] Ibid., p. 52. The Committee suggests that:

> The concept . . . can be applied by use of the following formula:
>
> $$S = 1 - \frac{(1-R)}{(1-C)}$$
>
> where:
> S = Reliability level for substantive tests
> R = Combined reliability level desired . . .
> C = Reliance assigned to internal accounting control and other relevant factors. (p. 53.)

influence the auditor's overall evidential support requirements. This effect receives detailed consideration in Chapter V.

The factor may also affect the auditor's evidential collection to the extent that it corroborates or conflicts with other evidential matter. For example, suppose a client's internal control system appears adequate and effective. The auditor will likely place more reliance on that system in restricting his substantive tests if the client is in sound financial health and has well-established operating and reporting policies than if the client faces insolvency or has questionable operating and reporting policies.

In the former case, the evaluation of internal control and the assessment of the client's "riskiness" tend to corroborate one another in predicting a low probability of material error in the client's financial statements. In the latter case, however, since the two types of evidence conflict, the auditor has little choice but to place greater reliance on substantive tests to settle the issue. (For a more detailed discussion of the effect of corroborative evidence on audit evidence accumulation, see supra, pp. 101-104.)

Expected Influence on Audit Program

In the present context, the auditor's assessment of client "riskiness" primarily affects his audit program indirectly through its tendency to augment or reduce the reliability of evidential support provided by his evaluation of client internal controls. Since, however, the auditor's evaluation of his client's internal controls can affect all three parameters of his evidential collection, client "riskiness" can also affect all three parameters.

Summary

This chapter has dealt with factors which, in part, determine the auditor's support requirements for an opinion on a given financial statement assertion -- specifically, the "factors which determine the minimum evidential support necessary to justify a professional opinion" on such an assertion as an element of the overall financial statements. As in the previous chapter, an important part of this discussion has centered around whether and how the individual factors considered might logically affect the types of evidence the auditor obtains, the times at which he obtains a given type, and the number of units of a given type he obtains at a given time. Also as in the previous chapter, the following table summarizes the conclusions of this aspect of the discussion.

Table 2.--Expected influence of factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion on the three parameters of the auditor's evidential collection: (1) the types of evidence included, (2) the times of collection of each type, and (3) the number of units of each type collected at a given time.

Variable	Type	Timing	Extent
Generally Accepted Auditing Standards	●	0	0
SEC Pronouncements	●	0	0
Commission Requirements (for Regulated Industries)	●	0	0
Policies of Individual Public Accounting Firms	●	◒	◒
Terms of the Auditor-Client Contract	◒	◒	◒
Materiality Considerations	●	◒	●
Auditor's Evaluation of the Probability that a Given Financial Statement Assertion Is Materially Misstated	●	●	●

Key:

● direct influence on this parameter of the auditor's program

◒ indirect or limited influence on this parameter of the auditor's program

0 no influence on this parameter of the auditor's program.

Of the factors discussed in this chapter, then, while all except "terms of the auditor-client contract" may exert considerable influence on the type parameter of the auditor's evidential collection, materiality considerations and the auditor's evaluation of the probability that a given financial statement assertion is materially

misstated are likely to have the greatest influence on the timing and extent parameters of that collection.

For some engagements, the auditor may consider the expected cost of sanctions for failure to detect material error sufficient to require that he obtain evidential support beyond the minimum necessary for a professional opinion. Factors which affect this expected disutility may thus also influence the auditor's program. Let us therefore turn our attention to factors of this nature.

CHAPTER V

FACTORS WHICH INFLUENCE THE PROBABILITY THAT THE AUDITOR WILL INCUR SANCTIONS FOR FAILING TO DETECT A MATERIAL ERROR GIVEN THAT SUCH ERROR EXISTS IN HIS CLIENT'S RECORDS

The auditor never achieves perfect knowledge of the degree to which a given set of financial records reflects "reality." Even if examination of every entry in those records, every asset allegedly owned by the client, every available supporting document, etc., could yield this degree of knowledge, such examination would undoubtedly be infeasible, both from the standpoint of cost, and of available time and staff. For this reason, however small it may be, the possibility always exists that an auditor will fail to detect material error in a given assertion of his client's financial statements. If subsequently discovered, however, such failure may lead to any or all of the following sanctions:

1. adverse publicity,
2. admonition from the SEC or AICPA,
3. loss of client,
4. lawsuit,
5. loss of right to practice before the SEC,
6. expulsion from the AICPA and/or loss of license to practice, and
7. conviction in criminal action.

Since these sanctions are a source of potentially great disutility, whenever conditions indicate a greater than usual probability of their occurrence, the prudent auditor may elect to extend his testing beyond that necessary to satisfy "minimum" professional requirements.

In addition to the composition of the auditor's evidential collection, Chapter I identified the following as factors which may influence the probability that an auditor will incur sanctions for failing to detect a material error existing in his client's records:

1. the nature of the specific error involved,
2. the degree of exposure the client's statements receive, indicated by:
    a. the client's size,
    b. the nature of the client's operations,
    c. the distribution of the client's ownership,
    d. loan covenants which require the client to maintain specified account balances or ratios,
3. the probability that the client will file bankruptcy subsequent to the audit, indicated by:
    a. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:
        (1) factors which indicate the client's financial position ("Retained Earnings" balance, liquidity situation, etc.),
        (2) economic conditions related to the availability of external capital,
        (3) the client's rate and method of growth,

b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:

(1) the nature of the client's operations,

(2) economic conditions relevant to the client's marketplace,

(3) the client's method of financing operations.

These factors form the basis of discussion for the remainder of this chapter.

The Nature of the Specific Error Involved

Whether or not sanctions are likely to result from an auditor's failure to detect material error in his client's financial statements may depend, to some extent, upon the actual nature of the error. For example, Arens has suggested:

> The management of the client is more likely to impose sanctions against the auditor for failure to find errors which reflect permanent losses of assets than for those which result from assigning costs and revenues to the wrong period . . . [i.e.,] management is likely to be more unhappy with the auditor if he fails to discover a defalcation than with an equal dollar amount of sales cut-off error.
>
> Other users are likely to complain more when errors are found to overstate net income rather than understate it. The only users who are significantly hurt by understatements are potential stockholders and creditors who failed to invest because of the understatement, or former investors who sold their investments because of the understatement. Historically, neither of these users have had a serious effect upon lawsuits or other serious sanctions.[1]

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[1] Alvin A. Arens, "The Adequacy of Audit Evidence Accumulation in Public Accounting" (Doctoral thesis, School of Business Administration, University of Minnesota, 1970), pp. 40-41.

Expected Influence on Audit Program

Obviously, an auditor does not know, before the fact, specifically which type(s) of material error his examination will fail to uncover. Nevertheless, the relationship between nature of error and risk of sanctions may directly affect his audit program. Presumably, associated with each financial statement assertion are a number of (identifiable) potential types of material error, each of which, in turn, is more or less likely to result in sanctions should the auditor fail to detect it. Chapter IV suggested that the auditor's goal in reviewing his client's system of internal control should be to determine which types of error have a high propensity to occur within that system. The auditor should, however, be aware of all the errors characteristic of a given type of financial statement assertion, whether they have a high propensity to occur within the client's internal control system or not. Furthermore, whenever he considers the risk of sanctions unusually high for a particular type of error, he is justified in specifically testing for that error even though his review of the client's internal control system indicates such an error is unlikely. In this manner, the relationship between nature of error and risk of sanctions may directly affect the type parameter of the auditor's evidential collection.

This relationship may also indirectly affect the extent and timing parameters of that collection. Chapter II suggested that the probability an auditor will incur sanctions for failing to detect material error in his client's statements and the probability that he will fail to detect such error in the first place, are both decreasing

functions of the degree of evidential support he obtains. The auditor, however, has three potential approaches to increasing evidential support: (1) introduce new types of (relevant) evidence into his collection, (2) increase the number of units obtained of some type(s) of evidence already included in that collection, and (3) reduce the length of the period of time between the date at which he obtains evidence and the date of his opinion on the financial statements under examination. For this reason, whenever an auditor considers the risk of sanctions associated with a particular type of error sufficiently great to warrant evidential support in excess of the "minimum" requirements of a professional opinion and other factors in the audit (such as those discussed in Chapter IV) already require him to perform tests relevant to the detection of this type error, the risk considerations may cause him to increase his sample size and/or wait until year end to perform his tests. Since the factor does not specifically indicate which course of action the auditor should take, however, its effect on extent and timing is indirect rather than direct.

The Degree of Exposure the Client's Statements Receive

Given that an auditor has failed to detect a materially misstated assertion in his client's statements, then, presumably, the greater the number, financial sophistication, and sensitivity to error of the users of those statements, and the greater the number of people actually made aware of the error, the greater is the probability the auditor will suffer sanctions of one form or another. At least four factors can affect and/or indicate to the auditor the degree and nature of exposure his client's statements will receive and hence may

influence the composition of his evidential collection. Specifically, these factors are:

1. the client's size,
2. the nature of the client's operations,
3. the distribution of the client's ownership, and
4. loan covenants which require the client to maintain specified account balances or ratios.

At this point, let us consider each of these factors in somewhat more detail.

The Client's Size

Generally speaking, the larger a client's operations, the more likely information concerning those operations will receive exposure in the various news media. At least roughly, then, a given client's size (as measured, for example, by total asset book value) should indicate to the auditor the probable extent of adverse publicity (a sanction whose primary disutility lies in resulting losses of current and potential engagements and their attendant revenues) he may expect should he fail to detect material error in that client's financial statements.

The Nature of the Client's Operations

Arens suggests that not only are the activities of larger clients most apt to receive news media attention, certain types of client are also more likely than others to be in the public eye. Thus, for example, he contends that, "Material errors in audited financial

statements of charitable organizations . . . almost always create adverse publicity for the CPA."[2]

The nature of a given client's operations may also influence the type of exposure his financial reports will receive. This effect becomes important whenever a certain class of statement user is particularly inclined to impose sanctions (and to impose more severe sanctions) should the auditor pass a material misstatement. Thus Arens states that, for example:

> . . . misstatements in governmental financial statements often result in sanctions that are more extreme than would exist for a privately owned company with similar misstatements.[3]

In addition to influencing the extent and type of exposure a given client's financial statements will receive, the nature of his operations may affect the auditor's risk of sanctions in a somewhat more direct manner. According to Arens, evidence indicates that:

> . . . If the client is forced to file bankruptcy subsequent to the audit, the probability of the accountant's being required to defend his audit work is significantly higher than if the client is under no financial strain.[4]

For this reason, Anderson, Giese, and Booker argue that to the extent the basic nature of a client's operations affect the financial and economic risks he must take, this basic nature also affects the auditor's risk of sanctions.[5]

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[2] Ibid., p. 41.

[3] Ibid.

[4] Ibid., pp. 38-39.

[5] H. M. Anderson, J. W. Giese, and Jon Booker, "Some Propositions About Auditing," The Accounting Review 45 (July 1970): 529.

For the sake of completeness, let us also note in passing that the nature of a given client's operations may have a far more basic influence on the auditor's evidential accumulation process than through its effect on his expected cost of sanctions. To the extent that different types of clients have different accounting systems (e.g., compare a construction company using completed contract income accounting with a municipality engaged in fund accounting), evaluation of their financial reports may require the auditor to obtain evidence in support of fundamentally different types of assertions. Since, however, the study of such differences would be a major research project in itself, it is beyond the scope of this dissertation.

The Distribution of the Client's Ownership

This factor influences both the extent and type of exposure financial statements receive. The distribution of partnership or closely-held corporation financial statements is normally limited to a relatively few owners (disregarding creditors for the time being) who are frequently managers as well. For a publicly-held corporation, however, financial statement exposure is likely to be considerably more extensive. Not only will the number of owners receiving copies of the statements be considerably larger in most cases, whole new classes of interested parties -- the SEC, financial analysts, employees, the general public -- also enter the picture.

This greater exposure afforded a publicly-held client's statements affects the auditor's risk of sanctions in at least three ways:

1. it introduces the SEC as a potential source of sanctions such as:

a. admonition - which, because of the SEC's weight may have serious adverse effect on the auditor's reputation,

b. temporary delisting (revocation of permission to practice before the SEC) - essentially a stronger admonition which adds the loss of revenue during the delistment period to adverse effect on the auditor's reputation, and

c. permanent delisting - which is, of course, effectively the loss of all clients who must report to the SEC (generally an auditor's largest clients),

2. it increases the probability of legal action should the auditor fail to detect material error existing in the client's statements since:

a. not only are the client (through its management), or any of its usually numerous owners potential plaintiffs, so too are any number of "third parties" whose identity may well be unknown to the auditor at the time he expresses his opinion,

b. as Arens suggests, the probability that any individual potential plaintiff will press suit is undoubtedly greater because such parties do not bear as "personal" and "sympathetic" a relationship to the auditor as do the owner-managers of partnerships and closely-held corporations,[6] and

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[6]Arens, p. 40.

3. it increases the probability of adverse effect on the auditor's public image since, the greater the number of people potentially affected by material error in a given client's financial statements, the greater is the probability that discovery of such error will be publicly disclosed.

Loan Covenants which Require the Client to Maintain Specified Account Balances or Ratios

Frequently, in its loan agreements, a financial institution will place constraints on the balance(s) of specified accounts (e.g., long-term debt), account aggregates (e.g., current assets), and/or account ratios (e.g., acid-test, working capital, debt-equity) in the borrower's financial statements. The purpose of such restrictions is, of course, to provide some assurance that the borrower will be able to meet his repayment schedule. To insure that the borrower is, in fact, satisfying the constraints, the lender may require audited financial reports.

The effect of this type of statement exposure on the auditor's risk of sanctions is obvious. If an auditor attests that his client is operating within covenant constraints and subsequently the client defaults on his debt, eventual disclosure that an account or accounts relevant to the covenant were materially misstated is almost certain to result in litigation. Therefore, one might reasonably expect that, in situations where the client seems in a weak financial position and/or he does not substantially exceed loan covenant agreements, the prudent auditor will extend his testing (at least in areas relevant to

the covenants) beyond the "minimum" requirements for a professional opinion.

Expected Influence on Audit Program

We have suggested that, through its effect on the auditor's evaluation of the probability that he will incur sanctions should he fail to detect a material error in his client's financial statements, the extent and type of exposure those statements receive may influence him to obtain evidential support in excess of the "minimum" required for a professional opinion. In general, however, while this factor may indicate to the auditor a need for extended evidential support, it is not likely to indicate specifically what parameter(s) of his evidential collection he must alter to obtain such support. This decision must depend upon the factors (previously discussed in Chapter III) peculiar to each individual engagement which define the evidential support function for a given type of audit evidence obtained at a given time, upon marginal evidential cost functions, and, of course, upon the auditor's constraints. In other words, statement exposure may affect any or all of the parameters of the auditor's evidential collection (type(s) of evidence included, time(s) of collection of each type, and the number of units of each type collected at a given time) indirectly. However, it will not affect any of them directly.

The Probability that the Client Will File Bankruptcy Subsequent to the Audit

Arens considers this factor "the most important" of the "conditions which affect the probability of sanctions for failure to discover misstatements . . ."[7] He writes:

> . . . If the client is forced to file bankruptcy subsequent to the audit, the probability of the accountant's being required to defend his audit work is significantly higher than if the client is under no financial strain. Even a large unexpected decrease in net income or other financial statement item will tend to make the users suspect that the correct financial condition was not reported. This is a natural reaction for financial statement users, especially outside investors and creditors. It can result from the honest belief that the auditor negligently failed to discover an existing error or from the users' desire to recover part of the loss they incurred regardless of the adequacy of the audit work performed. The importance of financial condition on the probability of serious sanctions resulting is evident from the numerous recent lawsuits arising after bankruptcy or near-bankruptcy has occurred for several large companies.[8]

To accurately appraise the probability that a client may face bankruptcy subsequent to an audit, the auditor must weigh two different types of factors:

1. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:
   a. factors which indicate the client's financial position,
   b. economic conditions related to the availability of external capital,
   c. the client's rate and method of growth, and

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[7] Ibid., p. 38.

[8] Ibid., pp. 38-39.

2. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:
   a. the nature of the client's operations,
   b. economic conditions relevant to the client's marketplace,
   c. the client's method of financing operations.

Factors which Affect or Indicate the Degree and Types of Financial Crisis the Client Can Withstand

Let us define a financial crisis as any event which has the potential to precipitate bankruptcy. Identification and discussion of all such crises is a major study in itself and hence is beyond the scope of this dissertation. The important point, however, is that the auditor, based upon his association with his client and his (supposedly) intimate knowledge of his client's operations, should be able to identify which types of crisis can pose a threat to the continuation of those operations. Furthermore, because of the effect client bankruptcy subsequent to the audit may have on his risk of sanctions (more specifically, lawsuits), he should evaluate the adequacy of a "minimum" evidential collection with respect to such weaknesses as he identifies. At least three factors effect, or can indicate to the auditor, the degree and types of financial crisis a given client can withstand.

Factors which indicate the Client's Financial Position

Clearly, such factors are a source of information concerning that client's ability to withstand financial crisis. The following table, while by no means comprehensive, suggests a few of the more

obvious crises a client may face along with financial condition indicators an auditor might use to determine the client's ability to withstand them.

Table 3.--Examples of financial crises and indicators of a client's ability to withstand them

Crisis	Indicator of a Client's Ability to Withstand
Operating loss	"Retained Earnings" balance
Debt repayment requirements	Liquidity situation
Loss of a major customer	Degree of concentration of business with one or a few customers
Casualty loss	Casualty insurance, "Retained Earnings" balance

Economic Conditions related to the Availability of External Capital

The client's financial condition primarily indicates his internal capacity to meet financial crisis. In evaluating his overall capacity to meet such crisis, however, the auditor must, in most cases, also take into account the client's ability to draw upon external sources of capital in an emergency situation, i.e., his line of credit and his potential for generating external investment. Of course, one important factor relevant to this ability is the client's existing capital structure, particularly his outstanding debt. Other relevant factors the auditor might consider, however, include the status of the money market (Is money generally available or is it "tight"?) and the general attitude of the investing public (Is the stock market "bullish" or "bearish"?).

The Client's Rate and Method of Growth

As Anderson, Giese, and Booker note, "rapid growth through mergers and acquisitions," especially if such growth is effected by the issuance of "junior stock equities," may increase a client's danger of bankruptcy substantially since "this method of expansion . . . depends heavily on an ever increasing stock-price, which in turn means [a requirement for steadily] increased earnings."[9] In other words, ceteris paribus, one would expect that a client committed to a long-term program of merger expansion through the issuance of junior equities would have far less ability to absorb an operating loss, or even reduced profits, than might otherwise be the case, since such loss or reduction could terminate the expansion program at a fatally premature state.

Factors which Indicate the Probability that the Client Will Face a Financial Crisis which Exceeds Those Capabilities

Even though a client may have little capability to withstand certain types of financial crisis, the probability of bankruptcy due to such crises may still be small if they have a low probability of occurring. For this reason, the auditor should consider the probability that the client will actually face a financial crisis which exceeds his withstanding capabilities. At least three factors may affect, or indicate this probability to the auditor.

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[9]Anderson, Giese, and Booker, p. 529.

The Nature of the Client's Operations

We have already discussed in some detail the effect of this factor on the auditor's risk of sanctions and therefore need not explore it further here except to reiterate that clearly, certain types of operations are inherently riskier than others. Thus, for example, Anderson, Giese, and Booker note that "other things equal," a commodity trader will bear greater "financial and economic risk" than will a foundry.[10]

Economic Conditions relevant to the Client's Marketplace

Although its measurement is admittedly difficult, the effect of such conditions is undeniable. For example, ceteris paribus, the client's chances of sustaining operating losses in times of recession, stiff competition, or declining demand for the client's product are clearly greater than they would be in times of market expansion, little or ineffectual competition, or expanding demand for the client's product.

The Client's Method of Financing Operations

Ceteris paribus, a client's danger of financial crisis should be greater, the more he relies upon debt as a source of financing. "Trading-on-the-equity" is a double-edged sword -- it will amplify a loss in the same way that it amplifies gains. Hence it increases the possibility that the client will incur an operating loss greater than it can absorb. Furthermore, the greater the amount of debt

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[10] Ibid.

outstanding, the greater is the danger that eventual repayment requirements may force the client to liquidate assets essential to the operation of his business.

