

The Influence of Auditor and Client Characteristics On Auditor Use of Analytical Procedures

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Abstract

This study examines the effect of certain characteristics of the audit situation and the auditor upon the extent and effectiveness of analytical procedures. Results indicate that characteristics of the auditor (including the auditor's knowledge of the client and the client's industry, the auditor's knowledge of analytical procedures, and the auditor's perception of such techniques) are instrumental in the decision to use and rely upon analytical procedures.

Introduction

In recent years, a great deal of attention has been focused on the use of analytical procedures as an audit technique. As described in SAS 56 [AICPA, 1988], analytical procedures consist of "evaluations of financial information made by a study of plausible relationships among both financial and nonfinancial data". Such a description encompasses a wide range of techniques from simple comparisons to the use of complex models.

SAS 56 [AICPA, 1988], unlike SAS 23 [AICPA, 1978] before it, requires the use of analytical procedures in the planning and overall review stages of all audits. This requirement is endorsed in the report of the Treadway Commission [Treadway, 1987], which recommends the required use of analytical procedures. Such support appears well founded in light of research indicating that analytical procedures can be an effective tool in the detection of financial statement errors. Hylas and Ashton [1982], conducting an empirical study of 281 errors requiring financial statement adjustments on 152 audits, found 27.1% of these errors were detected through the use of analytical procedures. Coglitore and Berryman [1988] present case evidence to support the position that the use of analytical procedures can aid in the detection of fraud. Research in the area of regression analysis and time-series models in analytical procedures has indicated that such techniques may provide effective and efficient audit tools.

Although the use of analytical procedures is supported, then, there is little guidance for the auditor in the proper application of such techniques. SAS 56 [AICPA, 1988] does not specify the extent of analytical procedures required nor does it set a limit on the extent that analytical procedures can be utilized. Certain conditions

are described in the Statement that would comprise a situation conducive to the use of analytical procedures, but a method of assessing the audit situation and determining the appropriate extent of analytical procedures is not set forth in this Statement.

This study examines the utilization of analytical procedures in actual audit settings and the factors that may have led to the decision to perform and rely upon such procedures. Using data gathered by the in-charge auditors who conducted the audits, models are constructed to help isolate significant factors. Although recent research has studied auditors' decisions regarding analytical procedures in experimental studies [Biggs, Mock, and Watkins, 1988; Blocher and Cooper, 1988], little research has examined the decisions made in actual practice. This study will examine the factors that auditors' utilization of analytical procedures.

Relevant Variables

In this study, two different measures of the use of analytical procedures are explored. The first measure, relating to the audit effort expended in performing analytical procedures, is the number of staff audit hours spent on analytical procedures (as a percentage of total staff audit hours). The second measure is the auditor's perceived reliance on the use of analytical procedures (measured on a 10-point scale) in developing the overall opinion regarding the financial statements. While the first variable measures the actual extent of the analytical procedures performed, the second variable provides a measure of the effectiveness of the procedures.

The use of analytical procedures is expected to be

dependent upon various factors within the audit. These factors are the independent variable in this study and include characteristics of the audit situation and characteristics of the auditor. Although auditing literature has suggested various factors that should affect these dimensions of analytical procedures, such research has been primarily prescriptive. The variables utilized in this study are derived from authoritative pronouncements (SAS 56 [AICPA, 1988] is generally cited, although SAS 23 [AICPA, 1978] supported many of the same variables), normative literature regarding analytical procedures, and interviews conducted with representatives (partners or managers) of five international public accounting firms. The interviews were from 30 minutes to an hour in length and included open-ended questions designed to encourage the interviewee to discuss the factors influencing the utilization of analytical procedures. These factors were then incorporated in the design of the study. A summary of the independent variables is presented in Table 1 and the individual factors are discussed below.

Quality of Internal Control

SAS 56 [AICPA, 1988] states that the auditor should consider the reliability of the data to be used in the analytical procedures in determining the expected effectiveness and efficiency of the procedures. One factor influencing this decision is whether the data was developed under a reliable system with adequate controls. Kinney [1979] argues that if internal controls are strong, the auditor will have greater flexibility in planning the mix between analytical procedures and detail tests. Thus, it would appear that the quality of internal control of the client would influence the extent of analytical procedures performed. The auditors interviewed in this study unanimously agreed that the greater the quality of the client's internal control system, the more appropriate are analytical procedures as an audit technique.