Expected Influence on Audit Program

The auditor's evaluation of the probability that his client will file bankruptcy subsequent to the audit should affect his evidence accumulation in essentially the same manner as his evaluation of the extent and type of exposure his client's statements will receive, i.e., while the potential effect of client bankruptcy on the auditor's risk of sanctions may influence him to obtain evidential support in excess of the "minimum" required for a professional opinion, those factors which indicate the probability of client bankruptcy are not likely to indicate to the auditor specifically which parameters of his evidential collection he must alter to obtain such support. Again, this decision must depend upon the factors (previously discussed in Chapter III) peculiar to each individual engagement which define the evidential support function for a given type of audit evidence obtained at a given time, upon marginal evidential cost functions, and, of course, upon the auditor's constraints. Thus, as in the case of statement exposure, while potential client bankruptcy may affect any or all of the parameters of the auditor's evidential collection (type(s) of evidence included, time(s) of collection of each type, and the number of units of each type collected at a given time) indirectly, this factor will not affect any of them directly. Since, however, the auditor is likely to identify in advance the type(s) of crisis which may precipitate a

particular client's bankruptcy, he may only require extended evidential support in areas relevant to such crises.

Summary

The auditor's failure to detect material error existing in his client's financial statements may lead to any or all of the following sanctions:

1. adverse publicity,
2. admonition from the SEC or AICPA,
3. loss of client,
4. lawsuit,
5. loss of right to practice before the SEC,
6. expulsion from the AICPA and/or loss of license to practice, and
7. conviction in criminal action.

Since such sanctions are a source of potentially great disutility to the auditor, whenever conditions indicate a greater than usual probability of their occurrence, the prudent auditor may elect to extend his testing beyond that necessary to satisfy "minimum" evidential requirements. Therefore, this chapter has dealt with the following factors, each of which affects, or at least may indicate to the auditor the probability that he will incur sanctions should he fail to detect material error existing in his client's financial statements:

1. the nature of the specific error involved,
2. the degree of exposure the client's statements receive, indicated by:

a. the client's size,

b. the nature of the client's operations,

c. the distribution of the client's ownership,

d. loan covenants which require the client to maintain specified account balances or ratios,

3. the probability that the client will file bankruptcy subsequent to the audit, indicated by:

a. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:

(1) factors which indicate the client's financial position ("Retained Earnings" balance, liquidity situation, etc.),

(2) economic conditions related to the availability of external capital,

(3) the client's rate and method of growth,

b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:

(1) the nature of the client's operations,

(2) economic conditions relevant to the client's marketplace,

(3) the client's method of financing operations.

As in the previous two chapters, the following table summarizes the effect such factors might logically have on the auditor's program.

Table 4.--Expected influence of factors which influence the probability that the auditor will incur sanctions for failing to detect a material error given that such error exists in his client's records on the three parameters of the auditor's evidential collection: (1) the types of evidence included, (2) the times of collection of each type, and (3) the number of units of each type collected at a given time.

Variable	Type	Timing	Extent
Nature of the Specific Error Involved	●	◐	◐
Degree of Exposure the Client's Statements Receive	◐	◐	◐
Probability that the Client Will File Bankruptcy Subsequent to the Audit	◐	◐	◐

Key:

● direct influence on this parameter of the auditor's program

◐ indirect or limited influence on this parameter of the auditor's program

0 no influence on this parameter of the auditor's program.

Chapters I-V have identified and discussed in varying detail a number of factors which seem logically capable of influencing audit evidence accumulation. Whether or not such factors do, in fact, affect the auditor's work, however, is a matter for empirical investigation rather than theoretical speculation. Therefore, let us turn to such a study, examining actual audit working papers, in an attempt to evaluate the relative influence of a number of "audit variables" on evidence accumulation in the areas of sales and accounts receivable.

CHAPTER VI

AN EMPIRICAL STUDY OF THE RELATIVE INFLUENCE OF FACTORS WHICH AFFECT AUDIT EVIDENCE ACCUMULATION

Chapters I-V of this dissertation have proposed a normative framework for audit evidence accumulation decisions and discussed factors which that framework suggested as relevant to such decisions. Unfortunately, as seems to be the case with most constructs of human behavior, a valid method of testing the model directly (i.e., through the observation or interrogation of auditors) is not apparent. Similarly, indirect testing (i.e., through the observation of audit workpapers) of the degree to which auditor behavior corresponds to the model per se is extremely difficult, if not impossible, because of the general complexity of an audit engagement, the interactive (corroborative) effect of various types of evidence, and the difficulty of attaching combinative quantitative measurements to many of the variables involved. However, by making restrictive assumptions with respect to certain of these variables and controlling others, the study reported in this chapter attempts to provide at least some insight into the auditor's decision process.

The complexity of the normative framework presented in Chapters I-V and the limited resources available for this research precluded any comprehensive test of that framework. Instead, the following

study is intended as a descriptive examination of auditor behavior. More specifically, the study's objective is to determine whether or not a sample of audit work-papers reflects any relationship between the composition of the auditors' evidential collections (the dependent variable) and those factors identified in Chapters I-V (the independent variables) which:

1. define evidential support functions,
2. determine minimum evidential support requirements,
3. affect the auditor's risk of sanctions, or
4. constrain the auditor's choice of evidential collection.

The Scope of the Study

Because it is virtually impossible to observe any human decision process directly and because it is extremely difficult to construct reliable "self-report" instruments, an audit work-paper review was selected as the source of data for this study. Time and cost considerations required, however, that such a review be restricted to a limited number of audit areas. Eventually, "sales" and "accounts receivable" were chosen for the following reasons:

1. both are typically material financial statement items,
2. while the tests performed for their verification are frequently interrelated, these tests are largely independent of the tests performed in other financial statement areas -- thus minimizing the likelihood of unobserved interactive effects,
3. while "sales," as an income statement item, requires <u>indirect</u> verification through "tests of transactions" (system

tests), "accounts receivable," as a balance sheet item, permits direct verification through confirmation (a balance test) -- thus both major auditing approaches are included, and

4. detailed documentation could be expected in these areas with respect to population characteristics as well as tests performed.

The Sample

The data for this study, obtained during the period of November, 1971-April, 1972, extracts from the audit work-papers for fifty-three clients of seven public accounting firms. Although the confidential nature of the information provided by these firms dictates that they, as well as their clients must remain anonymous, the following should give some indication of the sample's general composition.

The Public Accounting Firms

The public accounting firms here represented are by no means a random sample from some well-defined population. Rather, they are seven firms who had clients of the type desired and who were willing to participate. Except to assure the reader that these firms are representatives of "good" current practice, however, the author will not disclose any demographic information relating to them since such disclosure might endanger their anonymity.

The Clients

As was the case with the participating firms, the clients represented in this study are not a random sample. Rather, each cooperating

public accounting firm selected from among its own clients using the following criteria:

1. in all cases, sales and accounts receivable should be material items,
2. in all cases, the clients should have received unqualified opinions,
3. the selected clients should be free of "unusual auditing problems" (as defined by the selecting firm) in the areas of sales and accounts receivable,
4. manufacturing and merchandising concerns would be preferable; however, some service organizations might be acceptable (subject to the researcher's approval); in all cases, municipalities, financial institutions, fiscal agents, etc., would be unacceptable,
5. the work-papers should not pose the reviewer any serious problem with respect to time consumption or ability to locate all relevant information contained therein. (For this requirement, the firms received the following additional guidelines:[1]
   a. current assets should be less than $10,000,000,
   b. sales should be less than $20,000,000,
   c. the client should have no more than a few independent divisions and/or subsidiaries.

   The firms received instructions, however, that they might waive any or all of these supplementary guidelines if, in

[1] Perhaps a better guideline would have been: total weight of one year's work-papers should not exceed five pounds.

their opinion, the client's work-papers would not pose the reviewer serious problems.

The actual breakdown of the sample by participating firm is:[2]

Firm	Number of Clients Reviewed
A	10
B	10
C	5
D	5
E	10
F	3
G	10

Firms A through F provided data from each client's three most recent audits except in the cases of one client from Firm B and two from Firm E, each of which had retained the auditor for less than three years. Firm G, on the other hand, provided information only for the most recent year's audit, stating that the storage location of prior years' work-papers made retrieval impractical.

Of the fifty-three clients whose work-papers provide the data for this study:

1. forty-two are manufacturers, nine are merchandising concerns, and two are service organizations,

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[2]To safeguard the anonymity of participants in this study, identifying firm letters were randomly assigned and bear no relationship to, e.g., size or alphabetical order.

2. thirty-seven are partnerships or closely-held corporations, and of the remaining sixteen which are publicly owned, seven are listed on the New York Stock Exchange and one is listed on the American Stock Exchange,
3. six acquired one or more subsidiaries within the three previous years, and of the nine total acquisitions:
   a. seven were effected by an exchange of cash,
   b. two were effected by an exchange of stock,
   c. eight were accounted for as purchases,
   d. one was accounted for by the equity method,
4. sixteen had loan covenants, of which:
   a. five pertained to retained earnings only,
   b. one pertained to working capital only,
   c. ten pertained to both retained earnings and working capital, and
5. thirty-five reported on a calendar-year basis, while eighteen had a fiscal year ending on a date other than December 31.

Furthermore, among these fifty-three clients, in the most recent year audited (at the time of the data collection):

1. sales and accounts receivable internal controls ranged from poor to excellent,
2. the dollar value of accounts receivable ranged from $2600 to $10,641,000; the number of accounts receivable ranged from two accounts to fifteen thousand,

3. the book value of total assets ranged from $121,000 to $26,917,000,
4. sales ranged from $269,000 to $69,824,000,
5. net income before taxes ranged from -$2,857,000 to $5,570,000,
6. stockholders' equity ranged from $75,000 to $20,912,000, and
7. outstanding long-term debt ranged from none to $8,043,000.

In summary, the sample consists of medium sized, profit-oriented clients which had no significant auditing problems in the areas of sales and accounts receivable and which received a clean opinion. In these respects, the sample is relatively homogeneous and one would therefore expect a certain degree of similarity in the sample audit programs. Even within the bounds set by the sample selection criteria, however, client variations in size, nature of operations, distribution of ownership, rate and method of growth, method of financing operations, quality of internal control, and composition of accounts receivable appear sufficient to have caused variation in the nature, extent, and timing of audit procedures if the auditor considered such factors when developing his program.

The Method of Obtaining Data

Initially, the researcher hoped to personally review each cooperating firm's work-papers in order to obtain the data for this study. Firms A, B, D, and E (thirty-five clients) did, in fact,

permit such an approach.[3] However, as it affected firm selection, the confidentiality of the auditor-client relationship also required modification of the method of obtaining data from firms C, F, and G (eighteen clients). These firms stated as a precondition to their participation in the study that their own people must perform the work-paper review and denied the researcher first hand access to such records. This situation, unfortunately, introduced the possibility of variance in the reliability of data obtained -- both because of the potential for biased reporting, and because of the difference in the reviewers' experience with their respective firms (reviewers ranged from a partner (Firm F) to juniors (Firm C)). Nevertheless, this researcher feels that the actual risk of biased and/or inaccurate reporting was sufficiently small to be far outweighed by the value of having firms C, F, and G participate in the study.

A Caveat

Obviously, for the reasons enumerated above, this sample of firms and clients is far removed from any statistical ideal in terms of size and composition. Unfortunately, the obstacles of data confidentiality, firm conservatism, and the obviously limited resources of a one-man study necessitated the researcher's approach. Therefore, the reader should keep in mind that the data at hand can strictly purport to describe the "state of the art" of auditing in the participating firms only. Any attempts to draw inferences about the public

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[3] In all cases where the author reviewed client work-papers, the public accounting firm involved provided extensive assistance and supervision to insure that the review would be a thorough one.

accounting profession in general from this data run the risk of resulting in invalid conclusions.

The Dependent Variables and the Basic Approach

As previously noted, the objective of this study is to determine whether or not the participating firms' work-papers reflect any relationship between the composition of the auditors' evidential collections (the dependent variables) and those factors identified in Chapters I-V (the independent variables) which:

1. define evidential support functions,
2. determine minimum evidential support requirements,
3. affect the auditor's risk of sanctions, or
4. constrain the auditor's choice of evidential collection.

One problem which immediately arises is that in defining the composition of any evidential collection, one must consider three separate parameters:

1. the types of evidence included,
2. the times of collection of each type, and
3. the number of units of each type collected at a given time.

Since these parameters interact to determine the degree of evidential support the collection will provide, an auditor's decisions concerning them must be, to some extent, interdependent. Ideally, then, this study would consider all three parameters simultaneously as dependent variables. Unfortunately, the diverse nature of the parameters and the lack of any explicit, well-defined function which might relate them to some one-dimensional variable (e.g., "degree of evidential

support provided") precludes such an approach. Rather, each parameter must be analyzed as a separate dependent variable with the other parameters admitted into the analysis as independent variables wherever interaction seems an important consideration. Thus the empirical study which follows is subdivided into three parts:

I. a study of factors which affect the selection of audit procedures (i.e., types of evidence) in the areas of sales and accounts receivable (pp. 195-251),

II. a study of factors which affect the timing of audit tests in the area of sales and accounts receivable (pp. 251-58),

III. a study of factors which affect the sample size of audit tests in the areas of sales and accounts receivable (pp. 258-91).

Although the specific techniques of analysis will differ for each part, the basic approach will be the same.

1. enumerate the independent factors (identified in Chapters I-V) relevant to auditor decisions concerning the parameter in question, and
2. determine which of these factors, if any, seem to explain the auditor's decisions (as reflected in actual work-papers) with respect to that parameter.

The Independent Variables

Chapters I-V suggested a number of factors which should influence the auditor's selection of an evidential collection. The following table (Table 5) summarizes these factors and indicates their

treatment in the empirical study. Table 7 then lists the independent variables actually included in that study.

Table 5.--Factors which affect audit evidence accumulation and their operationalization for empirical study

Variable Designation	Variable	Explanation
	A. Factors which Define Evidential Support Functions	
	1. Relevance of the specific type of evidence to the proposition at hand.	Neither of these factors appears in the following study. One reason is the lack of any adequate means for measuring them. Since, at any rate, relevance is an inherent property of evidential matter, it should not vary significantly from audit to audit for a given type of evidence. Reliability is also largely an inherent property of evidential matter, however, for certain types of evidence, this factor may vary from audit to audit, e.g., the reliability of confirmations depends, to some extent, on the nature of the client's customers and the reliability of a number of procedures (e.g., "vouching") undoubtedly depends on the quality of the client's internal controls. Hopefully, however, the sample is sufficiently homogeneous that assuming reliability a constant will not adversely affect this study.
	2. Reliability of the specific type of evidence.	
x_1	3. Timeliness of the evidential matter.	Chapter III defined timeliness as the extent to which "reality" at the time an auditor obtains evidence reflects

Table 5--Continued

Variable Designation	Variable	Explanation
		"reality" at the auditor's opinion date. Hence, evidence will be "timely" if the auditor obtains it on or after the opinion date, or if the status of the financial statement assertion is not likely to change drastically over time, a situation which the auditor may assume when the client's internal controls are adequate. The variable, x_1, then, assumes a value of one if either: 1. the auditor obtained his evidence at or after his opinion date, or 2. the auditor evaluated his client's internal control as at least "adequate" with regard to the assertion in question. Otherwise, x_1 assumes a value of zero.
$x_2 - x_5$	4. Statistical parameters underlying the assertion the auditor wishes to evaluate.	x_2 is the dollar balance of the client's gross accounts receivable. x_3 is the total number of accounts receivable in the client's trial balance.

Table 5--Continued

Variable Designation	Variable	Explanation
		x_4 is the mean accounts receivable dollar balance ($x_4 = x_2/x_3$).
		x_5 is the client's net sales.
		The standard deviation of accounts receivable dollar balances, as well as any other sales statistical parameters were not available with sufficient frequency to permit their inclusion in the study.
	5. The existence of corroborative evidence.	One of the objectives of the following empirical study is to identify circumstances which caused the auditor to seek corroborative evidence through the performance of "optional" audit procedures. In this sense, "corroborative evidence" is a dependent rather than independent variable. However, the factor has another sense -- the auditor's acceptance or rejection of a particular financial statement assertion (or assertions) may influence his evaluation of other assertions. With respect to this second sense, however, since all the sample clients received unqualified opinions (indicating that the auditors accepted all material assertions in each client's financial statements), this factor is assumed constant.

Table 5--Continued

Variable Designation	Variable	Explanation
	B. Factors which Determine Minimum Evidential Support Requirements.	
	1. Generally Accepted Auditing Standards and Pronouncements of the AICPA.	Sales and accounts receivable were material in all the sample clients' financial statements. Therefore, the same GAAS and AICPA pronouncements applied to all the audits reviewed and this factor cannot explain any audit program differences. On the other hand, because such standards and pronouncements have the effect of defining generally "required" procedures, they likely explain the audit program similarities. For this reason, those procedures performed in at least ninety per cent of the audits reviewed will be designated as "required by GAAS or AICPA pronouncement" and omitted from further analysis.
	2. Authoritative pronouncements of the SEC. 3. Commission requirements for regulated industries.	Neither of these factors appears in the following study, since no SEC pronouncements pertain specifically to the auditing of sales and accounts receivables and none of the clients in the sample reported to any regulatory agency.

Table 5--Continued

Variable Designation	Variable	Explanation
$x_6 - x_{11}$	4. Policies of individual public accounting firms.	Variables $x_6 - x_{11}$ are "indicator" variables, which, taken together, should indicate whether "firm," in general, is a factor which affected the composition of the sample audit programs. These variables assume values as follows:

Firm which Performed Audit	x_6	x_7	x_8	x_9	x_{10}	x_{11}
A	1	0	0	0	0	0
B	0	1	0	0	0	0
C	0	0	1	0	0	0
D	0	0	0	1	0	0
E	0	0	0	0	1	0
F	0	0	0	0	0	1
G	-1	-1	-1	-1	-1	-1

These variables are always treated as a group in the following analysis and are hereafter designated as x_{6-11}.

5. Specific terms of the auditor's contract with his client.

This factor was "controlled" out of the study. All of the audits reviewed were "standard audits" -- containing no special contract terms.

Table 5--Continued

Variable Designation	Variable	Explanation
$x_{12} - x_{16}$	6. Materiality considerations.	One of the requirements of the sample in this study was that "sales" and "accounts receivable" were to be "material" items. Hence, from the absolute standpoint (materiality vs. immateriality) this variable was controlled out of the study. The following variables are included, however, as measures of "relative" materiality: x_{12} = Accounts Receivable/Sales x_{13} = Accounts Receivable/Total Assets x_{14} = Accounts Receivable/Net Income x_{15} = Sales/Total Assets x_{16} = Sales/Net Income
	7. The auditor's evaluation of the probability that a given financial statement assertion is materially misstated, based upon:	
$x_{17} - x_{24}$	a. the auditor's findings during his review of the client's internal control system.	Two different methods of operationalizing this factor were adopted. The first attempts to reflect, at least crudely the relative quality of the client's internal control/check, utilizing a scale ranging from zero to five as follows:

Table 5--Continued

Variable Designation	Variable	Explanation		
		The variable:	which represents:	assumes the value:	when the auditor rated his client's internal control/check:
		x_{17}	internal control-sales	0	very poor
		x_{18}	internal check-sales	1	inadequate-poor
		x_{19}	internal control-accounts receivable	2	adequate-fair
		x_{20}	internal check-accounts receivable	3	good
				4	very good
				5	excellent

The second method, in contrast, distinguishes only between "inadequate" and "adequate" internal control/check. Thus:

Table 5--Continued

Variable Designation	Variable	Explanation			
		The variable:	which represents:	assumes the value:	when the auditor rated his client's internal control/ check:
		x_{21}	internal control-sales		
		x_{22}	internal check-sales	0	inadequate (<2 on the above scale)
		x_{23}	internal control-accounts receivable	1	adequate (≥ 2 on the above scale)
		x_{24}	internal check-accounts receivable		
	b. the auditor's findings in actual tests of his client's records.		This factor was controlled out of the study. In none of the audits reviewed did the auditor's tests of his client's financial records disclose any significant errors either in accounting output or in the functioning of the internal control system.		

Table 5--Continued

Variable Designation	Variable	Explanation
	C. Factors which Affect the Auditor's Risk of Sanctions.	
	1. The nature of the specific error involved.	The effect of this variable as discussed in Chapter V (pp. 149-51) is assumed constant over the study since the basic types of errors which can exist in any financial statement area are inherent to that area and do not differ from audit to audit. (The probability that a given type of error will occur, which does fluctuate as a function of the client's internal controls, is a separate factor treated above.)
	2. The degree of exposure the client's statements receive, indicated by:	
x_5, x_{25}, x_{26}	a. the client's size,	x_5 is the client's net sales. x_{25} is the client's total assets. x_{26} is the client's total stockholders' equity.
x_{27}, x_{28}	b. the nature of the client's operations,	Variables x_{27} and x_{28} are "indicator" variables, which, taken together, should indicate whether the nature of the client was a factor which affected the composition of the sample audit programs. These variables assume values as follows:

Table 5--Continued

Variable Designation	Variable	Explanation

Nature of Client	Value of: x_{27}	x_{28}
Merchandiser	1	0
Service Organization	0	1
Manufacturer	-1	-1

These variables are always treated as a group in the following analysis and are hereafter designated as x_{27-28}.

x_{29} - x_{31} — c. the distribution of the client's ownership,

Variables x_{29} - x_{31} are "indicator" variables, which, taken together should indicate whether the nature of the distribution of the client's ownership affected the composition of the sample audit programs. These variables assume values as follows:

Distribution of Client Ownership	Value of: x_{29}	x_{30}	x_{31}
Corporation--shares traded over-the-counter	1	0	0
Corporation--member of New York Stock Exchange	0	1	0

Table 5--Continued

Variable Designation	Variable	Explanation

Distribution of Client Ownership	Value of: x_{29}	x_{30}	x_{31}
Corporation--member of American Stock Exchange	0	0	1
Partnership or closely-held corporation	-1	-1	-1

These variables are always treated as a group in the following analysis and are hereafter designated as x_{29-31}.

x_{32} - x_{33}

d. loan covenants which require the client to maintain specified account balances or ratios.

Variables x_{32} and x_{33} are "indicator" variables, which, taken together should indicate whether loan covenants affected the composition of sample audit programs. These variables assume values as follows:

Table 5--Continued

Variable Designation	Variable	Explanation

Loan Covenant Status	Value of: x_{32}	x_{33}
Covenant restricting dividends only	1	0
Covenant restricting working capital only, or working capital and dividends*	0	1
No covenant	-1	-1

These variables are always treated as a group in the following analysis and are hereafter referred to as x_{32-33}.

3. The probability that the client will file bankruptcy subsequent to the audit, indicated by:

*The two different types of covenant must be combined here because only one client had a covenant on working capital only. In any case, however, the researcher considers the restriction on working capital the more important of the two with respect to potential effect on the auditing of sales and accounts receivable.

Table 5--Continued

Variable Designation	Variable	Explanation
	a. factors which indicate the degree and type of financial crisis the client can withstand:	
x_{34}, x_{35}	(1) factors which indicate the client's financial position ("Retained Earnings" balance, liquidity situation, etc.),	x_{34} is the client's "Retained Earnings" balance. x_{35} is the client's net income before taxes and extraordinary items. A factor whose inadvertant exclusion weakens this study somewhat is the client's working capital. Unfortunately, this factor did not suggest itself to the researcher until too late in the study to allow its inclusion in the empirical data.
x_{36}	(2) economic conditions related to the availability of external capital,	x_{36} is the client's debt/equity ratio. Information pertaining to each client's line of credit was unavailable. Factors external to the firm, relating to the money market in general, are assumed constant.

Table 5--Continued

Variable Designation	Variable	Explanation
x_{37}, x_{38}	(3) the client's rate and method of growth,	Variables x_{37} and x_{38} are "indicator" variables which, taken together, should indicate whether client acquisitions of other companies affected the composition of sample audit programs. The variables assume values as follows:

Client status with respect to acquisitions within the previous three years	Value of: x_{37}	Value of: x_{38}
At least one acquisition--purchase for cash	1	0
At least one acquisition--exchange of stock	0	1
No acquisitions	-1	-1

These variables are always treated as a group in the following analysis and are hereafter referred to as x_{37-38}.

Those firms which made no acquisitions showed no extraordinary growth over the three year period.

Table 5--Continued

Variable Designation	Variable	Explanation
	b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities:	
x_{27}, x_{28}	(1) the nature of the client's operations,	See p. 186.
	(2) economic conditions relevant to the client's marketplace,	This factor does not appear in the following study. A review of the financial statements, and especially the president's letter, for each sample client did not disclose the existence of any extraordinary market conditions. Therefore this factor is assumed constant over the sample.
x_{36}	(3) the client's method of financing operations,	x_{36} is the client's debt/equity ratio.
	D. Factors which Constrain the Auditor's Choice of Evidential Collection.	
	1. Time constraints.	This factor does not appear in the following study. With possibly one exception, the sample clients were relatively small companies and their workpapers indicated that the auditor's

Table 5--Continued

Variable Designation	Variable	Explanation
		deadline was generally flexible. Thus, for the engagements reviewed in this study, time was probably seldom, if ever, an effective constraint.
x_{39}	2. Staff constraints.	The purpose of x_{39} is to distinguish between audits where staff limitations may affect evidence accumulation and audits where staff availability is not apt to be an effective constraint. Because of their predominance, audits of clients whose fiscal year ends December 31 are by far the most apt to fall into the former category. Therefore: $x_{39} = \begin{cases} 1 \text{ if the client's fiscal year ended in December,} \\ 0 \text{ if the client's fiscal year ended on any other date.} \end{cases}$

Table 6.--A summary of the independent variables included in the study

Variable Designation	Variable
x_1	Timeliness of evidential matter
x_2	Dollar balance of the client's gross accounts receivable
x_3	Total number of accounts receivable in the client's trial balance
x_4	Mean accounts receivable dollar balance
x_5	Client's net sales
x_{6-11}	Policies of individual public accounting firms
x_{12}	Accounts Receivable/Sales
x_{13}	Accounts Receivable/Total Assets
x_{14}	Accounts Receivable/Net Income
x_{15}	Sales/Total Assets
x_{16}	Sales/Net Income
x_{17}, x_{21}	Auditor evaluation of client internal control -- sales
x_{18}, x_{22}	Auditor evaluation of client internal check -- sales
x_{19}, x_{23}	Auditor evaluation of client internal control -- accounts receivable
x_{20}, x_{24}	Auditor evaluation of client internal check -- accounts receivable
x_{25}	Client's total assets
x_{26}	Client's total stockholders' equity
x_{27-28}	Nature of the client's operations
x_{29-31}	Distribution of the client's ownership
x_{32-33}	Nature and existence of restrictive loan covenants
x_{34}	Client's "Retained Earnings" balance
x_{35}	Client's net income before taxes and extraordinary items
x_{36}	Client's debt/equity ratio
x_{37-38}	Client's rate and method of growth
x_{39}	Date of client's fiscal year-end

A Study of Factors which Affect the Selection of Audit Procedures in the Areas of Sales and Accounts Receivable

The Audit Area of Sales

Arens identifies the following auditing procedures as relevant to one or more financial statement assertions regarding "sales":[4]

r	R	1.	Foot and crossfoot the sales journal.
r	R	2.	Summarize the detail and trace the totals to the general ledger.
r	R	3.	Reconcile the list of accounts receivable to the accounts receivable control account.
		4.	Foot individual subsidiary accounts.
r	R	5.	Confirm accounts receivable.
r	R	6.	Compare actual inventory to perpetual inventory.
r	R	7.	Perform cut-off procedures.
		8.	Trace entries from the sales journal to the subsidiary ledger.
		9.	Trace entries from the subsidiary ledger to the sales journal.
		10.	Trace from sales journal entries to sales invoices.
		11.	Trace from sales invoices to sales journal entries. Compare customer, invoice number and amount.
		12.	Trace from sales invoices to shipping documents.
	R	13.	Trace from shipping documents to sales invoices. Compare customer name and quantity shipped.
		14.	Trace from shipping documents to perpetual inventory records. Compare descriptions and quantities.
		15.	Trace from shipping documents to sales orders.
		16.	Account for a sequence of sales invoices.
		17.	Account for a sequence of shipping documents.
		18.	Review the sales journal for duplicate sales invoices.
		19.	Review sales invoices for shipping document numbers appearing on more than one invoice.
		20.	Compare sales prices with approved price lists.
		21.	Recompute extensions and footings.
		22.	Compare discounts allowed with authorized sales terms.
		23.	Compare freight charged with authorized charges.
	R	24.	Compare sales classifications to supporting documents.

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[4] Alvin A. Arens, "The Adequacy of Audit Evidence Accumulation in Public Accounting" (Doctoral Thesis, School of Business Administration, University of Minnesota, 1970), pp. 145-149.

The capital "R" appearing before a number of the above procedures identifies those which Arens considers required.[5] A lower case "r," on the other hand, precedes those procedures which each of the sample firms performed in at least ninety per cent of their reported audits (eighty per cent for firms which reported only five clients).

Apparently, then, not all of the sample public accounting firms agree with Arens regarding the status of:

13. Trace from shipping documents to sales invoices, Compare customer name and quantity shipped.

24. Compare sales classification with supporting documents.

While Firms C, D, F, and G did, in fact, apparently consider the former procedure "required" (according to the above operational definition), none of the remaining firms recorded performing it in more than thirty per cent of their reported audits. Similarly, although Firms C, D, and G appeared to regard the latter procedure as "required," and Firms F and A documented its performance in two of three and eight of ten reported audits, respectively, Firm B reported its performance in only two of ten audits and Firm E never showed evidence of having performed it.

Two different conclusions are consistent with the above facts, either:

1. not all public accounting firms regard the procedures as "required," or

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[5] Ibid.

2. while all the sample firms do consider performance of the procedures required, some do not always document such performance in their work-papers.

While recognizing the latter possibility, the researcher considers the former more likely and therefore treats the two procedures, as well as the others not preceded by a lower case "r," as "optional" for the remainder of the study.

Basic Methodology

Initially, the following general model, derived from the analysis in Chapters III-V, was hypothesized for each of the specific assertions comprising the audit area of sales:

$$E_i = f(x_1, x_5, x_{6-10}, x_{17}, x_{18}, x_{21}, x_{22}, x_{25}, x_{26}, x_{27-28}, x_{29-31}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}, x_{39}, x_{40}, x_{41})$$

where: E_i is the set of tests selected by the auditor from the set of all optional tests relevant to the i^{th} sales assertion,

f is a linear function,

x_{40} is the percentage of "Accounts Receivable" dollar value confirmed by any means (positive confirmations, negative confirmations, and alternative procedures),

x_{41} is the percentage of the total number of "Accounts Receivable" confirmed by any means (positive confirmations, negative confirmations, and alternative procedures), and

all other x_i are defined as in Table 5.[6]

Ideally, this study would have treated the audit area of sales as a whole, taking as its dependent variable the set of all optional sales tests performed by the auditor. Unfortunately, because of the small sample size relative to the number of optional procedures, this approach was impracticable. Essentially, feasibility required a reduction in the "range" of the dependent variable, i.e., a reduction in the number of possible combinations of procedures available to the auditor. Analyzing the area of sales into its component assertions and treating each assertion as an independent problem accomplished this reduction. Thus, this section actually consists of thirteen separate studies, each taking as its dependent variable the auditor's selection from optional tests relevant to a specific sales assertion.[7] Justification for this approach derives primarily from the auditor's responsibility for all material assertions contained in his client's financial statements whether he consciously attempts to verify each one individually or not.

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[6]Since Firm G effectively performed all of the optional procedures on all of its engagements here represented, its ten clients are omitted from this part of the study.

[7]The specific set of assertions adopted are those identified by Arens, pp. 145-157. Arens also indicates the procedures relevant for testing each of the assertions.

In addition to requiring a reduction in the range of the dependent variable, the study's relatively small sample size also limited the number of independent variables which could be considered simultaneously before random correlation would confound the analysis. For this reason, rather than evaluating the above general model's ability to predict the auditor's choice of optional procedures, each of the following analyses had to be content with the somewhat more restricted problem of identifying factors which seemed to exert the greatest influence in that choice.

The approach adopted to achieve this end was the same for all assertions considered -- essentially a two-step process involving discriminant analysis.[8]

The objective of the first step was to eliminate independent variables which exhibited no ability to predict the auditor's selection of optional procedures. Toward this objective, the sample observations were grouped according to optional procedures performed and subjected to a stepwise discriminant analysis.[9] As each additional

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[8]Discriminant analysis is a form of regression analysis applicable in situations where one desires to classify observations into two or more groups based upon certain characteristics of the observations.

For discussions of this technique, see: T. W. Anderson, An Introduction to Multivariate Statistical Analysis (New York: John Wiley and Sons, Inc., 1958), H. C. Fryer, Concepts and Methods of Experimental Statistics (Boston, Allyn and Bacon, Inc., 1966), or C. R. Rao, Advanced Statistical Methods in Biometric Research (New York: John Wiley and Sons, Inc., 1952).

[9]The specific analytical tool employed was the U.C.L.A. Biomedical program, "BMD07M -- Stepwise Discriminant Analysis" as described in: W. J. Dixon, ed., BMD Biomedical Computer Programs (University of California Press, 1970), pp. 587-605, and available through the program library of the University of Kansas Computation Center.

This particular program has the attractive feature of admitting

independent variable entered the analysis, the resulting discriminant function was evaluated empirically by an approach which Lachenbruch and Mickey refer to as the "resubstitution" method.[10] Effectively, when the inclusion of additional independent variables could no longer improve the frequency of accurate classification (or materially improve the significance level of the existing classification), the discriminant analysis terminated. At this point, variables not included in the final discriminant function were eliminated from further consideration.

Unfortunately, as Lachenbruch and Mickey have noted, for small samples, the resubstitution approach to evaluating a discriminant function tends to favorably bias the estimated frequency of correct classification.[11] This tendency is unfortunate for two reasons.

First of all, such biased estimates may have resulted in the erroneous elimination of one or more "useful" variables (i.e., variables with some ability to discriminate) -- a regrettable though unavoidable contingency since the "resubstitution" method was the only approach economically feasible considering the sample size and number

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independent variables into the discriminant function one-by-one, in decreasing order of ability to discriminate, forming a new function as each variable enters.

[10] P. A. Lachenbruch and M. R. Mickey, "Estimation of Error Rates in Discriminant Analysis," Technometrics 10 (February 1968): 3.
The "resubstitution" method consists of using the discriminant function to reclassify the observations which originally determined that function. The resulting predicted, or ex post, classifications are then compared to the actual, or ex ante, classifications to estimate the function's predictive accuracy.

[11] Ibid.

of independent variables involved. Actually, however, this problem was probably not severe. Since the specific stepwise analysis used admits variables in decreasing order of ability to discriminate, one may reasonably expect that any which were erroneously omitted were probably not highly significant, especially since an extremely low significance level (<.50) for elimination was purposely set in recognition of the problem.

Clearly the more important consequence of the resubstitution method's tendency to bias the frequency of correct classifications is that, while one may reasonably assume that the variables eliminated in step one had little or no ability to predict the auditor's selection of optional procedures, one cannot draw any useful valid conclusions about the variables remaining in the analysis after that step.

For this reason, a second step was necessary. The primary objectives of this second step were:

1. determine the "best" (in the sense of ability to predict and of parsimony) combination of variables remaining after step one, and
2. determine whether a model based on that combination could, in fact, predict significantly better than chance the auditor's selection of optional procedures.

Accomplishing the first objective required a method of evaluating discriminant functions which would yield an unbiased estimate of the frequency of correct classifications. Fortunately, such a method

(essentially a special type of "holdout" approach)[12] became feasible with the greatly reduced number of independent variables. Lachenbruch and Mickey describe the method as follows:

> . . . take all possible splits of size one in one group and the remainder in the other. This has the effect of successively omitting one observation from the computation of the discriminant function.[13]

In other words, given n observations, one calculates n discriminant functions, holding out a different observation each time as the verification sample. The resulting discriminant functions are then each used to reclassify their respective hold-out observation, and the proportion of accurate groupings thus obtained yields an unbiased estimate of the probability of accurate classification.[14]

An added attraction of this approach is that it does not depend upon an assumption of normality and therefore is useful where "normality is questionable (e.g., when a large number of dichotomies are used as variables) and the sample size is small relative to the number of variables."[15]

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[12]The basic idea of the "holdout" methods is to divide the sample observations into two groups. The first group (classification group) is then used to define a discriminant function which, in turn, is used to classify the observations in the second (holdout or verification) group. The predicted classifications are then compared to the actual classifications to estimate the function's predictive accuracy. For discussion and evaluation of the approach see Lachenbruch and Mickey.

[13]Lachenbruch and Mickey, p. 4.

[14]Ibid.

[15]Ibid., p. 10.

Given this method for evaluating discriminant functions, the selection of a "best" combination of independent variables in each given case was simply a matter of determining which combination maximized the frequency of correct classifications. In those cases where more than one combination satisfied this criterion, the one with the fewest variables was considered "best."

After selection of the "best" combination of independent variables, all that remained was to determine whether that combination could predict the auditor's selection of optional procedures better than chance. The tests chosen for this part of the analysis were tests of significance for sample proportions described by Clark and Schkade[16] (for two-group classifications) and Mosteller and Bush[17] (for multi-group classifications).

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[16]Charles T. Clark and Lawrence L. Schkade, Statistical Methods for Business Decisions (Cincinnati: South-Western Publishing Co., 1969), pp. 417-418.

The formula for calculating z is:

$$z = \frac{r - 1/2 - E(r)}{\sigma_r} = \frac{r - 1/2 - n\pi}{\sqrt{n\pi(1-\pi)}}$$

where: r is the number of correct classifications,
$E(r)$ is the number of correct classifications expected by chance,
σ_r is the standard deviation of r,
n is the number of observations, and
π is the probability of obtaining a correct classification by chance.

To insure a conservative (with respect to the significance test) estimate of $E(r)$, π was defined as follows:

$$\pi = \begin{cases} \left(\frac{t_1}{n}\right)^2 + \left(\frac{t_2}{n}\right)^2, \left(\frac{t_1}{n}\right)^2 + \left(\frac{t_2}{n}\right)^2 \geq \frac{t_1c_1 + t_2c_2}{n^2} \\ \frac{t_1c_1 + t_2c_2}{n^2}, \frac{t_1c_1 + t_2c_2}{n^2} > \left(\frac{t_1}{n}\right)^2 + \left(\frac{t_2}{n}\right)^2 \end{cases}$$

In all, the above two-step analysis was performed on thirteen separate assertions of the audit area of sales. Let us now turn to the results of the analysis. (In addition to the thirteen assertions specifically analyzed, Arens also identified four for which all relevant procedures were "required" procedures. These four are included in the following report for the sake of completeness.)

where: t_i is the number of observations which actually belong to the i^{th} group, and
c_i is the number of observations classified in the i^{th} group by the discriminant function.

[17]Frederick Mosteller and Robert R. Bush, "Selected Quantitative Techniques," in Handbook of Social Psychology, ed. by Gardner Lindzey (Reading, Massachusetts: Addison Wesley Publishing Co., Inc., 1954) pp. 310-311.

The formula for calculating z is:

$$z = \frac{r - 1/2 - \bar{m}}{\sigma_r}$$

$$\bar{m} = \frac{\sum t_i c_i}{n}$$

$$\sigma_r^2 = \frac{1}{n^2(n-1)} \left[\left(\sum t_i c_i \right)^2 - n \sum t_i c_i (t_i + c_i) + n^2 \sum t_i c_i \right]$$

where: r is the number of correct classifications,
$\bar{m}$ is the expected number of correct classifications,
σ_r is the standard deviation of r,
n is the number of observations,
t_i is the number of observations which actually belong to the i^{th} group, and
c_i is the number of observations classified in the i^{th} group by the discriminant function.

Assertion I: "The records of transactions obtained from the client are mechanically accurate and balance with the general ledger."[18]

Relevant procedures:

r 1. Foot and crossfoot the sales journal.

r 2. Summarize the detail and trace the totals to the general ledger.[19]

Since all of the sample firms apparently considered both of these procedures "required," further analysis was unnecessary.

Assertion II: "The same sales transaction information was recorded in both the sales journal and the subsidiary ledger."[20]

Relevant procedures:

r 1. Reconcile the list of accounts receivable to the accounts receivable control account.

2. Foot individual subsidiary accounts.

3. Trace entries from the sales journal to the subsidiary ledger.

4. Trace entries from the subsidiary ledger to the sales journal.[21]

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[18] Arens, p. 145.

[19] Ibid.

[20] Ibid., p. 146.

[21] Ibid.

Of these procedures, the sample firms considered the last three "optional." Thus, based on possible combinations of optional procedures, there were eight groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedures Performed (X) (2)	(3)	(4)
I	5			
II	2			X
III	18		X	
IV	2	X		
V	4		X	X
VI	2	X		X
VII	5	X	X	
VIII	3	X	X	X

Groups II, IV, and VI lacked the sufficient number of observations (3) for discriminant analysis and were therefore omitted from further study.

Utilizing the remaining groupings to eliminate variables with no apparent ability to predict the auditor's selection of optional procedures relevant to this assertion, step one of the analysis reduced the initial hypothesized model to the following:

$$E_{II} = f(x_1, x_{6-10}, x_{18}, x_{21}, x_{27-28}, x_{29-31}, x_{39}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{II} = f(x_{18}, x_{29-31}).$$

Classification functions, derived with x_{18} (internal check (1)) and x_{29-31} (indicator variables for the distribution of the client's ownership) as the independent variables and evaluated by means of the modified holdout method described above, yielded the following confusion matrix:[22]

Actual Group Membership	Predicted Group Membership					
	I	III	V	VII	VIII	Total
I	5	0	0	0	0	5
III	4	9	1	2	1	17*
V	2	0	2	0	0	4
VII	3	2	0	0	0	5
VIII	0	0	2	0	2	4
Total	14	11	5	2	3	35

*The discriminant functions were unable to classify one of Group III's observations.