The participants in this study were asked to evaluate the quality of the client's internal control, based on the

TABLE 1
SUMMARY OF INDEPENDENT VARIABLES

Variable	Operational Definition
Audit Characteristics	
Quality of Internal Control of Client	Discrete variable: 10-point scale ranging from 1 (extremely weak) to 10 (extremely strong)
Industry of Client	2-digit SIC code
Size of Client	Operating revenue
Number of Transactions of Client	Nature of transactions recorded by accounting system. Discrete variable: 10-point scale ranging from 1 (very few transactions, each of a very material amount) to 10 (very many transactions, each of a very immaterial amount)
Availability of Computer	Auditor access to computer and appropriate software to perform analytical procedures. Dichotomous variable: 1 = Yes, 0 = No
Auditor Characteristics	
Knowledge of Client	Number of years the company a client of audit firm
Knowledge of Client Industry	Number of in-charge accountant's clients in same industry Number of audit manager's clients in same industry
Knowledge of Analytical Procedures	Self-rating of extent of knowledge. Discrete variable: 10-point scale ranging from 1 (extremely limited) to 10 (extremely extensive)
Perception of Analytical Procedures' Effectiveness	Perception of effectiveness of analytical procedures. Discrete variable: 10-point scale ranging from 1 (extremely ineffective) to 10 (extremely effective)

documentation of the internal control system in the audit workpapers. A ten-point scale was used to allow differentiation among a wide range of internal control systems. Since auditors make many of their decisions regarding the use of analytical procedures during the planning stages of the audit, the participants were asked to state their perception of the internal control of the client at the beginning of the audit.

Industry of Client

According to SAS 56 [AICPA, 1988], the analytical procedures performed should also be based upon the predictability of the relationships examined by the procedures. One indicator of such predictability would be the industry in which the company operates. In addition, SAS 56 [AICPA, 1988] states that the utilization of analytical procedures should depend upon the availability of data. Some industries publish extensive data concerning the trends and conditions present among industry members, while such information is not available in other industries.

Size of Client

The size of the client may serve as a proxy regarding the effect of the expense of structural analytical procedures. According to Wallace [1983], the use of structural models requires improved planning, additional training of personnel, computer software, and the collection of data. Although many of these costs may be nominal after the initial audit application of the technique, they may act as "barriers to entry" for smaller firms. With a smaller client, it may be less costly to extend the detail tests than to design and implement sophisticated analytical procedures. Thus, the utilization of analytical review procedures may be better suited to audits of larger clients. In this study, the size of the client was measured as total operating revenues in the audit year under examination.

Number of Transactions of Client

The appropriateness of analytical procedures in an audit may be affected by the type of transactions processed by the client. As one partner of an international public accounting firm pointed out, ratios, for example, are more meaningful in the audit of clients with a lot of very small transactions than when auditing clients with few, very large, transactions. Blocher and Willingham [1985] note that the extent of analytical procedures depends upon the substitutability of other audit techniques. In auditing a client with very few, but large, transactions, detail testing of a high percentage of the transactions may provide more audit assurance, at a lower cost, than analytical procedures.

Therefore, a greater relative number of transactions

processed by the client should lead to a higher utilization of analytical procedures in the audit.

Availability of Computer

Although the role of the computer in auditing has greatly increased in the past few years, almost 30% of the auditors in this study reported that they did not have access, during the audit in question, to a computer and the appropriate software to perform analytical procedures. The more sophisticated procedures, such as regression analysis, time-series modeling, and discriminant analysis, require the auditor's use of a computer to perform the complex calculations. Even in simpler quantitative methods, the availability of a computer may simplify the computations. This assistance may be obtained through access to a microcomputer with the appropriate software or a time-sharing program. Kunitake, Luzi, and Glezen [1985] note that other characteristics of microcomputer utilization facilitate the automation of analytical procedures, including the ease of developing appropriate models (particularly with the use of newly developing computerized decision aids), the ability to re-use models, the availability of statistical conclusions to aid in the interpretation of the results, and the availability of "integrated software" in a single interactive program that may contain a spread sheet program, word processing capabilities, and data base management. Since the use of computers enhances and simplifies the use of analytical procedures, the availability of computers and appropriate software would seem to have a positive relationship with the extent of analytical procedures performed.

Knowledge of Client and Client Industry

The design of analytical procedures and, often, the interpretation of the results obtained by the procedures depend upon the auditor's knowledge of and experience with the particular audit client and the client's industry. These factors were frequently referred to in the interviews with audit partners and managers. SAS 56 [AICPA, 1988] also states that such knowledge is generally required to understand the financial relationships essential in planning and evaluating the results of analytical procedures. Kinney and Felix [1980] contend that an auditor's knowledge of the client's specific environmental data is necessary and Lev [1980] agrees that the application of analytical procedures utilizing external data depends upon the auditor's familiarity with the firm's environment.

In this study, the knowledge of the client is measured as the number of years the company had been a client of the audit firm. The knowledge of the client's industry is measured by the number of clients the in-charge accountant and the audit manager served in the same industry.(1)

Knowledge of Analytical Procedures and Perception of Analytical Procedures Effectiveness

SAS 56 [AICPA, 1988] explicitly states that an understanding of the purposes of analytical procedures and the limitations of those procedures is important in planning and evaluating the results of analytical procedures. This knowledge of analytical techniques must also be accompanied by a perception, by the auditor, that such techniques provide an effective audit tool. In one interview, a partner of an international public accounting firm stressed that an auditor's past experience with analytical procedures has a strong effect on his propensity to apply such techniques. If the auditor has seen analytical procedures used successfully in past audits, he is more likely to be willing to apply and rely on analytical techniques. Blocher, Esposito, and Willingham [1983] note that "many auditors lack confidence in analytical procedures because of the perceived low precision of the procedures and the perceived unreliability of the data that are necessary for the procedures, for example, monthly data and operating data".