As the above matrix indicates, the classification functions predicted group membership correctly for eighteen observations (51.4 per

[22]The "Total" column designates the number of observations actually belonging to a given group. The "Total" row designates the number of observations which the discriminant functions classified into a given group. Each individual cell, c_{ij}, indicates the number of observations belonging to the i^{th} group which the discriminant functions classified into the j^{th} group. Thus, for example, the above matrix indicates that while a total of five observations actually belonged to Group I, the discriminant function classified a total of fourteen observations (including the five which actually belonged) into that group. Furthermore, since correct classifications appear on the left-to-right diagonal, the matrix reveals that the discriminant functions predicted group membership correctly for eighteen (5 + 9 + 2 + 0 + 2) observations.

cent of all observations classified). The number of correct classifications one would expect by chance (supra, p. 203, footnote 16) is only 8.5 (24.3 per cent). Thus the classification functions did perform significantly better than chance ($\alpha < .000048$).

Another set of classification functions which performed almost as well also deserves mention here because of the specific variables involved. These functions are derived from the model:

$$E_{II} = f(x_{6-10}),$$

(i.e., indicator variables for the firm which performed the audit are the only independent variables) and, when evaluated by the modified holdout approach, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership					
	I	III	V	VII	VIII	Total
I	3	2	0	0	0	5
III	6	7	0	5	0	18
V	1	0	0	1	2	4
VII	2	0	0	3	0	5
VIII	0	0	1	0	3	4
Total	12	9	1	9	5	36

In this case, the classification functions accurately predicted the group membership of sixteen observations (44.4 per cent). The number of correct predictions one would expect by chance is 8.2 (22.8 per cent). Thus these classification functions also performed significantly better than chance ($\alpha < .000968$).

The importance of this result is that, for assertion II, based solely on the knowledge of which firm performed the audit, one can predict significantly better than chance which combination of procedures were selected for a given observation. If this result should hold true over the majority of the assertions studied, it may tend to indicate that different public accounting firms do, in fact, adopt different basic approaches to the audit of sales. For this reason, the model:

$$E_i = f(x_{6-10})$$

will be specifically tested for all remaining assertions.

Assertion III:[23] "Every actual shipment of merchandise was recorded as shipped."[24]

Relevant procedures:

r 1. Confirm accounts receivable.

r 2. Compare actual inventory to perpetual inventory.[25]

Since all of the sample firms apparently considered both of these procedures "required," further analysis was unnecessary.

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[23]Arens lists this assertion, along with the next two under the more general assertion: "Every actual current period merchandise shipment was reflected in current period sales." Arens, p. 146.

[24]Arens, p. 146.

[25]Ibid.

Assertion IV: "Every recorded shipment was billed."[26]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Account for a sequence of shipping documents.

3. Trace from shipping documents to sales invoices.[27]

Of these procedures, the sample firms considered the last two "optional." Thus, based on possible combinations of optional procedures, there were four groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedures Performed (X) (2)	(3)
I	22		
II	9		X
III	1	X	
IV	8	X	X

Group III lacked the sufficient number of observations for discriminant analysis and was therefore eliminated from further study.

Utilizing the remaining groups, however, and eliminating variables with no apparent ability to predict the auditor's selection of

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[26] Ibid.

[27] Ibid.

optional procedures relevant to this assertion, step one of the analysis reduced the initial hypothesized model to the following:

$$E_{IV} = f(x_5, x_{6-10}, x_{18}, x_{22}, x_{25}, x_{26}, x_{36}).$$

Selecting the "best" combination of these remaining variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{IV} = f(x_5, x_{18}, x_{22}, x_{25}, x_{26}, x_{36}).$$

Classification functions, derived with x_5 (total sales), x_{18} (internal check (1)), x_{22} (internal check (2)), x_{25} (total assets), x_{26} (stockholders' equity), and x_{36} (debt/equity ratio) as the independent variables and evaluated by means of the modified holdout method, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership			
	I	II	IV	Total
I	15	4	3	22
II	1	8	0	9
IV	1	4	3	8
Total	17	16	6	39

As the above matrix shows, the classification functions predicted group membership correctly for twenty-six observations (66.7 per cent). The number of observations one would expect by chance in this case is 14.5 (37.2 per cent). Thus, the classification functions performed significantly better than chance ($\alpha < .0000481$).

Another set of classification functions which performed almost as well also deserves mention because of the fact that the functions were far more parsimonious. These functions were based on the model:

$$E_{IV} = f(x_{18}, x_{26})$$

Classification functions, derived with x_{18} (internal check (1)), and x_{26} (stockholders' equity) as the independent variables and evaluated by the modified holdout method yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership			
	I	II	IV	Total
I	18	0	4	22
II	4	4	1	9
IV	4	1	3	8
Total	26	5	8	39

These classification functions predicted group membership correctly for twenty-five observations (64.1 per cent). The number of correct classifications one would expect by chance is 17.5 (44.9 per cent). Thus these functions also performed significantly better than chance ($\alpha < .00256$).

Finally, classification functions based on the assumption that:

$$E_{IV} = f(x_{6-10})$$

yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership			
	I	II	IV	Total
I	15	1	6	22
II	2	3	4	9
IV	1	3	4	8
Total	18	7	14	39

In this case, the classification functions accurately predicted the group membership of twenty-two observations (56.4 per cent). The number of correct predictions one would expect by chance is 14.6 (37.4 per cent). Thus these classification functions also performed somewhat better than chance ($\alpha < .00621$).

Assertion V: "Every sales billing was recorded in the sales journal."[28]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Trace from sales invoices to sales journal entries.

3. Account for a sequence of sales invoices.[29]

Of these procedures, the sample firms considered the last two "optional." Thus based on possible combinations of optional procedures, there were four groups into which a given observation might fall. The actual groupings were as follows:

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[28] Ibid.

[29] Ibid.

Group	Number of Observations	Optional Procedures Performed (X) (2)	(3)
I	6		
II	5		X
III	12	X	
IV	19	X	X

Utilizing the above groupings to eliminate variables with no apparent ability to predict the auditor's selection of optional procedures relevant to this assertion, step one of the analysis reduced the initial hypothesized model to the following:

$$E_V = f(x_1, x_{17}, x_{26}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in further reduction of the model to:

$$E_V = f(x_{17}, x_{26}, x_{34}, x_{35}, x_{36}).$$

Classification functions, derived with x_{17} (internal control (1)), x_{26} (stockholders' equity), x_{34} ("Retained Earnings" balance), x_{35} (net income), and x_{36} (debt/equity ratio) as the independent variables and evaluated by means of the modified holdout method, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	III	IV	Total
I	0	5	0	1	6
II	3	1	0	1	5
III	2	3	4	3	12
IV	1	4	2	12	19
Total	6	13	6	17	42

In this case, the classification functions predicted group membership correctly for seventeen observations (40.5 per cent). The number of correct classifications one would expect by chance is 11.8 (28.1 per cent). Therefore, while the classification functions performed better than chance, the difference was not as significant as in the previous analyses ($\alpha < .0392$).

On the other hand, classification functions derived from the model:

$$E_V = f(x_{6-10})$$

generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	III	IV	Total
I	0	2	4	0	6
II	2	0	2	1	5
III	4	1	5	2	12
IV	4	8	7	0	19
Total	10	11	18	3	42

Here the classification functions only predicted the group membership of five observations (11.9 per cent) correctly. The number of accurate predictions one would expect by chance is 9.2 (21.9 per cent). Thus, in this case, the classification functions actually predicted group membership somewhat worse than chance although the difference is probably not significant ($\alpha < .0643$).

Assertion VI:[30] "Each recorded shipment was stated the same as the actual shipment."[31]

Relevant procedures:

r 1. Confirm accounts receivable.

r 2. Compare actual inventory to perpetual inventory.

3. Trace from shipping documents to perpetual inventory records. Compare descriptions and quantities.

4. Trace from shipping documents to sales orders.[32]

Of these procedures, the sample firms considered the last two "optional." Thus, based on possible combinations of optional

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[30] Arens lists this assertion, along with the next three under the more general assertion: "Each recorded merchandise shipment was correctly recorded (customer, description, quantity, price, mechanical accuracy, and terms of shipment)." Arens, p. 147.

[31] Arens, p. 147.

[32] Ibid.

procedures relevant to this assertion, step one of the analysis reduced the initial hypothesized model to the following:

$$E_{VI} = f(x_5, x_{6-10}, x_{18}, x_{21}, x_{26}, x_{35}, x_{36}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{VI} = f(x_{6-10}).$$

Classification functions derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership			
	I	II	IV	Total
I	19	0	0	19
II	7	2	4	13
IV	0	0	5	5
Total	26	2	9	37

In this case, the classification functions accurately predicted the group membership for twenty-six observations (70.3 per cent). The number of correct predictions one would expect by chance is 15.3 (41.4 per cent). Thus these classification functions performed considerably better than chance ($\alpha < .00000130$).

Assertion VII:[33] "Each recorded billing was stated the same as the recorded shipment [with respect to customer and quantity shipped]."[34]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Trace from shipping documents to sales invoices. Compare customer name and quantity shipped.[35]

Although Arens regards both of these procedures as required, the frequency with which a number of the sample firms omitted the second one indicates that at least some public accountants consider it "optional." Thus, there were two groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedures Performed (X)
I	21	0
II	22	X

Utilizing the above groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform

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[33]Arens does not distinguish between this assertion and Assertion VIII, but rather combines the two as simply: "Each recorded billing was stated as the recorded shipment." Arens, p. 147.

[34]Arens, p. 147.

[35]Ibid.

this optional procedure, step one of the analysis reduced the intial hypothesized model to the following:

$$E_{VII} = f(x_{6-10}, x_{17}, x_{18}, x_{21}, x_{22}, x_{39}).$$

Selecting the "best" combination of these remaining variables, step two resulted in further reduction of the model to:

$$E_{VII} = f(x_{6-10}, x_{17}, x_{22}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit), x_{17} (internal control (1)), and x_{22} (internal check (2)), as the independent variables and evaluated by means of the modified holdout method yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	18	3	21
II	5	17	22
Total	23	20	43

The above matrix reveals that the classification functions predicted group membership correctly for thirty-five observations (81.4 per cent). The number of correct classifications one would expect by chance (supra, p. 203, footnote 16) is 21.5 (50 per cent). Thus the classification functions did perform significantly better than chance ($\alpha < .0000481$) in this case.

Another set of classification functions which deserves mention here because of its parsimony is the set derived from:

$$E_{VII} = f(x_{17}, x_{22}).$$

These functions, evaluated by the modified holdout approach yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	Total
I	18	3	21
II	9	13	22
Total	27	16	43

In this case the classification functions accurately predicted the group membership of thirty-one observations (72.1 per cent). The number of correct predictions one would expect by chance is 21.5 (50 per cent). Thus these functions also performed significantly better than chance ($\alpha < .00307$).

Finally, classification functions derived from:

$$E_{VII} = f(x_{6-10})$$

and evaluated by the modified holdout approach generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	Total
I	14	7	21
II	6	16	22
Total	20	23	43

Here the classification functions correctly predicted group membership for thirty observations (69.8 per cent). The number of correct predictions one would expect by chance is again 21.5 (50 per cent). Thus, these functions also performed better than chance ($\alpha < .00776$).

Assertion VIII: "Each recorded billing was stated the same as the recorded shipment [with respect to price, mechanical accuracy and terms of shipment]."[36]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Compare sales prices with approved price lists.

3. Recompute extensions and footings.

4. Compare cash terms used with authorized terms.

5. Compare actual freight charged with correct freight charges.[37]

Of these procedures, the sample firms considered the last four "optional." Thus, based on possible combinations of optional procedures, there were sixteen groups into which a given observation might fall. The actual groupings were as follows:

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[36] Ibid.

[37] Ibid.

Group	Number of Observations	Optional Procedures Performed (X) (2)	(3)	(4)	(5)
I	8				
II	0				X
III	0			X	
IV	5		X		
V	1	X			
VI	0			X	X
VII	0		X		X
VIII	0	X			X
IX	0		X	X	
X	0	X		X	
XI	17	X	X		
XII	0		X	X	X
XIII	0	X		X	X
XIV	2	X	X		X
XV	0	X	X	X	
XVI	5	X	X	X	X

The only groups containing a sufficient number of observations for discriminant analysis were I, IV, XI and XVI, therefore, these were the only groups considered in forming the classification functions.

Utilizing the four groups, step one of the analysis reduced the initial hypothesized model to the following:

$$E_{VIII} = f(x_{6-10}, x_{17}, x_{40}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in further reduction of the model to:

$$E_{VIII} = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership				
	I	IV	XI	XVI	Total
I	8	0	0	0	8
IV	4	0	0	1	5
XI	5	0	12	0	17
XVI	2	0	2	1	5
Total	19	0	14	2	35

In this case, the classification functions accurately predicted the group membership of twenty-one observations (60 per cent). The number of correct classifications one would expect by chance is 11.4 (32.6 per cent). Thus the functions performed significantly better than chance ($\alpha < .000108$).

Assertion IX : "Each sale recorded in the sales journal was stated the same as the billing."[38]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Trace from sales invoices to sales journal entries. Compare customer, invoice number and amount.[39]

Most of the sample public accounting firms appear to consider the latter of these procedures as optional. Thus, there were two possible groups into which a given sample observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedure Performed (X)
I	13	0
II	30	X

Utilizing the above groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this procedure, step one reduced the initial hypothesized model to the following:

$$E_{IX} = f(x_{6-10}, x_{17}, x_{21}, x_{22}, x_{25}, x_{37-38}).$$

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[38] Ibid., p. 148.

[39] Ibid.

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{IX} = f(x_{6-10}).$$

Classification functions derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	8	5	13
II	2	28	30
Total	10	33	43

In this case, the classification functions accurately predicted the group membership of thirty-six observations (83.7 per cent). The number of correct predictions one would expect by chance is twenty-six (60.5 per cent). Thus, the classification functions performed significantly better than chance ($\alpha < .00159$).

Assertion X: "Each sale recorded in the sales journal was correctly classified."[40]

Relevant procedure:

1. Compare sales classifications to supporting documents.[41]

At least some of the sample public accounting firms apparently considered this procedure optional. Therefore, there were two possible groups into which a sample observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedure Performed (X)
I	20	0
II	15	X

Utilizing these groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this procedure, step one reduced the initial hypothesized model to the following:

$$E_X = f(x_1, x_{6-10}, x_{18}, x_{25}, x_{26}, x_{29-31}, x_{34}, x_{35}, x_{36}, x_{40}, x_{41}).$$

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[40] Ibid.

[41] Ibid.

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_X = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	16	4	20
II	3	12	15
Total	19	16	35

In this case, then, the classification functions predicted group membership correctly for twenty-eight observations (80 per cent). The number of correct classifications one would expect by chance is 17.9 (51.1 per cent). Thus, the classification functions did perform significantly better than chance ($\alpha < .000687$).

A classification function which also deserves mention here because of its parsimony is the function derived from:

$$E_X = f(x_{35}).$$

This function (with net income its only independent variable) generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	17	3	20
II	8	7	15
Total	25	10	35

Thus the classification function accurately predicted group membership for twenty-four observations (68.6 per cent). The number of correct predictions one would expect by chance is 18.6 (53.1 per cent). In this case, the classification functions performed somewhat better than chance ($\alpha < .0495$).

Assertion XI:[42] "No actual merchandise shipment was recorded as a shipment more than once."[43]

Relevant procedures:

r 1. Confirm accounts receivable.

r 2. Compare actual inventory to perpetual inventory.[44]

Since all of the sample firms apparently considered both of these procedures "required," further analysis was unnecessary.

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[42]Arens lists this assertion, along with the next two under the more general assertion: "No merchandise shipment was recorded more than once." Arens, p. 148.

[43]Arens, p. 148.

[44]Ibid.

Assertion XII: "No recorded merchandise shipment was billed more than once."[45]

Relevant procedures:

1. Confirm accounts receivable.
2. Review sales invoices for shipping document numbers appearing on more than one invoice.[46]

The sample public accounting firms considered the latter of these procedures optional. Therefore, based on possible combinations of optional procedures, there were two groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedure Performed (X)
I	32	0
II	4	X

Utilizing these groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this procedure, step one reduced the initial hypothesized model to the following:

$$E_{XII} = f(x_1, x_{6-10}, x_{17}, x_{18}, x_{21}, x_{22}, x_{29-31}, x_{37-38}, x_{39}, x_{40}, x_{41}).$$

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[45] Ibid.

[46] Ibid.

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{XII} = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	30	2	32
II	2	2	4
Total	32	4	36

Even though, as the above matrix indicates, these classification functions accurately predicted group membership for thirty-two observations (88.9 per cent), since the number of correct predictions one would expect by chance is 28.9 (80.3 per cent), the functions did not perform significantly better than chance ($\alpha < .1401$).

Assertion XIII: "No billing of sales was recorded in the sales journal more than once."[47]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Review the sales journal for duplicate sales invoices.[48]

The sample public accounting firms considered the latter of these procedures optional. Therefore, based on possible combinations of optional procedures, there were two groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedure Performed (X)
I	33	0
II	10	X

Utilizing these groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this procedure, step one reduced the initial hypothesized model to the following:

$$E_{XIII} = f(x_1, x_{6-10}, x_{22}, x_{27-28}, x_{29-31}, x_{39}).$$

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[47] Ibid.

[48] Ibid.

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{XIII} = f(x_1, x_{6-10}, x_{22}, x_{39}).$$

Classification functions, derived with x_1 (indicator of evidential "timeliness"), x_{6-10} (indicator variables for the firm which performed the audit), x_{22} (internal check (2)), and x_{39} (indicator of client's year end) as the independent variables and evaluated by means of the modified holdout method, generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	29	4	33
II	3	7	10
Total	32	11	43

As the above matrix indicates, these classification functions accurately predicted group membership for thirty-six observations (83.7 per cent). The number of correct classifications one would expect by chance is 27.7 (64.4 per cent). Thus, the functions performed significantly better than chance ($\alpha < .00554$).

As an alternative, classification functions, derived with x_{6-10} as the independent variables and evaluated by means of the modified holdout method yielded the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	Total
I	25	8	33
II	4	6	10
Total	29	14	43

In this case, the classification functions predicted group membership correctly for thirty-one observations (72.1 per cent). The number of correct predictions one would expect by chance is 27.7 (64.4 per cent). Thus, these classification functions did not perform significantly better than chance ($\alpha < .1841$).

Assertion XIV:[49] "Each recorded shipment was for an actual shipment."[50]

Relevant procedures:

r 1. Confirm accounts receivable.

r 2. Compare actual inventory to perpetual inventory.

3. Trace from shipping documents to perpetual inventory records.

4. Trace from shipping documents to sales orders.[51]

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[49]Arens lists this assertion, along with the next two under the more general assertion: "Each recorded sale was valid." Arens, pp. 148-149.

[50]Arens, p. 149.

[51]Ibid.

Of these procedures, the sample firms considered the last two "optional." Thus, based on possible combinations of optional procedures, there were four groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedures Performed (X) (3)	(4)
I	19		
II	7		X
III	6	X	
IV	5	X	X

Utilizing these groupings to eliminate variables with no apparent ability to predict the auditor's selection of optional procedures relevant to this assertion, step one of the analysis reduced the initial hypothesized model to the following:

$$E_{XIV} = f(x_5, x_{6-10}, x_{18}, x_{25}, x_{35}, x_{36}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{XIV} = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	III	IV	Total
I	19	0	0	0	19
II	3	2	0	2	7
III	4	0	0	2	6
IV	0	0	0	5	5
Total	26	2	0	9	37

As the above matrix indicates, the classification functions accurately predicted group membership for twenty-six observations (70.3 per cent). Since the number of correct classifications one would expect by chance is only 14.9 (40.3 per cent), the functions obviously performed significantly better than chance ($\alpha < .000000287$).

Assertion XV: "Each recorded billing was for a recorded shipment."[52]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Trace from sales invoices to shipping documents.[53]

The sample public accounting firms considered the latter of these procedures optional. Therefore, based on possible combinations of optional procedures, there were two groups into which a given observation might fall. The actual groupings were as follows:

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[52] Ibid.

[53] Ibid.

Group	Number of Observations	Optional Procedure Performed (X)
I	18	0
II	20	X

Utilizing these groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this procedure, step one reduced the initial hypothesized model to the following:

$$E_{XV} = f(x_{6-10}, x_{17}, x_{21}, x_{26}, x_{41}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{XV} = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership I	II	Total
I	14	4	18
II	8	12	20
Total	22	16	38

As the above matrix indicates, these classification functions accurately predicted group membership for twenty-six observations

(68.4 per cent). The number of correct classifications one would expect by chance is 19.0 (50.1 per cent). Thus, in this case, the classification functions performed significantly better than chance ($\alpha < .0183$).

Assertion XVI: "Each sale recorded in the sales journal was for a recorded billing."[54]

Relevant procedures:

r 1. Confirm accounts receivable.

2. Trace from sales journal entries to sales invoices.[55]

The sample public accounting firms considered the latter of these procedures optional. Therefore, based on possible combinations of optional procedures, there were two groups into which a given observation might fall. The actual groupings were as follows:

Group	Number of Observations	Optional Procedure Performed (X)
I	30	0
II	9	X

Utilizing these groupings to eliminate variables with no apparent ability to predict whether or not the auditor would perform this

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[54] Ibid.

[55] Ibid.

procedure, step one reduced the initial hypothesized model to the following:

$$E_{XVI} = f(x_1, x_5, x_{6-10}, x_{25}, x_{27-28}, x_{37-38}, x_{40}).$$

Selecting the "best" combination of these remaining independent variables, step two of the analysis resulted in a further reduction of the model to:

$$E_{XVI} = f(x_{6-10}).$$

Classification functions, derived with x_{6-10} (indicator variables for the firm which performed the audit) as the independent variables and evaluated by means of the modified holdout method, generated the following confusion matrix:

Actual Group Membership	Predicted Group Membership		
	I	II	Total
I	28	2	30
II	5	4	9
Total	33	6	39

As the above matrix indicates, these classification functions predicted group membership correctly for thirty-two observations (82.1 per cent). The number of correct predictions one would expect by chance is 26.8 (68.7 per cent). Thus, in this case, although the classifications performed somewhat better than chance, the difference is probably not highly significant ($\alpha < .0526$).

Assertion XVII: "All recorded sales were a result of current period transactions and [no] recorded sales were a result of subsequent or prior period shipments."[56]

Relevant procedures:

r 1. Confirm accounts receivable.

r 2. Perform cut-off procedures.[57]

Since all of the sample public accounting firms apparently considered both of these procedures "required," further analysis was unnecessary.

Summary and Conclusions: Procedure Selection in the Area of Sales

Tables 7 and 8 (infra, pp. 241-45) summarize the results of the foregoing analysis. The first table indicates that, for eleven of the thirteen assertions examined, some combination of independent variables predicted better than chance ($\alpha < .05$) which tests the auditor would select. However, for at least two reasons, one should view these results with a certain degree of skepticism.

The first of these reasons concerns the specific manner in which the audit area of sales was analyzed into component assertions. Undoubtedly, because of the amount and variety of evidence necessary to support an overall opinion on any given set of financial statements, the public accountant must subdivide each audit into smaller, relatively independent areas of investigation. Chapter II argued

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[56] Ibid.

[57] Ibid.

(pp. 36-38) that the individual financial statement assertion is the most appropriate level of disaggregation for the auditor's evidence selection decisions. Unfortunately, the work-papers examined in the course of this study provided little indication of the actual manner in which the practicing public accountant subdivides an audit (beyond the level of general audit "areas" such as sales, accounts receivable, cash, inventories, etc.). Furthermore, even if the sample auditors did select their evidential matter with specific assertions in mind, their work-papers did not indicate what assertions they considered or whether those assertions corresponded with Arens' set. Therefore, (1) to the extent that assumed and actual levels of disaggregation differed, and (2) to the extent that assumed and actual assertions differed, the results of the foregoing analysis may be invalid.

The second reason for skepticism concerning the results of the above analysis is the exploratory approach it adopted. Instead of testing specific hypotheses about any one particular combination of independent variables (the traditional approach), this analysis sought to identify those combinations with the greatest predictive ability for each assertion. Unfortunately, because of the relatively large number of potential independent variables (providing literally thousands of combinations to choose from) and the relatively small number of sample observations, it is possible that the apparent predictive ability of some resulting independent variable combinations may be nothing more than random correlation.

Because of these two problems (questionable validity of the manner in which "sales" was analyzed into component assertions and danger

Table 7.--Summarized results of the study of factors which affect the selection of audit procedures in the area of sales (A)

Assertion	Variables Remaining after Step One	Variables Remaining after Step Two	Significance "Best" Combination	x_{6-10}
I	ALL RELEVANT PROCEDURES WERE REQUIRED.			
II	x_1, x_{6-10}, x_{18}, x_{21}, x_{27-28}, x_{29-31}, x_{39}	x_{18}, x_{29-31}	.0000481	.000968
III	ALL RELEVANT PROCEDURES WERE REQUIRED.			
IV	x_5, x_{6-10}, x_{18}, x_{22}, x_{25}, x_{26}, x_{36}	x_5, x_{18}, x_{22}, x_{25}, x_{26}, x_{36}	.0000481	.00621
V	x_1, x_{17}, x_{26}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}	x_{17}, x_{26}, x_{34}, x_{35}, x_{36}	.0392	.0643*
VI	x_5, x_{6-10}, x_{18}, x_{21}, x_{26}, x_{35}, x_{36}	x_{6-10}	.00000130	.00000130

*Variables predicted worse than chance.

Table 7--Continued

Assertion	Variables Remaining after Step One	Variables Remaining after Step Two	Significance "Best" Combination	Significance x_{6-10}
VII	x_{6-10}, x_{17}, x_{18}, x_{21}, x_{22}, x_{39}	x_{6-10}, x_{17}, x_{22}	.0000481	.00776
VIII	x_{6-10}, x_{17}, x_{40}	x_{6-10}	.000108	.000108
IX	x_{6-10}, x_{17}, x_{21}, x_{22}, x_{25}, x_{37-38}	x_{6-10}	.00159	.00159
X	x_{1}, x_{6-10}, x_{18}, x_{25}, x_{26}, x_{29-31}, x_{34}, x_{35}, x_{36}, x_{40}, x_{41}	x_{6-10}	.000687	.000687
XI	ALL RELEVANT PROCEDURES WERE REQUIRED.			
XII	x_{1}, x_{6-10}, x_{17}, x_{18}, x_{21}, x_{22}, x_{29-31}, x_{37-38}, x_{39}, x_{40}, x_{41}	x_{6-10}	.1401	.1401
XIII	x_{1}, x_{6-10}, x_{22}, x_{27-28}, x_{29-31}, x_{39}	x_{1}, x_{6-10}, x_{22}, x_{39}	.00554	.1841

Table 7--Continued

Assertion	Variables Remaining after Step One	Variables Remaining after Step Two	Significance "Best" Combination	x_{6-10}
XIV	x_5, x_{6-10}, x_{18}, x_{25}, x_{35}, x_{36}	x_{6-10}	.000000287	.000000287
XV	x_{6-10}, x_{17}, x_{21}, x_{26}, x_{41}	x_{6-10}	.0183	.0183
XVI	x_1, x_5, x_{6-10}, x_{25}, x_{27-28}, x_{37-38}, x_{40}	x_{6-10}	.0526	.0526
XVII	ALL RELEVANT PROCEDURES WERE REQUIRED.			

Table 8.--Summarized results of the study of factors which affect the selection of audit procedures in the area of sales (B)

Factors	Assertion													Number of Times the Variable Remained in the Analysis after Step One (x)	Number of Times the Variable Remained in the Analysis after Step Two (x^*)
	II	IV	V	VI	VII	VIII	IX	X	XII	XIII	XIV	XV	XVI		
x_1	x		x					x	x	x^*			x	6	1
x_5		x^*		x							x		x	4	1
x_{6-10}	x	x		x^*	x^*	x^*	x^*	x^*	x^*	x^*	x^*	x^*	x^*	12	10
x_{17}			x^*		x^*	x	x		x			x		6	2
x_{18}	x^*	x^*		x	x			x	x		x			7	2
x_{21}	x			x	x		x		x			x		6	0
x_{22}		x^*			x^*		x		x	x^*				5	3
x_{25}		x^*					x	x			x		x	5	1
x_{26}		x^*	x^*	x				x				x		5	2
x_{27-28}	x									x			x	3	0
x_{29-31}	x^*							x	x	x				4	1
x_{32-33}			x											1	0
x_{34}			x^*					x						2	1

Table 8--Continued

Factors	Assertion													Number of Times the Variable Remained in the Analysis after Step One (x)	Number of Times the Variable Remained in the Analysis after Step Two (x^*)
	II	IV	V	VI	VII	VIII	IX	X	XII	XIII	XIV	XV	XVI		
x_{35}			x^*	x				x			x			4	1
x_{36}		x^*	x^*	x				x			x			5	2
x_{37-38}			x				x		x				x	4	0
x_{39}	x				x				x	x^*				4	1
x_{40}						x		x	x				x	4	0
x_{41}								x	x			x		3	0

of random correlation), the greatest value of the above analysis undoubtedly lies in the methodology it introduces (the actual limitations of the analysis arise from the small sample size, not from the methodology employed) and the questions it raises (particularly concerning the auditor's approach to disaggregating evidence accumulation decisions) rather than in its specific results. Nevertheless, at least two of these results are sufficiently important to warrant further discussion here.

First of all, variables x_{6-10}, by themselves, predicted the auditor's test selection better than chance ($\alpha < .05$) for nine of the thirteen assertions examined. These indicator variables for the firm which performed the audit were the most accurate predictors of procedure selection for eight assertions and combined with other variables to form the most accurate set of predictors for two more. The fact that they turn up so often as, or among, the "best" combinations of independent variables indicates that x_{6-10} probably had predictive ability beyond mere random correlation. Apparently then, each of the sample firms had its own (to some extent unique) basic approach to the audit of sales for clients of the size and nature included in this study -- an approach that was relatively insensitive to variations (of the magnitude encountered here) in the other factors considered.

The other result worthy of mention is the frequency with which one of both of the internal check factors (x_{18} and x_{22}) and one or both of the internal control factors (x_{17} and x_{21}) survived step one (nine and eight times out of thirteen, respectively). These results probably indicate that the sample auditor's programs were, in fact,

to some extent sensitive to the quality of their client's internal check and internal control, although the evidence here is not nearly so compelling as that regarding x_{6-10}.

The Audit Area of Accounts Receivable

Arens identifies the following auditing procedures as relevant to one or more financial statement assertions regarding "accounts receivable":[58]

1. Aged trial balance procedures.

r R a. Foot the list obtained from the client.

r R b. Reconcile the total with the general ledger.

r R c. Compare the detail list to the subsidiary ledger.

r R d. Review the listing for non-customer accounts and consignments.

2. Confirmation of Accounts Receivable.

a. Positive Confirmations.

r R (1) Send positive confirmations.

r R (2) Send second requests to non-respondents.

r R (3) Reconcile apparent differences disclosed by positive confirmations.

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[58]Arens, pp. 145-155. Note that these procedures are primarily applicable to determining the validity of accounts receivable. Procedures applicable to determining the collectibility of such accounts are defined as beyond the scope of the study.

b. Negative Confirmations.

(1) Send negative confirmations.

r R (2) Reconcile apparent differences disclosed by negative confirmations.

r R c. Alternative Procedure -- Trace collections received on open account.[59]

The capital "R" and lower case "R" appearing before all of the above procedures except:

2. b. (1). Send negative confirmations.

identify, respectively, those procedures which Arens considers required and those procedures which all of the sample firms performed in at least ninety per cent of their reported audits (eighty per cent for firms which reported only five clients).

Because it provides essentially the same information as positive confirmation, though usually with considerably less reliability, negative confirmation is not really an "optional" procedure in the sense of the "optional" sales tests described above. Rather, it is an alternative means of satisfying the basic requirement of Generally Accepted Auditing Standards that accounts receivable be confirmed. Only if the auditor cannot achieve adequate and economically feasible coverage of his client's accounts receivable through positive confirmation alone does negative confirmation become a valid (and, in fact, a required) procedure.

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[59] Arens identifies this procedure as a required follow-up for "non-responses" to positive confirmations. In fact, all of the sample firms performed this procedure as a required follow-up for both types of confirmation and for "responses" as well as "non-responses."

Summary and Conclusions: Procedure Selection in the Area of Accounts Receivable

The absence of "optional" procedures in the area of accounts receivable precluded tests of the nature performed in the area of sales. Nevertheless, while the number of observations is insufficient to permit more than tentative generalizations, the work-papers reviewed suggest some tendencies worthy of mention here.

Essentially, four factors appear to have influenced most greatly the selection of accounts for a particular type of confirmation. These factors were: the size of a receivable relative to others in the trial balance, the age of the account, the total number of receivables in the trial balance, and individual firm policies.

Clearly the most important factor in the selection of an account for positive confirmation was its size relative to other receivables in the trial balance. For all of the sample firms except G (which selected accounts randomly and without regard to dollar balance), the predominant approach was to select receivables in excess of some minimum dollar balance -- the particular minimum in any given case generally being dependent upon and in considerable excess of the trial balance average. This method of selection was, in fact, the only one recorded in the sample work-papers from firms, C. D, and E. Firms A, B, and F, however, also occasionally added ninety-day-old receivables (in some cases again setting a minimum dollar balance) to their positive confirmations.

Besides the size and age of individual accounts, another factor which seems to have affected the auditor's confirmation approach was the total number of receivables in the trial balance. Generally, as

long as this number did not exceed some maximum (which varied from firm to firm) the sample auditors tended to perform all confirmation positively. Otherwise, they tended to use a mixture of positive and negative confirmation.

The predominant method of specifying accounts for negative confirmation was simply random or pseudo-random selection from all receivables (or all receivables in excess of some minimum dollar balance) not already designated for positive confirmation. The actual extent of negative confirmative coverage varied from firm to firm. However, in general, Firms A and E seemed to confirm a larger percentage of accounts negatively than did Firms B, C and D. (Firms F and G did not utilize negative confirmation sufficiently often to permit generalizations about their approach.

Summary and Conclusions: Procedure Selection in the Areas of Sales and Accounts Receivable

The foregoing analysis has concerned itself with factors which affect the section of audit procedures in the areas of sales and accounts receivable. Although a regrettably, but unavoidably, small sample limited the study somewhat, the following tentative conclusions seem reasonable.

First of all, the results suggest that, at least for the clients observed, Generally Accepted Auditing Standards and individual firm policy were the primary determinants of test selection in the area of sales. Additionally, the results suggest that client internal check and internal control may have had some influence in this area.

With respect to accounts receivable, on the other hand, the primary determinant of test selection appears to have been Generally Accepted Auditing Standards. Additionally, however, the size, age, and number of receivables in the client's trial balance, and specific firm policies probably influenced whether a given receivable would be confirmed positively, negatively, or not at all.

After he has determined which procedures he will perform, the auditor must decide when and to what extent he will perform them. The remainder of this chapter is concerned with factors which influence these latter two decisions. Let us, therefore, turn to a study of factors which affect the timing of audit procedures in the areas of sales and accounts receivable.

A Study of Factors which Affect the Timing of Audit Evidence Accumulation in the Areas of Sales and Accounts Receivable

Chapters III-V identify a number of factors seemingly capable of having an indirect or limited effect on the auditor's timing decisions (e.g., see supra, pp. 105, 145, and 166). The only factor identified in these discussions as capable of directly affecting such decisions, however, is the quality and comprehensiveness of the client's internal control. With regard to this factor's expected effect, Chapter IV's argument (supra, pp. 136-139) suggests that the absence of adequate internal control in a given audit area will generally necessitate year-end testing. The presence of adequate control, however, although an essential precondition, is not, in itself, sufficient reason for the auditor to obtain his evidence at an interim date. Year-end tests

provide inherently more reliable evidence than interim tests, regardless of the status of the client's internal control.

Reduced reliability notwithstanding, however, two factors not specifically discussed in Chapters III-V, time constraints and staff constraints, may cause the auditor to schedule some tests at an interim date. Time constraints are most likely to occur in the audits of larger, publicly-held clients, since such clients frequently desire to issue their financial statements within a fairly short time (e.g., a month) after the close of their fiscal year. Staff constraints, on the other hand, are most likely to become an important consideration whenever an auditing firm has a large number of engagements in progress simultaneously.

All of the sample clients in this study were relatively small, most were closely-held, and none imposed any kind of restrictive deadline on the auditor's opinion. Therefore, time constraints were controlled out of the analysis. A number of the sample clients did, however, have a fiscal year which coincided with the calendar year. Therefore, since the public accountant's peak season traditionally begins toward the end of December, the following general model was hypothesized for timing decisions with regard to sales tests of transactions and accounts receivable confirmation:

1. If the client's internal control is inadequate, either due to a lack of separation of cash-handling and record-keeping functions or for some other reason, schedule the appropriate test(s) at or after the client's year-end regardless of when that year-end occurs.

2. If the client's internal control is adequate:

   a. if the client's fiscal year does not end during the busy season (operationally defined as December-February), schedule the appropriate test(s) at or after the client's year end,

   b. if the client's fiscal year ends during the busy season, schedule the appropriate test(s) at an interim date.

The following analysis evaluates this model's predictive ability when applied to the sample observations.

The Audit Area of Sales

In mathematical form, the above model, as hypothesized with regard to sales tests of transactions,[60] appears as follows:

$$t_s = f(x_{21}, x_{39}) = \begin{cases} 0; \ x_{21} = 0, \ \underline{\text{or}} \ x_{39} = 0 \\ 1; \ x_{21} = 1, \ \underline{\text{and}} \ x_{39} = 1 \end{cases}$$

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[60] Another factor which undoubtedly affects when the auditor will perform a particular test is the nature of the test, itself. Thus, for example, sales tests actually fall into two basic categories: tests of transactions and cut-off tests. Because of the nature and objective of cut-off procedures, however, and the fact that they are seldom particularly time consuming, such procedures are almost always deferred until the client's year-end regardless of the "circumstances of the audit." Since, in forty-seven of the fifty-one sample observations for which the auditor reported performing cut-off tests, he performed those tests at year end, no further analysis was considered necessary. (Note, however, that in all of the four cases where the auditor performed his cut-off tests at an interim date, the client had "good" internal control and a fiscal year which ended December 31.

where: t_s indicates the model's prediction as to when the auditor performed his sales tests of transactions; it assumes a value of zero if the model predicts the auditor performed such tests at or after the client's year end and a value of one if it predicts he performed such tests at an interim date;

x_{21} indicates the quality and comprehensiveness of the client's internal control over sales; it is assigned a value of zero if the auditor evaluated such control as inadequate or if no separation of record-keeping and cash-recording functions existed and a value of one, otherwise, and

x_{39} indicates the client's fiscal year end; it assumes a value of one if that year end occurs in December, January, or February and a value of zero if it occurs at any other time.

The method adopted to evaluate this model was essentially the same as that adopted to evaluate the classification functions of the previous section. First, the model predicted timing decisions for each sample observation. Then, these predictions were compared with the auditor's actual timing decisions. The following confusion matrix summarizes the results of the comparisons:

Actual Timing Decision - Tests of Transactions	Predicted Timing Decision - Tests of Transactions		
	Interim	Year-End	Total
Interim	16	8	24
Year-End	3	26	29
Total	19	34	53

As the above matrix indicates, the hypothesized model accurately predicted the auditor's timing decision forty-two times (79.2 per cent). The number of correct predictions one would expect by chance[61] is 27.2 (51.3 per cent). Therefore, in this case, the model performed significantly better than chance ($\alpha < .0000481$).

The Audit Area of Accounts Receivable

In mathematical form, the general timing model as hypothesized with regard to accounts receivable confirmation,[62] appears as follows:

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[61]The estimate of the number of correct predictions one would expect by chance as well as the test of significance used in this analysis is again that found in Clark and Schkade, pp. 417-18, and described in the preceding section of this chapter (supra, pp. 203-204).

[62]Accounts receivable tests, like sales tests, actually fall into two categories: confirmation procedures and trial-balance procedures. As in the case of sales cut-off tests, trial balance tests appear to belong to the class of procedures usually deferred until the client's year-end regardless of the "circumstances of the audit." Thus, since in forty-seven of the fifty-three sample engagements, the auditor performed his accounts receivable trial balance procedures at the client's year end, no further analysis was performed. (Again note, however, that in all six cases where the auditor performed his trial balance procedures at an interim date, the client had at least "adequate" internal control over accounts receivable and a fiscal year which ended December 31.)

$$t_{a/r} = f(x_{23}, x_{39}) = \begin{cases} 0; & x_{23} = 0, \text{ or } x_{39} = 0 \\ 1; & x_{23} = 1, \text{ and } x_{39} = 1 \end{cases}$$

where: $t_{a/r}$ indicates the model's prediction as to when the auditor confirmed accounts receivable; it assumes a value of zero if the model predicts the auditor performed confirmation at or after the client's year end and a value of one if the model predicts he performed this test at an interim date;

x_{23} indicates the quality and comprehensiveness of the client's internal control over accounts receivable; it is assigned a value of zero if the auditor evaluated such control as inadequate or if no separation of record-keeping and cash-handling functions existed and a value of one otherwise; and

x_{39} is defined as above.

Comparing this model's predicted timing decision with the auditor's actual timing decision for each sample observation yielded the following confusion matrix:

Actual Timing Decision - Confirmation of Receivables	Predicted Timing Decision - Confirmation of Receivables		
	Interim	Year-End	Total
Interim	13	6	19
Year-End	6	28	34
Total	19	34	53

As the above matrix indicates, in this case, the hypothesized model predicted the auditor's timing decision correctly forty-one times (77.4 per cent). The number of correct predictions one would expect by chance is 28.6 (54.0 per cent). Here, again, the model performed significantly better than chance ($\alpha < .000687$).

Summary and Conclusions: Timing of Evidence Accumulation in the Areas of Sales and Accounts Receivable

For both sales tests of transactions and the confirmation of accounts receivable, a model employing the quality of client internal control and date of client year-end as independent variables predicted the sampled timing decisions significantly better than chance. While this model performed better than one based on either of the above variables alone (specifically with respect to clients which had "adequate" internal control and a fiscal year-end outside the auditors' normal busy season), the introduction of additional independent variables, such as the firm which performed the audit, distribution of the client's ownership and the existence of loan covenants, did not improve its performance. Therefore, a reasonable conclusion would seem

to be that the hypothesized model reflects the sample auditors' normal timing decision rule for clients of the size and nature included in this study.

To this point in the chapter, we have attempted to draw some empirical conclusions concerning factors which affect the type and timing parameters of the auditor's evidential collection. To complete the analysis, let us turn to an empirical study of factors which affect the extent parameter of that collection.

A Study of Factors which Affect the Sample Size of Audit Tests in the Areas of Sales and Accounts Receivable

Chapters III-V identify numerous factors logically capable of affecting the extent parameter of the auditor's evidential collection. Unfortunately, because the number of potential independent variables was relatively large compared to the number of sample observations, determination and evaluation of a general model of the auditor's sample size decision process was infeasible. For this reason the study is restricted to the more limited objective of identifying factors which seemed to exert the greatest influence in that process.

Basic Methodology

Toward this objective, each of the following analyses employed multiple linear regression[63] to identify the combination of independent variables which explained, most fully, observed variations in the

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[63]For discussion of this technique, see T. W. Anderson, An Introduction to Multivariate Statistical Analysis (New York: John Wiley and Sons, Inc., 1958), or almost any introductory mathematical statistics text.

auditor's sample selection decision. The basic approach involved initially forming a least squares equation which included, as independent variables, all factors identified in Chapters III-V as relevant to that decision (the dependent variable). From this equation, independent variables were then deleted, one-at-a-time, in increasing order of their ability to account for variation in the dependent variable.[64] As each independent variable dropped out of the analysis, a new multiple linear regression function was formed and evaluated with respect to its ability to explain such variation.

Although the usual measure of this ability is the coefficient of multiple determination (R^2),[65] that measure proved inadequate here. As Ruble, Kiel and Rafter note, R^2 is always an increasing function of the number of independent variables involved in an analysis (i.e., the introduction of an additional independent variable into a least squares function, even though that variable has little or no actual relationship to the dependent variable, will never decrease R^2 and may increase it somewhat due to spurious correlation).[66] Since the effects of

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[64]The specific analytical tools employed were two of the Michigan State University Agricultural Experiment Station's STAT series computer routines, "LS-Least Squares," as described in William L. Ruble, Donald Kiel, and Mary E. Rafter, STAT Series Description No. 7, LS-Calculation of Least Squares (Regression) Problems on the LS Routine (East Lansing: Michigan State University Agricultural Experiment Station, 1969), and "LSDEL-Stepwise Deletion of Variables from a Least Squares Equation," as described in Mary E. Rafter and William L. Ruble, STAT Series Description No. 8, LSDEL-Stepwise Deletion of Variables from a Least Squares Equation (East Lansing: Michigan State University Agricultural Experiment Station, 1966). Both routines are available through the program library of the Michigan State University Computation Center.

[65]Ruble, Kiel, and Rafter, pp. 5-6, 34.

[66]Ibid., p. 34.

spurious correlation tend to increase as the number of independent variables increases, and since the number of sample observations was relatively small, this study required a measure of explained variation which would take potential random correlation into account -- a requirement which R^2 obviously does not fulfill.

A measure which does fulfill this condition, however, is $\bar{R}^2$, the coefficient of multiple determination adjusted for degrees of freedom in the analysis.[67] Unlike its unadjusted counterpart, $\bar{R}^2$ will <u>increase</u> as independent variables are deleted from a regression function so long as the resulting loss in explained variation is not sufficiently significant to offset the increase in the degrees of freedom adjustment factor.

For this reason, independent variables were deleted from the regression function until $\bar{R}^2$ attained its maximum value. Since, however, even the use of $\bar{R}^2$ may not have entirely eliminated the possibility of random correlation, the results reported for each of the following analyses include:

1. the combination of independent variables which maximized $\bar{R}^2$, in decreasing order of importance,
2. any variables whose deletion from this combination would reduce the optimum $\bar{R}^2$ by no more than .05 per variable, and

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[67] <u>Ibid.</u> $\bar{R}^2 = 1 - \frac{N-1}{N-K-1}(1-R^2)$

where: N is the number of observations,
K is the number of independent variables, and
R^2 is the coefficient of multiple determination.

3. $\bar{R}^2$ for the five or six most important factors in the optimum function.

Let us now turn to the results of the analysis.

The Audit Area of Sales

Initially, the following general model was hypothesized to explain the auditor's sample size decisions with regard to sales tests of transactions:[68]

$$q_s = f(x_1, x_3, x_4, x_5, x_{6-8}, x_{14}, x_{15}, x_{21}, x_{22}, x_{25}, x_{26}, x_{27-28}, x_{29-31}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}, x_{39}, x_{40}, x_{41}, x_{42}, x_{44})$$

where: q_s is the number of observations in the auditor's sales tests of transactions sample,

f is a linear function,

x_{40} is the percentage of "Accounts Receivable" dollar balance confirmed by any means (positive confirmations, negative confirmations, and alternative procedures),

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[68] With regard to the other basic category of sales tests, cut-off procedures, sample size data was insufficient to permit similar analysis. In fact, even for sales tests of transactions, specific sample-size data was relatively scarce -- appearing in only twenty-nine of the fifty-three sets of work-papers reviewed. Thus, one must be particularly aware of the potential effects of spurious correlations.

x_{41} is the percentage of the total number of accounts receivable confirmed by any means (positive confirmations, negative confirmations, and alternative procedures),

x_{42} indicates the quality and comprehensiveness of the client's internal control over sales and assumes a value of zero if the auditor evaluated such control as inadequate or if no separation of record-keeping and cash-handling function existed and a value of one, otherwise, and

x_{44} is an indicator variable for the time at which the tests of transactions were performed, and assumes a value of one if the tests were performed during the auditor's busy season (January-March) and a value of zero, otherwise, and

all other x_i are defined as in Table 5.

Of these variables, the combination which maximized $\bar{R}^2$ (.6711) was, in order of decreasing importance:

Variable(s)	Factor Represented
x_{6-8}	the firm which performed the audit,[69]
x_{27-28}	the nature of the client's operations,

[69]Only Firms A, B, C, and E are represented here. The other three provided insufficient information with regard to tests of transactions to permit inclusion.

Variable(s)	Factor Represented
x_{32-33}	the existence and nature of loan covenants between the client and one or more creditors,
x_{22}	the auditor's evaluation of his client's internal check over sales,
x_{42}	the quality of the client's internal control over sales (auditor's evaluation adjusted for any lack of separation of record-keeping and cash handling functions),
x_{29-31}	the distribution of the client's ownership,
x_{41}	the percentage of the total number of accounts receivable confirmed by any means,
x_{34}	the client's "Retained Earnings" balance,
x_{21}	the auditor's evaluation of his client's internal control over sales, and
x_{26}	the client's total stockholders' equity.

The last three factors, x_{26}, x_{21} and x_{34}, each made a marginal contribution to $\bar{R}^2$ of less than .0240. Furthermore, deletion of all three from the analysis reduces $\bar{R}^2$ only slightly to .6289.[70] Therefore, one may reasonably question whether these variables' apparent relationship to tests of transactions sample size was, in fact, more than random correlation.

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[70]The further deletion of the next least important factor, x_{41}, reduces $\bar{R}^2$ to .5626, a loss in explained variation of .0663.

On the other hand, the five most significant factors[71] in the regression function have the following effect on $\bar{R}^2$ when admitted to that function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_{6-8}	.0000
x_{27-28}	.3071
x_{32-33}	.4295
x_{22}	.4851
x_{42}	.5163

These results would seem to indicate that, at the least, the first four factors do bear more than a random relationship to auditor tests of transactions sample size decisions.

The Audit Area of Accounts Receivable

A problem which arose with respect to this analysis was how to measure extent of accounts receivable confirmation. Should the basis be the number of receivables confirmed or the dollar value of those receivables? Should only positive coverage be considered or should coverage by negative confirmation and alternative procedures, such as tests of subsequent collection, be included as well? Because the sample auditors' actual approach to selecting accounts for confirmation almost invariably referred, in some manner or other, to the dollar balance of such accounts, and because, presumably, no rational auditor

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[71] Since, in the case of some indicators (i.e., x_{6-8}, x_{27-28}, x_{32-33}) more than one independent variable was required to describe a particular factor, the five factors here referred to actually represent ten independent variables in the regression function.

acting in his client's interest would perform a particular verification technique on a given receivable unless: (1) he considered verification of that receivable necessary for his opinion on the client's financial statements, and (2) he was willing to accept the result of his selected technique as evidence of the account's status, this researcher believes that the percentage of "Accounts Receivable" dollar balance confirmed by any means is the most meaningful measure available.[72] So that the reader may draw his own conclusions, however, results appear below for analyses adopting each of the following measures of extent as their dependent variable:

1. the percentage of the total number of accounts receivable confirmed positively,
2. the percentage of the total number of accounts receivable confirmed by any means,
3. the percentage of "Accounts Receivable" dollar balance confirmed positively,
4. the percentage of "Accounts Receivable" dollar balance confirmed by any means.

Furthermore, since the auditor's usual approach to selecting receivables for confirmation did not refer to any percentage of total

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[72]Another possible method of measuring extent of receivables confirmation might have been to look at the reliability and confidence level (holding one constant and treating the other as the dependent variable) with which the auditor could estimate his client's "Accounts Receivable" dollar balance based upon the confirmation sample. Since, however, the sample auditors did not, themselves, adopt statistical parameters to define the extent of their receivables coverage, analyzing their decision model in terms of such parameters did not seem sufficiently meaningful to warrant the practical problems involved in converting the reported confirmation data into statistical terms.

coverage, per se, but rather called for positive confirmation of "all accounts with a balance in excess of $xxx," and negative confirmation of a random or pseudo-random "representative sample of all accounts not receiving a positive confirmation," the results reported below also include those of analyses which adopted as their dependent variables:

5. the smallest dollar balance receivable (less than ninety days old) considered for positive confirmation in a given audit, and
6. the smallest dollar balance receivable (less than ninety days old) considered for confirmation by any means in a given audit.

In all cases, the following general model was hypothesized to explain the auditor's sample selection decision:

$$q_{a/r} = f(x_1, x_2, x_3, x_4, x_5, x_{6-11}, x_{12}, x_{13}, x_{14}, x_{19}, x_{20}, x_{23}, x_{24}, x_{25}, x_{26}, x_{27}, x_{28}, x_{29-31}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}, x_{39}, x_{43}, x_{45})$$

where: $q_{a/r}$ is the "extent" of accounts receivable confirmation as defined in each specific analysis,

x_{43} indicates the quality and comprehensiveness of the client's internal control over accounts receivable and assumes a value of zero if the auditor evaluated such control as inadequate or if no separation of record-keeping and cash-handling functions existed and a value of one otherwise,

x_{45} is an indicator variable for the time at which confirmation was performed and assumes a value of one if it was performed during the auditor's busy season (January-March) and a value of zero otherwise, and

all other x_i are defined as in Table 5.

The Percentage of the Total Number of Accounts Receivable Confirmed Positively

The combination of independent variables which maximized $\bar{R}^2$ (.6584) was, in order of decreasing importance:

Variable(s)	Factor Represented
x_{6-11}	the firm which performed the audit,[73]
x_{29-31}	the distribution of the client's ownership,
x_{26}	the client's total stockholders' equity,
x_4	the client's mean accounts receivable dollar balance,
x_{13}	the ratio of the client's "Accounts Receivable" to total assets,
x_{43}	the quality of the client's internal control over accounts receivable (auditor's evaluation adjusted for any lack of separation of record-keeping and cash-handling functions),

[73] All seven public accounting firms are represented here.

Variable(s)	Factor Represented
x_{32-33}	the existence and nature of loan covenants between the client and one or more creditors,
x_{36}	the client's debt/equity ratio,
x_{27-28}	the nature of the client's operations,
x_2	the dollar balance of the client's gross accounts receivable,
x_{24}	the auditor's evaluation of the client's internal check over accounts receivable,
x_{39}	an indicator variable for the date of the client's fiscal year end.

The last six of these factors, x_{39}, x_{22}, x_2, x_{27-28}, x_{36} and x_{32-33}, each made a marginal contribution to $\bar{R}^2$ of less than .0295. Furthermore, deletion of all six factors (nine independent variables) from the analysis reduces $\bar{R}^2$ only slightly to .5508. Therefore, one cannot rule out the possibility that these variables' apparent relationship to the percentage of the total number of receivables confirmed positively is, in fact, merely spurious correlation.

On the other hand, the six most significant factors (thirteen independent variables) in the regression function have the following effect on $\bar{R}^2$ when admitted to that function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_{6-11}	---[74]
x_{29-31}	.0899
x_{26}	.2938
x_{4}	.4501
x_{13}	.5022
x_{43}	.5508

These results would seem to indicate that, in combination, at least the first four factors do bear more than a random relationship to the percentage of the total number of accounts receivable confirmed positively.

The Percentage of the Total Number of Accounts Receivable Confirmed by Any Means

As the close relationship between this and the previously examined dependent variable might lead one to expect, the combination of factors which maximized $\bar{R}^2$ (.6458) in both cases is almost identical, not only in the factors included, but also in the relative significance of those factors:

Variable(s)	Factor Represented
x_{6-11}	the firm which performed the audit,[75]
x_{29-31}	the distribution of the client's ownership,
x_{25}	the client's total assets,

[74] "---" indicates that the program did not calculate $\bar{R}^2$ at that step of the analysis.

[75] All seven public accounting firms are represented here.

Variable(s)	Factor Represented
x_4	the client's mean accounts receivable dollar balance,
x_{13}	the ratio of the client's "Accounts Receivable" to total assets,
x_{43}	the quality of the client's internal control over accounts receivable (auditor's evaluation adjusted for any lack of separation of record-keeping and cash-handling functions),
x_2	the dollar balance of the client's gross accounts receivable,
x_{39}	an indicator variable for the date of the client's fiscal year end,
x_{24}	the auditor's evaluation of the client's internal check over accounts receivable,
x_{32-33}	the existence and nature of loan covenants between the client and one or more creditors,
x_{26}	the client's total stockholders' equity,
x_{34}	the client's "Retained Earnings" balance.

The last three of these factors, x_{34}, x_{26} and x_{32-33}, each made a marginal contribution to $\bar{R}^2$ of less than .0190. Furthermore, deletion of the three factors (four independent variables) from the analysis reduces $\bar{R}^2$ only slightly to .6182. Therefore, one may seriously question whether these variables' apparent relationship to the percentage of the total number of receivables confirmed by any means is, in fact, more than spurious correlation.

On the other hand, the six most significant factors (thirteen independent variables) in the regression function have the following effect on $\bar{R}^2$ when admitted to that function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_{6-11}	---
x_{29-31}	.0964
x_{25}	.2251
x_{4}	.2616
x_{13}	.3291
x_{42}	.4295

These results would seem to indicate that the factors do bear more than a random relationship to the percentage of the total number of accounts receivable confirmed by any means.

The Percentage of "Accounts Receivable" Dollar Balance Confirmed Positively

The combination of independent variables which maximized $\bar{R}^2$ (.8166) in this case was, in order of decreasing importance:

Variable(s)	Factor Represented
x_{6-10}	the firm which performed the audit,[76]
x_{29-31}	the distribution of the client's ownership,

[76] All firms except Firm G are represented here.

Variable(s)	Factor Represented
x_4	the client's mean accounts receivable dollar balance,
x_{12}	the ratio of the client's "Accounts Receivable" to net sales,
x_{25}	the client's total assets,
x_1	the "timeliness" of accounts receivable confirmation,
x_{43}	the quality of the client's internal control over accounts receivable (auditor's evaluation adjusted for any lack of separation of record-keeping and cash-handling functions),
x_{32-33}	the existence and nature of loan covenants between the client and one or more creditors,
x_{37-38}	the existence and nature of any subsidiary acquisitions effected by the client,
x_{34}	the client's "Retained Earnings" balance,
x_{35}	the client's net ordinary income before taxes,
x_{13}	the ratio of the client's "Accounts Receivable" to total assets,
x_{36}	the client's debt/equity ratio,
x_{39}	an indicator variable for the date of the client's fiscal year end,
x_{23}	the auditor's evaluation of the client's internal control over accounts receivable.

Deletion of x_{23} reduces $\bar{R}^2$ by only .0033. On the other hand, the next two factors in the list, x_{39} and x_{36}, each made seemingly substantial contributions to $\bar{R}^2$ -- .0485 and .0545, respectively. Despite this fact, however, deletion of x_{23}, x_{39}, x_{36}, x_{13}, x_{35}, x_{34}, x_{37-38}, x_{32-33}, x_{43} and x_1 (twelve independent variables) only reduces $\bar{R}^2$ to .5827. Therefore, one may not rule out the possibility that any apparent relationship between these factors and the percentage of "Accounts Receivable" dollar balance confirmed positively is merely spurious correlation.

On the other hand, the six most significant factors (twelve independent variables) in the regression function have the following effect on $\bar{R}^2$ when admitted to that function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_{6-10}	---
x_{29-31}	---
x_4	.1370
x_{12}	.3433
x_{25}	.5827
x_1	.5928

These results would seem to indicate that at least the first five factors do bear more than a random relationship to the percentage of "Accounts Receivable" dollar balance confirmed positively.

The Percentage of "Accounts Receivable" Dollar Balance Confirmed by Any Means

The combination of independent variables which maximized $\bar{R}^2$ (.3906) for this dependent variable was, in order of decreasing importance:

Variable(s)	Factor Represented
x_{27-28}	the nature of the client's operations,
x_{29-31}	the distribution of the client's ownership,
x_{26}	the client's total stockholders' equity,
x_{12}	the ratio of the client's "Accounts Receivable" to net sales,
x_{34}	the client's "Retained Earnings" balance,
x_{6-10}	the firm which performed the audit,[77]
x_{24}	the auditor's evaluation of the client's internal check over accounts receivable,
x_{35}	the client's net ordinary income before taxes,
x_{25}	the client's total assets,
x_{13}	the ratio of the client's "Accounts Receivable" to total assets,
x_{37-38}	the existence and nature of any subsidiary acquisitions effected by the client,
x_{32-33}	the existence and nature of loan covenants between the client and one or more creditors.

[77] As in the previous case, all firms except Firm G are represented here.

Deletion of the last eight of these factors (fourteen independent variables) reduces $\bar{R}^2$ only slightly to .3642. Therefore, one cannot rule out the possibility that any apparent relationship between these factors and the percentage of "Accounts Receivable" dollar balance confirmed by any means is merely spurious correlation.

On the other hand, the remaining four factors (seven independent variables) have the following effect on $\bar{R}^2$ when admitted to the regression function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_{27-28}	---
x_{29-31}	.0874
x_{26}	.2530
x_{12}	.3642

These results would seem to indicate that the factors do bear more than a random relationship to the percentage of "Accounts Receivable" dollar balance confirmed by any means.

The Smallest Dollar Balance Receivable (Less than Ninety Days Old) Considered for Positive Confirmation in a Given Audit

In this case, regression analysis failed to identify any combination of more than one independent variable which was sufficiently associated with the dependent variable to yield an $\bar{R}^2$ greater than zero. A single independent variable, x_{25} (the client's total assets) maximized the adjusted coefficient of determination at only .0204. These results would seem to indicate that none of the factors

considered in this study bear any significant linear relationship to the smallest dollar balance receivable considered for positive confirmation in a given audit.

The Smallest Dollar Balance Receivable (Less than Ninety Days Old) Considered for Confirmation by Any Means in a Given Audit

The combination of independent variables which maximized $\bar{R}^2$ (.3727) for this dependent variable was, in order of decreasing importance:

Variable(s)	Factor Represented
x_5	the client's net sales,
x_{45}	the time at which confirmation was performed,
x_{43}	the quality of the client's internal control over accounts receivable (auditor's evaluation adjusted for any lack of separation of record-keeping and cash-handling functions),
x_4	the client's mean accounts receivable dollar balance,
x_2	the dollar balance of the client's gross accounts receivable,
x_{26}	the client's total stockholders' equity,
x_{12}	the ratio of the client's "Accounts Receivable" to net sales.

The last two of these factors, x_{12} and x_{26} each made a marginal contribution to $\bar{R}^2$ of less than .0205. Furthermore, deletion of these

factors (two independent variables) only reduces $\bar{R}^2$ to .3467. Therefore, one may reasonably question whether the variables' apparent relationship to the smallest dollar balance receivable considered for confirmation by any means in a given audit is, in fact, more than spurious correlation.

On the other hand, the five most significant factors (five independent variables) in the regression function have the following effect on $\bar{R}^2$ when admitted to that function in order of decreasing importance:

Factor Admitted	Resulting $\bar{R}^2$
x_5	.0681
x_{45}	.0927
x_{43}	.1587
x_4	.2329
x_2	.3467

These results would seem to indicate that the five above factors bear more than a random relationship to the percentage of the total number of accounts receivable confirmed by any means.

Summary and Conclusions: Sample Size of Audit Tests in the Areas of Sales and Accounts Receivable

Tables 9 and 10 summarize the results of the foregoing analysis. These tables both indicate that, in every case but one (the smallest dollar balance receivable considered for positive confirmation), some combination of independent variables appeared to bear more than a random relationship to the relevant operational definition of the

Table 9.--Summarized results (A) of the study of factors which affect the sample size of audit tests in the areas of sales and accounts receivable

Extent of Testing as Measured By:	Factors which Maximized $\bar{R}^2$	Apparently Significant Factors	Maximum $\bar{R}^2$	$\bar{R}^2$ Considering Only the Apparently Significant Factors
1. Sales Tests of Transactions Sample Size	x_{6-9}, x_{21}, x_{22}, x_{26}, x_{27-28}, x_{29-31}, x_{32-33}, x_{34}, x_{41}, x_{42}	x_{6-11}, x_{22}, x_{27-28}, x_{32-33}	.6711	.4851
2. Percentage of the Total Number of Accounts Receivable Confirmed:				
a. Positively	x_2, x_4, x_{6-11}, x_{13}, x_{24}, x_{26}, x_{27-28}, x_{29-31}, x_{32-33}, x_{36}, x_{39}, x_{43}	x_4, x_{6-11}, x_{13}, x_{26}, x_{29-31}, x_{43}	.6584	.5508

Table 9--Continued

Extent of Testing as Measured By:	Factors which Maximized $\bar{R}^2$	Apparently Significant Factors	Maximum $\bar{R}^2$	$\bar{R}^2$ Considering Only the Apparently Significant Factors
b. By Any Means	x_2, x_4, x_{6-11}, x_{13}, x_{24}, x_{25}, x_{26}, x_{29-31}, x_{32-33}, x_{34}, x_{39}, x_{43}	x_4, x_{6-11}, x_{13}, x_{25}, x_{29-31}, x_{43}	.6458	.4295
3. Percentage of "Accounts Receivable" Dollar Balance Confirmed:				
a. Positively	x_1, x_4, x_{6-10}, x_{12}, x_{13}, x_{23}, x_{25}, x_{29-31}, x_{32-33}, x_{34}, x_{35}, x_{36}, x_{37-38}, x_{39}, x_{43}	x_4, x_{6-10}, x_{12}, x_{25}, x_{29-31}	.8166	.5827

Table 9--Continued

Extent of Testing as Measured By:	Factors which Maximized $\bar{R}^2$	Apparent Significant Factors	Maximum $\bar{R}^2$	$\bar{R}^2$ Considering Only the Apparently Significant Factors
b. By Any Means	x_{6-10}, x_{12}, x_{13}, x_{24}, x_{25}, x_{26}, x_{27-28}, x_{29-31}, x_{32-33}, x_{34}, x_{35}, x_{37-38}	x_{12}, x_{26}, x_{27-28}, x_{29-31}	.3906	.3642
4. Smallest Dollar Balance Receivable Considered for Confirmation:				
a. Positively	x_{25}	---	.0204	---
b. By Any Means	x_2, x_4, x_5, x_{12}, x_{26}, x_{43}, x_{45}	x_2, x_4, x_5, x_{13}, x_{45}	.3727	.3467

Table 10.--Summarized results (B) of the study of factors which affect the sample size of audit tests in the areas of sales and accounts receivable. (X indicates that the factor appears in the regression function which maximized $\bar{R}^2$ for the dependent variable in question.)

Factors	Sales Tests of Transactions Sample Size	Percentage of the Total Number of Accounts Receivable Confirmed: Positively	Percentage of the Total Number of Accounts Receivable Confirmed: By Any Means
x_1			
x_2		X	X
x_3			
x_4		X*	X*
x_5			
x_{6-11}	X*	X*	X*
x_{12}			
x_{13}		X*	X*
x_{14}			
x_{15}			
x_{19}			
x_{20}			
x_{21} or x_{23}	X		
x_{22} or x_{24}	X*	X	X
x_{25}			X*
x_{26}	X	X*	X
x_{27-28}	X*	X	

Table 10--Continued

Factors	Sales Tests of Transactions Sample Size	Percentage of the Total Number of Accounts Receivable Confirmed: Positively	Percentage of the Total Number of Accounts Receivable Confirmed: By Any Means
x_{29-31}	X	X*	X
x_{32-33}	X*	X	X
x_{34}	X		X
x_{35}			
x_{36}		X	
x_{37-38}			
x_{39}		X	X
x_{40}			
x_{41}	X		
x_{42} or x_{43}	X	X*	X*
x_{44} or x_{45}			

*apparently significant factor

Table 10--Continued

Factors	Percentage of "Accounts Receivable" Dollar Balance Confirmed: Positively	Percentage of "Accounts Receivable" Dollar Balance Confirmed: By Any Means	Smallest Dollar Balance Receivable Considered for Confirmation: Positively	Smallest Dollar Balance Receivable Considered for Confirmation: By Any Means
x_1	X			
x_2				X*
x_3				
x_4	X*			X*
x_5				X*
x_{6-11}	X*	X		
x_{12}	X*	X*		X
x_{13}	X	X		
x_{14}				
x_{15}				
x_{19}				
x_{20}				
x_{21} or x_{23}	X			
x_{22} or x_{24}		X		
x_{25}	X*	X	X	
x_{26}		X*		
x_{27-28}		X*		
x_{29-31}	X*	X*		

Table 10--Continued

Factors	Percentage of "Accounts Receivable" Dollar Balance Confirmed: Positively	Percentage of "Accounts Receivable" Dollar Balance Confirmed: By Any Means	Smallest Dollar Balance Receivable Considered for Confirmation: Positively	Smallest Dollar Balance Receivable Considered for Confirmation: By Any Means
x_{32-33}	X	X		
x_{34}	X	X		
x_{35}	X	X		
x_{36}	X			
x_{37-38}	X	X		
x_{39}	X			
x_{40}				
x_{41}				
x_{42} or x_{43}	X			X*
x_{44} or x_{45}				X*

auditor's sample selection decision. One must, however, regard these results as only tentative for two reasons.

First of all, evidence indicates that the sample auditors did not all use the same decision rule to select receivables for confirmation. The two primary approaches taken were:

1. select all accounts in excess of some minimum dollar balance (in which case the dependent variable was the minimum dollar balance), and
2. select sufficient accounts to assure confirmation of a specified percentage of the "Accounts Receivable" dollar balance (in which case the dependent variable was the specified percentage).[78]

Because of the limited number of work-papers available for this study, grouping observations according to the auditor's sample selection rule and performing individual analysis on each of the resulting groups was impossible. Instead, all the observations had to be combined in a single analysis.

The necessary assumption for such an approach is, of course, that the two sample selection rules are essentially equivalent. Since, however, it seems likely that most auditors do have some level of overall coverage in mind when they impose a minimum dollar balance requirement on receivables to be confirmed, this assumption appears

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[78] A third potential approach, not adopted in any of the sample audits is, "Select a 'statistical sample' which assures specified levels of confidence and reliability." In this case, of course, the specified statistical parameters would have been the dependent variables.

reasonable. Nevertheless, to the extent that the two approaches are not equivalent, the reliability of the foregoing analysis is impaired.

The second reason one must regard the results of the above analysis as merely tentative is the fact that, as was the case in the study of factors which affect the selection of audit procedures, the number of potential independent variables was relatively large compared to the number of sample observations -- a situation which invariably amplifies the possibility that spurious correlation may have confounded the analysis.

With these limitations in mind, let us attempt some generalizations about the results of the analysis. Based upon frequency of occurrence in the final regression functions (i.e., the regression functions which maximized $\bar{R}^2$ for the various dependent variables considered), four factors appear to have had the greatest overall association with the extent of audit testing in both the areas of sales and accounts receivable:

1. the firm which performed the audit,
2. the client's size,
3. the quality and comprehensiveness of the client's internal control, and
4. the distribution of the client's ownership.

Although the number of observations precludes more than tentative conclusions, a closer look at the effects of these factors would seem worthwhile.

The Firm which Performed the Audit

As Table 10 reveals, x_{6-11}, the variables which represented this factor, appeared in the final regression function for five of the seven analyses performed, and among the most significant factors four times. With respect to the behavior of specific firms, the sample data indicates the following:

1. with regard to sales tests of transactions, Firms B, C and E tended to draw larger samples (thirty or more observations in sixteen of twenty-one audits for which data was available) than did Firms A and D (fifteen or fewer observations in ten of eleven observations for which data was available),[79]
2. with regard to accounts receivable, Firms A, B, C and E all tended to confirm more extensively than Firm D. Of the firms with the greatest coverage, however, while all performed substantial positive confirmation, Firms A and E relied somewhat more heavily on negative confirmation than did B and C. On the other hand, Firm D's coverage although not as extensive as that of the other four firms was primarily positive.

The Client's Size

Two measures of this factor which correlated highly with one another ($r = .906$) were included among the study's independent variables -- x_{25}, the client's total assets, and x_{26}, the client's total

[79]Insufficient information was available to permit any generalization about Firms F and G.

stockholders' equity. As Table 10 indicates, at least one of these factors appeared in the final regression function for each of the seven analyses performed. Furthermore, one or the other appeared among the most significant variables four times.

In general, correlation coefficients associating these factors with the several independent variables examined indicate that:

1. the size of the auditor's test of transaction samples tended to vary directly with the client's size,
2. the total number of receivable confirmations sent also tended to vary directly with the client's size, however, the percentage of receivable coverage, both positive and overall tended to decline as the size of the client increased.

The Quality and Comprehensiveness of the Client's Internal Control

Two indicators of this factor were included among the study's independent variables, x_{22} (x_{24}), the auditor's evaluation of his client's internal control system with regard to sales (accounts receivable) and x_{42} (x_{43}), this evaluation adjusted for the degree of separation of cash-handling and record-keeping functions within that system. In both the case of sales and of accounts receivable, the two indicators correlated moderately ($r = .484$ and $.511$, respectively).

As Table 10 indicates, at least one of these indicators appeared in the final regression function for six of the seven analyses performed, and at least one appeared among the most significant factors four times. Correlation coefficients associating these factors with the several independent variables examined indicate that both the size

of the auditor's test of transactions sample and the extent of accounts receivable confirmation coverage (positive and overall) tended to vary inversely with the quality and comprehensiveness of the client's internal control.

The Distribution of the Client's Ownership

As Table 10 discloses, x_{29-31}, the variables which represented this factor, appeared in the final regression function for five of the seven analyses performed, and among the most significant factors four times. A priori, one would expect the extent of the auditor's testing to increase as his client's ownership becomes more widespread. The actual effect of this factor in the sample audits, however, is not entirely clear. Nevertheless, evidence seems to indicate that:

1. with regard to sales tests of transactions, the sample auditors tended to increase the number of observations if the client was listed on the New York Stock Exchange, but did not apparently test publicly-held clients whose shares were traded over-the-counter any more extensively than privately-held clients,[80]
2. with regard to the confirmation of accounts receivable, the sample auditors tended to increase both their total and positive coverage if the client was publicly rather than privately held.

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[80]Data was insufficient to permit any generalizations concerning clients whose shares were traded on the American Stock Exchange.

In addition to the four above factors, two more which had an observable association with the extent of testing in the area of accounts receivable were:

1. the mean accounts receivable dollar balance, and
2. the relative materiality of "Accounts Receivable."

The Mean Accounts Receivable Dollar Balance

As Table 10 reveals, x_4, the independent variable which represented this factor, appeared in the final regression function for four of the six analyses related to the extent of accounts receivable confirmation. Furthermore, in each case, this variable was among the most significant.

In general, the sample evidence seems to indicate that the smallest dollar balance receivable considered for confirmation (both positive and by any means) and the percentage of receivable coverage (both positive and total) all tended to vary directly with the mean receivable dollar balance.

The Relative Materiality of "Accounts Receivable"

Two measures of this factor which correlated highly with one another ($r = .804$) were included among the study's independent variables -- x_{12}, the ratio of the client's "Accounts Receivable" to net sales, and x_{13}, the ratio of the client's "Accounts Receivable" to total assets. As Table 10 indicates, at least one of these factors appeared in the final regression function for five of the six analyses

related to the extent of accounts receivable confirmation. Furthermore, one or the other appeared among the most significant factors four times.

In general, the sample evidence tends to indicate that, as the relative materiality of "Accounts Receivable" increased, the percentage confirmed, both positive and total, tended to decrease. While this result may indicate that the sample auditors had a different measure of the factor than the ones adopted in this study, it probably merely indicates that absolute rather than relative materiality was the important consideration in their conscious decision process, and that the decision process inadvertently led to less extensive confirmation.

Summary and Conclusions: An Empirical Study of the Relative Influence of Factors which Affect Audit Evidence Accumulation

This chapter has concerned itself with an empirical study of the relative influence of a number of factors logically capable of affecting audit evidence accumulation. The study, based on sample data extracted from the work-papers for fifty-three clients of seven public accounting firms, consisted of three sections:

1. a study of factors which affected the selection of audit procedures in the areas of sales and accounts receivable,
2. a study of factors which affected the timing of audit tests in the areas of sales and accounts receivable, and
3. a study of factors which affected the sample size of audit tests in the areas of sales and accounts receivable.

Although the specific techniques of analysis differed for each part, the basic approach was the same:

1. enumerate the factors (identified in Chapters I-V) relevant to auditor decisions concerning the parameter in question, and
2. determine which of these factors, if any, seemed to explain the sample auditors' decisions with respect to that parameter.

Factors which Affected the Selection of Audit Procedures

Results of this study indicate that, for the clients observed, Generally Accepted Auditing Standards and individual firm policy were the primary determinants of test selection in the area of sales. Additionally, the results suggested that client internal check and internal control may have had some influence in this case.

With respect to accounts receivable, on the other hand, the primary determinant of test selection appears to have been Generally Accepted Auditing Standards. Additionally, evidence suggests that four factors largely influenced whether a given receivable would be confirmed positively, negatively, or not at all. These factors were the size of the receivable relative to others in the trial balance, the age of the receivable, the total number of receivables in the trial balance and the firm performing the audit.

Factors which Affected the Timing of Audit Tests

Results of this study indicate that, for the clients observed, quality of client internal control and date of client year-end were the primary determinants of the timing of audit tests in both the areas of sales and accounts receivable.

Factors which Affected the Sample Size of Audit Tests

Results of this study suggest that, for the clients observed, the firm performing the audit, the client's size, the quality and comprehensiveness of the client's internal control and the distribution of the client's ownership had the greatest association with the auditors' sample size decisions in both the areas of sales and accounts receivable. Additionally, evidence indicates that the mean receivable dollar balance affected the auditors' decision with respect to the smallest dollar balance receivable considered for confirmation (both positive and by any means) and the percentage of receivable coverage (both positive and total).

The foregoing study has been intended as a descriptive examination of auditor behavior. More specifically, the study's objective has been to determine whether or not audit work-papers representative of "good" current practice appear to reflect any relationship between the composition of the auditor's evidential collection (the dependent variable) and those factors identified in Chapters I-V (the independent variables) which:

1. define evidential support functions,
2. determine minimum evidential support requirements,
3. affect the auditor's risk of sanctions, or
4. constrain the auditor's choice of evidential collection.

Certainly, one can point to procedural weaknesses in the study. The sample data was random neither with respect to the participating firms nor the clients selected. The number of independent variables was relatively large compared to the number of sample observations. The method of operationalizing certain of the variables, both independent and dependent, is open to question. The method of reducing the study of factors which affected procedure selection to manageable proportions is likewise open to question. For these reasons, one should not regard the results reported above as more than tentative. Nevertheless, if only because of some methodology suggested, some questions raised, and, perhaps most importantly, the knowledge that public accounting firms were, in fact, willing to provide data for such a study, this researcher considers the inquiry to have been worthwhile.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

The purpose of this dissertation has been to study the auditor's decision process with regard to questions of evidence accumulation. Effectively, the study consisted of three sections. First, Chapters I and II suggested a programming framework for audit evidence accumulation decisions. Then, Chapters III-V discussed, in detail, certain individual factors indicated by the framework as relevant to such decisions. Finally, Chapter VI attempted to evaluate empirically the relative influence of a number of those factors in actual audit situations.

A Programming Framework for Audit Evidence Accumulation Decisions

Chapter I outlined the following programming framework for audit evidence accumulation decisions:

> Given a number of alternative evidential collections relevant to a particular audit, the auditor should select that collection, E_k, which maximizes:
>
> $$U^{+}(R(E_k)) + U^{-}(C(E_k)) + E[U^{-}(S(E_k))]$$

subject to the constraints:

$$B(E_k) \geq B_{min}$$

$$T(E_k) \leq T_{max}$$

$$SR(E_k) \leq SR_{max}$$

where:

$U^{+}(R(E_k))$ is the utility of the audit fee associated with evidential collection E_k,

$U^{-}(C(E_k))$ is the disutility of the cost of obtaining evidential collection E_k,

$E[U^{-}(S(E_k))]$ is the expected disutility of sanctions associated with evidential collection E_k,

$B(E_k)$ is the degree of support provided by evidential collection E_k,

B_{min} is the minimum evidential support necessary to justify a professional opinion on a given set of financial statements,

$T(E_k)$ is the time required to accumulate evidential collection E_k,

T_{max} is the maximum time available to the auditor for gathering evidence on a given audit engagement,

$SR(E_k)$ denotes the audit staff required to accumulate evidential collection E_k, and

SR_{max} denotes the staff available for a given audit engagement.

This framework is a useful context in which to identify and study factors relevant to audit evidence accumulation decisions since, corresponding to each of the nine parameters which comprise it, is a category of factors relevant to such decisions. Unfortunately, the construct is of little further use. For this reason, Chapter II modified it in such a manner as to make it compatible with, and capable of practical application in, the following framework for audit judgment formation:

1. identify all the material propositions contained in the set of financial statements under examination,
2. for each proposition:
   a. determine the degree of evidential support required to justify an opinion on the proposition,
   b. select the kind(s) and estimate the quantity(ies) of evidential matter necessary to provide the required degree of evidential support,
   c. design the audit step(s) necessary to yield the desired kind(s) and quantity(ies) of evidence,
   d. apply the step(s) and amass a collection of evidential matter, and
   e. evaluate the collection of evidence (If the evidence provides sufficient justification, render an opinion on the proposition. If not, either gather more evidence or disclaim an opinion on that proposition), and

3. based upon the results of the individual proposition evaluations, render (or disclaim) an opinion on the financial statements as a whole.

Essentially, two modifications of the original model were necessary to achieve this goal:

1. replacement of the overall evidential support constraint:

$$B(E_k) \geq B_{min}$$

with the set of constraints:

$$b_a(E_k) \geq b_{amin}, \quad (a = 1, 2, \ldots, r)$$

or their equivalent:

$$p(F|M_a \cap E_k) \leq p_{amax}, \quad (a = 1, 2, \ldots, r)$$

where: $b_a(E_k)$ is the degree of support provided by evidential collection E_k for the auditor's opinion on the a^{th} assertion of his client's financial statements,

b_{amin} is the minimum evidential support necessary for a professional opinion on that a^{th} assertion,

$p(F|M_a \cap E_k)$ is the probability that the auditor will fail to detect material error which exists in the a^{th} assertion of his client's records given that he selects evidential collection E_k,

p_{amax} is the maximum allowable probability that the auditor will fail to discover material error which exists in the a^{th} assertion of the client's statements,

$b_a(E_k)$ and $p(F|M_a \cap E_k)$ are determined by the same factors which determine $B(E_k)$ in the original model, and

b_{amin} and p_{amax} are determined by the same factors which determine B_{min} in the original model,

2. replacement of the original objective function:

$$\text{Maximize } U^+(R(E_k)) + U^-(C(E_k)) + E[U^-(S(E_k))]$$

with the objective function:

$$\text{Minimize } C(E_k)$$

and the set of constraints:

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r)$$

or their equivalent:

$$b_a(E_k) \geq b_{aminrisk} \qquad (a = 1, 2, \ldots, r)$$

where: $p(F|M_a \cap E_k)$ and $b_a(E_k)$ are defined as above,

$p_{amaxrisk}$ represents, to the auditor, the maximum acceptable probability (based upon his evaluation of the expected disutility of sanctions) that he will

fail to detect a material error existing in the a^{th} assertion of his client's financial statements, and

$b_{aminrisk}$ represents, to the auditor, the minimum evidential support necessary for an opinion on the a^{th} assertion of his client's financial statements (based upon his evaluation of the expected disutility of sanctions).

These modifications resulted in the following general framework for audit evidence accumulation decisions:

Develop the audit program in such a manner as to:

Minimize $C(E_k)$

subject to: $b_a(E_k) \geq b_{amin} \qquad (a = 1, 2, \ldots, r)$

or

$$p(F|M_a \cap E_k) \leq p_{amax} \qquad (a = 1, 2, \ldots, r)$$

$$T(E_k) \leq T_{max}$$

$$SR(E_k) \leq SR_{max}$$

$$b_a(E_k) \geq b_{aminrisk} \qquad (a = 1, 2, \ldots, r)$$

or

$$p(F|M_a \cap E_k) \leq p_{amaxrisk} \qquad (a = 1, 2, \ldots, r).$$

Some Factors Relevant to Audit Evidence Accumulation Decisions

Analysis of each of the parameters comprising the framework presented above indicated three categories of audit variables particularly

worthy of further study. Accordingly, the second section of this dissertation was devoted to a discussion of:

1. factors which define the evidential support function for a given type of audit evidence obtained at a given time (Chapter III),
2. factors which determine the minimum evidential support necessary to justify a professional opinion on a given financial statement assertion (Chapter IV), and
3. factors which influence the probability that the auditor will incur sanctions for failing to detect a material error given that such error exists in his client's records (Chapter V).

The primary focus of the discussion was on the factors' expected effects on the three parameters of the auditor's evidential collection:

1. the type(s) of evidence included,
2. the time(s) of collection of each type, and
3. the number of units of each type collected at a given time.

Factors which Define the Evidential Support Function for a Given Type of Audit Evidence Obtained at a Given Time

Chapter III identified the following factors as belonging to this category:

1. the relevance of the specific type of evidential matter to the audit engagement,
2. the reliability of the specific type of evidential matter, itself a function of:

a. the conclusiveness of the given type of evidence, and

b. the possibility of misinterpreting evidence of this nature,

3. the "timeliness" of the evidential matter, itself a function of:

a. the time at which the evidence is obtained, and

b. the quality and comprehensiveness of the client's internal controls,

4. the statistical parameters of the population underlying the assertion which the auditor wishes to evaluate, e.g.:

a. size,

b. variance,

c. rate of error, and

5. the existence of corroborative evidence.

In summary, Chapter III concluded the following with regard to the expected influence of these factors on the auditor's evidential collection:

1. factors capable of affecting the type parameter:

a. directly:

(1) relevance of evidential matter,

(2) reliability of evidential matter,

(3) existence of corroborative evidence,

b. indirectly, or in a limited manner:

(1) "timeliness" of evidential matter,

(2) statistical parameters of the underlying population.

2. factors capable of affecting the timing parameter:
   a. directly: "timeliness" of evidential matter,
   b. indirectly; or in a limited manner:
      (1) reliability of evidential matter,
      (2) statistical parameters of the underlying population,
      (3) existence of corroborative evidence.
3. factors capable of affecting the extent (sample size) parameter:
   a. directly:
      (1) statistical parameters of the underlying population,
      (2) existence of corroborative evidence,
   b. indirectly, or in a limited manner:
      (1) reliability of evidential matter,
      (2) "timeliness" of evidential matter.

Factors which Determine the Minimum Evidential Support Necessary to Justify a Professional Opinion of a Given Financial Statement Assertion

Chapter IV identified the following factors as belonging to this category:

1. Generally Accepted Auditing Standards and other authoritative pronouncements of the AICPA,
2. authoritative pronouncements of the SEC,
3. commission requirements for regulated industries,
4. policies of individual public accounting firms,

5. specific terms of the auditor's contract with his client,
6. materiality considerations,
7. the auditor's evaluation of the probability that a given financial statement assertion is materially misstated, based upon:
    a. the auditor's findings during his review of the client's internal control system, and
    b. the auditor's findings in actual tests of the client's records.

In summary, Chapter IV concluded the following with regard to the expected influence of these factors on the auditor's evidential collection:

1. factors capable of affecting the type parameter:
    a. directly:
        (1) Generally Accepted Auditing Standards,
        (2) SEC pronouncements,
        (3) regulatory commission requirements,
        (4) individual CPA firm policies,
        (5) materiality considerations,
        (6) auditor evaluation of the probability that a given financial statement assertion is materially misstated.
    b. indirectly, or in a limited manner: auditor-client contract terms,
2. factors capable of affecting the timing parameter:

a. directly: auditor evaluation of the probability that a given financial statement assertion is materially misstated,

b. indirectly, or in a limited manner:

(1) individual CPA firm policies,

(2) auditor-client contract terms,

(3) materiality considerations,

3. factors capable of affecting the extent parameter:

a. directly:

(1) materiality considerations,

(2) auditor evaluation of the probability that a given financial statement assertion is materially misstated,

b. indirectly, or in a limited manner:

(1) individual CPA firm policies,

(2) auditor-client contract terms.

Factors which Influence the Probability that the Auditor Will Incur Sanctions for Failing to Detect a Material Error Given that Such Error Exists in His Client's Records

Chapter V identified the following factors as belonging to this category:

1. nature of the specific errors involved,

2. the degree of exposure the client's statements receive, indicated by:

a. the client's size,

b. the nature of the client's operations,

c. the distribution of the client's ownership, and

d. loan covenants which require the client to maintain specified account balances or ratios,

3. the probability that the client will file bankruptcy subsequent to the audit, indicated by:

a. factors which affect or indicate the degree and types of financial crisis the client can withstand, e.g.:

(1) factors which indicate the client's financial position ("Retained Earnings" balance, liquidity situation, etc.),

(2) economic conditions related to the availability of external capital,

(3) the client's rate and method of growth, and

b. factors which affect or indicate the probability that the client will face a financial crisis which exceeds its capabilities, e.g.:

(1) the nature of the client's operations,

(2) economic conditions relevant to the client's marketplace,

(3) the client's method of financing operations.

In summary, Chapter V concluded the following with regard to the expected influence of these factors on the auditor's evidential collection:

1. factors capable of affecting the <u>type</u> parameter:

a. directly: nature of the specific error involved,

b. indirectly, or in a limited manner:

(1) degree of exposure the client's statements receive,

(2) probability that the client will file bankruptcy subsequent to the audit,

2. factors capable of affecting the timing parameter:

   a. directly: none,

   b. indirectly, or in a limited manner:

      (1) nature of the specific error involved,

      (2) degree of exposure the client's statements receive,

      (3) probability that the client will file bankruptcy subsequent to the audit,

3. factors capable of affecting the extent parameter:

   a. directly: none,

   b. indirectly, or in a limited manner:

      (1) nature of the specific error involved,

      (2) degree of exposure the client's statements receive,

      (3) probability that the client will file bankruptcy subsequent to the audit.

While a number of authors have discussed factors which influence or should influence the auditor's accumulation of evidence, no one has previously attempted to relate these "variables of the audit" to audit programs in some sort of functional manner. This part of the dissertation has been a first step in that direction -- but only a first step. The models developed are of a general, abstract nature, clearly not

sufficiently specific to operate as audit program "generators." The value of the models lies in the fact that they have identified and placed in perspective numerous factors which should affect the auditor's work and have suggested a logical framework for his decision process in questions of evidence accumulation.

An Empirical Study of the Relative Influence of Factors which Affect Audit Evidence Accumulation

The final section of this dissertation reports an empirical study of the relative influence of factors identified in the previous section on actual audit evidence accumulation decisions. This research effort's objective was to determine whether or not a sample of audit work-papers would reflect any relationship between the composition of the auditor's evidential collection (the dependent variable) and those factors identified in Chapters I-V (the independent variables) which:

1. define evidential support functions,
2. determine minimum evidential support requirements,
3. affect the auditor's risk of sanctions, or
4. constrain the auditor's choice of evidential collection.

To accomplish this objective, the study, based on sample data extracted from the work-papers for fifty-three clients of seven public accounting firms, consisted of three sections:

1. a study of factors which affected the selection of audit procedures in the areas of sales and accounts receivable,
2. a study of factors which affected the timing of audit tests in the areas of sales and accounts receivable, and

3. a study of factors which affected the sample size of audit tests in the areas of sales and accounts receivable.

Because the study faced such obstacles as data confidentiality, firm conservatism, and the limited resources of a one-man inquiry, certain procedural weaknesses were inadvertent. Thus, the sample data was random neither with respect to the participating firms nor the clients selected and the number of independent variables was relatively large compared to the number of sample observations. Furthermore, the methods of operationalizing certain of the variables (dependent and independent), and of reducing to manageable proportions the study of factors which affected procedure selection are both open to question. For these reasons, one must regard the results reported below as merely tentative and should exercise great caution and skepticism in attempting to draw any conclusions from them about the general state of the art in public accounting.

Factors which Affected the Selection of Audit Procedures

In this study, multiple discriminant analysis indicated that, for the clients observed, Generally Accepted Auditing Standards and individual firm policy were the primary determinants of test selection in the area of sales. Furthermore, with the possible exception of client internal check and internal control, none of the other independent variables selected for this particular study seemed to have any significant effect on the sample auditors' decisions.

With respect to accounts receivable, on the other hand, the primary determinant of test selection appeared to be Generally Accepted

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Auditing Standards (evidenced by the lack of "optional" procedures in this area). Additionally, however, the evidence suggested that four factors largely influenced whether a given receivable would be confirmed positively, negatively, or not at all. These factors were the size of the receivable relative to others in the trial balance, the age of the receivable, the total number of receivables in the trial balance and the firm performing the audit.

In a number of respects, the above results corroborate Arens' findings in an earlier study based on the work-papers for "twenty-eight audit clients of five different CPA firms."[1] Reporting the results of that study, Arens wrote:

> It was clear from a review of the working papers that there was a concept of a minimum program for every audit in the study. This was demonstrated by the fact that some procedures were performed for every audit reviewed. . . . In addition, there were other procedures for each audit area which were performed for a large portion of the clients.[2]

He further noted, however, that:

> . . . there were substantial differences in the procedures used by different CPA firms . . . an indication that the different CPA firms have different concepts about which procedures are required for an audit . . . [and] that each of the CPA firms in the study has some notion of what a minimum audit program should be . . .[3]

Finally, although he found that, "in a small number of cases the internal control system appeared to influence the selection of audit

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[1]Alvin A. Arens. "The Adequacy of Audit Evidence Accumulation in Public Accounting" (Doctoral Thesis, School of Business Administration, The University of Minnesota, 1970), p. 260.

[2]Ibid., p. 261.

[3]Ibid., p. 262.

procedures,"[4] and "materiality had an occasional influence,"[5] he concluded that, in general, the "variables of the audit" did not "have a significant effect on the audit procedures selected for the audit clients in this study."[6]

Although all of the above findings agree with the present study, some disagreement exists with regard to the type of accounts receivable confirmation selected and the follow-up on non-returned positive confirmations. According to Arens, in his study:

> The results indicated that the type of confirmation and the follow-up on non-returned positive confirmations by second requests and alternative procedures was dependent more upon the CPA firms than upon any of the variables of the audit, but the composition of the population did have some effect on the type of confirmation used.[7]

In the present study, on the other hand, evidence indicated that, although firm policy and population composition continued as the two primary factors determining the nature of receivable confirmation, population characteristics appeared somewhat more important. The evidence further indicated that all the firms in the present study performed extensive follow-up procedures on returned as well as unreturned positive confirmations.

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[4] Ibid., p. 263.

[5] Ibid., p. 264.

[6] Ibid., p. 263.

[7] Ibid.

[8] The fact that Arens' study was performed prior to the issuance of SAP No. 43 (which made follow-up procedures mandatory whenever the auditor has unreturned receivables confirmations), while this study is based on audits subsequent to that pronouncement probably explains this latter difference in findings.

Factors which Affected the Timing of Audit Tests

Three factors appeared, a priori, likely to have the greatest influence on auditor decisions concerning the timing parameter of his evidential accumulation:

1. the quality and comprehensiveness of the client's internal control,
2. time constraints, and
3. staff constraints.

Since time constraints, generally only occurring in the audits of large publicly-held clients, were effectively controlled out of the analysis, the study hypothesized the following general model to explain the sample auditor's timing decisions with regard to sales tests of transactions and accounts receivable confirmation:

1. If the client's internal control is inadequate, either due to a lack of separation of cash-handling and record-keeping functions, or for some other reason, schedule the appropriate test(s) at or after the client's year-end regardless of when that year-end occurs.
2. If the client's internal control is adequate:
    a. if the client's fiscal year does not end during the busy season (operationally defined as December-February), schedule the appropriate tests at or after the client's year-end,
    b. if the client's fiscal year ends during the busy season, schedule the appropriate test(s) at an interim date.

In both cases, this hypothesized model predicted the sample auditors' timing decision significantly better than chance.

Factors which Affected the Sample Size of Audit Tests

In this study, multiple linear regression indicated that, for the clients observed, the firm performing the audit, the client's size, the quality of the client's internal control and the distribution of the client's ownership had the greatest association with the auditor's sample size decisions in both the areas of sales and accounts receivable. Additionally, evidence indicated that the mean receivable dollar balance affected the auditor's decision with respect to the smallest dollar balance receivable considered for confirmation (both positive and by any means) and the percentage of receivable coverage (both positive and total).

To some extent, these results corroborate the following conclusions of Arens' earlier study:

> . . . the extent of the sample in accounts receivable depended primarily upon the population size and the CPA performing the audit although the composition of accounts receivable did have some effect. The other variables of auditing had no perceptible effect upon the sample size in confirmation.[9]

The present results, however, do indicate the influence of several factors apparently not manifested in Arens' data.

Conclusions

The normative framework for audit evidence accumulation decisions developed in the first two chapters of this dissertation and summarized

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[9] Ibid., pp. 263-264.

above is mathematical in format -- implying that the ideal approach to such decisions would be quantitative. Unfortunately, few factors relevant to audit evidence accumulation lend themselves to meaningful quantification. Furthermore, the functions relating such factors to appropriate parameters in the decision framework are not apt to be well defined. These practical limitations, however, do not negate the validity of the framework, itself. That the auditor may not be able to quantify: (1) professional requirements, (2) the risk of sanctions, (3) evidential support functions, or (4) time, staff and cost considerations does not imply that he ought to ignore them.

Whether or not the auditor does, by and large, ignore such considerations is an empirical question. For purposes of discussing this study's findings on the matter, it is useful to classify factors relevant to audit evidence accumulation decisions into two categories: (1) constants of the audit (factors which do not vary from client to client, e.g., Generally Accepted Auditing Standards, firm policies, and, perhaps available staff), and (2) variables of the audit (conditions which depend to some extent on the particular client involved, e.g., the relative materiality of various statement items, quality and comprehensiveness of the client's internal controls, factors which affect or indicate the auditor's risk of sanctions, etc.).

Both the present study and Arens' earlier work identify certain procedures performed during all or almost all of the observed audits.[10] These findings tend to support a hypothesis that the factors classified as constants of the audit do affect evidence accumulation decisions to

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[10]Supra, pp. 195, 247-48.

the extent that they define a minimum set of procedures for all engagements. On the other hand, in both studies, individual firm policy appears to have been a significantly greater cause of differences in procedure selection and sample size determination than any of the other factors considered. This finding suggests, as Arens has noted,[11] that CPA firms do not entirely agree as to which procedures belong in their minimum set, and further implies that audit evidence accumulation decisions are relatively insensitive to most factors which fall into the category of variables of the audit.

At least two explanations are consistent with both this latter conclusion and the normative decision framework discussed above. The first is simply that, in general, the practicing public accountant perceives costs of evaluating and incorporating variables of the audit into his evidence accumulation decisions greater than costs of over- or underauditing which may result from ignoring such variables in favor of a standard audit program.

Perhaps a more satisfying explanation, however, is that the auditor does consider at least some of the variables, such as materiality, quality of internal control, client liquidity, leverage, etc., but treats them as dichotomies rather than continuous variables. In other words, he evaluates a statement item as either material or immaterial, client internal control as either adequate or inadequate, client liquidity and leverage as either tolerable or intolerable, etc., but makes little or no attempt to measure relative differences beyond these dichotomies.

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[11] Arens, pp. 262, 263.

If public accountants treat variables of the audit as dichotomies, they are apt to perceive less difference among clients (especially of similar size and nature of operations) and, as a result, their audit programs are apt to exhibit less variation than if they evaluated such factors along a continuum. In this case the relatively small and perhaps homogeneous[12] samples, as well as the somewhat unsophisticated analytical techniques employed, may have denied both the present study and that of Arens sufficient sensitivity to detect such relationships between audit variables and evidence accumulation decisions as may have actually existed.

Suggestions for Further Research

As is generally the case where human behavior is involved, two avenues exist along which one might conduct research in the area of audit evidence accumulation-descriptive study and normative study.

The purpose of descriptive research is simply to explain or describe actual behavior. In the area of audit evidence accumulation, appropriate objectives for this type of study would appear to include:

1. identifying the manner in which public accountants subdivide an audit (into audit areas, specific financial statement assertions, etc.) for the purpose of determining evidence requirements, and identifying the specific set of financial statement assertions they attempt to evaluate,

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[12]Homogeneous in the sense that the sample auditors may not have perceived the differences in variables of the audit as significant from observation to observation.

2. identifying the factors which public accountants consider when constructing an audit program (i.e., the independent variables in their evidence accumulation decision model), and
3. identifying these factors' relative influence and specific effects on audit program development (i.e., the functions in the auditor's evidence accumulation model).

In contrast to the purpose of descriptive research, the function of normative research is to identify or define an ideal. Appropriate objectives for this type of study in the area of audit evidence accumulation would appear to include:

1. identifying the optimal manner (from a cost-benefit standpoint) of subdividing an audit (into audit areas, financial statement assertions, etc.) for the purpose of determining evidence requirements,
2. identifying all the assertions generally contained in a set of financial statements,
3. identifying all factors relevant to audit evidence accumulation decisions,
4. identifying the relative influence and specific effects such factors should have on audit evidence accumulation, which, in turn, requires:
    a. development of methods for measuring such factors as well as guidelines for relating them to evidence accumulation decisions,
    b. determination of the costs and benefits of measuring such factors with varying degrees of precision and of

incorporating them into audit evidence accumulation decisions, and

c. a study of the sanctions an auditor may receive for failing to detect material error which exists in his client's statements, factors which may indicate the auditor's risk of incurring such sanctions, and the cost of sanctions if incurred,

5. defining more precisely the relationship between evidential matter and evidential support, and
6. defining a "minimum" set of audit procedures to be performed for all engagements where the relevant financial statement assertion is material -- regardless of the status of other audit variables.

Generally speaking, research in the area of audit evidence accumulation has been scarce. On the descriptive side, both the present study and that of Arens have attempted to identify factors which public accountants consider when constructing an audit program, as well as the relative influence and specific effect of such factors. On the normative side, these same two studies have also attempted to identify the factors relevant to audit evidence accumulation decisions and the relative influence and specific effect such factors should have. Anderson, Giese and Booker have also identified a number of factors relevant to evidence accumulation decisions.[13] Along somewhat different lines, for selected audit areas, Arens has provided a comprehensive list of

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[13]H. M. Anderson, J. W. Giese, and Jan Booker, "Some Propositions about Auditing," The Accounting Review 45 (July 1970): 524-31.

financial statement assertions (as well as the audit procedures relevant to their evaluation), and, for some areas, has even gone so far as to suggest "minimum" procedures. Finally, a number of authors have discoursed on the relationship between evidential matter and evidential support.[14]

Undoubtedly, there have been other studies in the area of audit evidence accumulation. No research effort, however, appears to have been of sufficient scope and depth to rank as definitive. Thus, for someone interested in this area, considerable opportunity would appear to exist for both original and worthwhile research into any or all of the topics mentioned above.

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[14]Cf. Arens, pp. 106-22; R. K. Mautz, "The Nature and Reliability of Audit Evidence," The Journal of Accountancy 105 (May 1958): 40-47; Howard F. Stettler, "Auditing Standards and Competence of Evidential Matter," The Accounting Review 29 (January 1954): 121-26; Floyd W. Windal, "Standards of Reliability for Audit Evidence," The New York Certified Public Accountant 31 (June 1961): 394-400.

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