The in-charge accountants in this study rated their knowledge of analytical procedures and their perception of analytical effectiveness on ten-point scales.

Data

In order to study the application of analytical procedures in audit settings, information regarding actual audits was used. This information was collected from three international public accounting firms. Information was collected from two offices of each of the participating firms, resulting in data from six practice offices located in three separate large metropolitan areas.

The data needed for the study included information regarding client characteristics and audit work performed in the examination of the financial statements of the client. Due to the confidential nature of the information, the actual collection of the data from the audit workpapers was completed by personnel of the accounting firms. In-charge accountants were asked to supply information regarding two recent audits they had supervised, due to their detailed familiarity with all phases of the audit work completed. These accountants were selected by a representative of the accounting firm, usually an audit partner, who coordinated the collection of the data in his/her office. Materials were sent directly to this representative to be distributed to the individual participants. The packets contained a cover letter to the auditor, data summary sheets, a listing of 2-digit SIC codes, and an addressed, stamped envelope to facilitate the return of the materials. In addition, a memo from the coordinating firm representative, encouraging participation, was usually included.(2)

Participants were asked to select audits with more than 500 total staff hours to avoid the inclusion of extremely small audits that may not exhibit a representative utilization of analytical procedures.

Information required to complete the data summary sheets was primarily factual and based upon the actual audit work performed. The majority of the information should have been available in the audit workpapers or in the practice office and participants were asked to estimate any information not explicitly stated in the available documentation of the audit. Since any such estimates were based upon the in-charge accountants' knowledge of the audit and the procedures performed, the information provided should be relatively accurate. Response to the request for information was encouraging, with 86% of the auditors responding with information on at least one audit. These responses yielded information on 126 different audit engagements, although missing data on the data summary sheets resulted in only 88 audits being available for use in the statistical analysis. A profile of the audits included in the models is presented in Table 2.

Results

The first model analyzes the effect of the independent variables upon the extent of analytical procedures, as measured by the percentage of total audit staff hours spent in the performance of analytical procedures. The results of the regression analysis are presented in Table 3.(3)

Due to the categorical nature of the industry variable, this variable was added to the model as a covariate. The analysis of covariance adjusts the observed response variables for the effect of the covariate (in this case, for the type of industry of the client). If such an adjustment was not made, differences in the extent of analytical procedures applied due to the presence of the other independent variables would be harder to detect [Montgomery, 1984]. The industry of the client was originally reported by the participants as a two-digit SIC code. These codes were then grouped into seven categories, as shown in Table 2, combining industries that are as homogeneous as possible. The covariate utilized in the model indicates the client's membership in one of the industry categories.

In preliminary analyses of variance performed, the office of the auditor appeared to have a significant effect on the extent of the analytical procedures performed. Thus, this variable was also included in the model as a covariate to remove the effects on the independent variables due to the audit having been performed out of a particular office.

TABLE 2
MODEL SAMPLE PROFILE
(n=88)

Dependent Variables		
Extent of Analytical Procedures (Analytical procedures staff hours as a percentage of total audit staff hours):		
Mean		0.086
Standard Deviation		0.053
Minimum		0.006
Maximum		0.303
Effectiveness of Analytical Procedures (Perceived reliance on analytical procedures):		
	<u>No.</u>	<u>%</u>
2 (1 = No reliance)	9	10.2
3	14	15.9
4	12	13.6
5	16	18.2
6	15	17.0
7-9 (9 = Total reliance)	22	25.0
Audit Characteristics		
Quality of Internal Control:		
	<u>No.</u>	<u>%</u>
1 (extremely weak)	3	3.4
2	4	4.5
3	5	5.7
4	3	3.4
5	7	8.0
6	5	5.7
7	15	17.0
8	18	20.5
9	23	26.1
10 (extremely strong)	5	5.7
Industry of Client:		
	<u>No.</u>	<u>%</u>
Agriculture, Mining, and Construction	14	15.9
Manufacturing	10	11.4
Services	22	25.0
Regulated Industries	9	10.2
Wholesale/Retail Trade	8	9.1
Finance, Insurance, and Real Estate	16	18.2
Government, Misc.	9	10.2
Size of Client (Operating Revenues)		
Mean		574,120,459
Standard Deviation		2,028,356,021
Minimum		200,000
Maximum		16,400,000,000
Type of Transactions of Client:		
	<u>No.</u>	<u>%</u>
2 (1 = very few, material)	1	1.1
3	4	4.5
4	5	5.7
5	6	6.8
6	8	9.1
7	21	23.9
8	20	22.7
9	15	17.0
10 (many, immaterial)	8	9.1
Availability of Computer (Auditor's access to computer and appropriate software to perform analytical procedures):		
	<u>No.</u>	<u>%</u>
Yes	62	70.5
No	26	29.5

TABLE 2
(cont.)

Auditor Characteristics		
Knowledge of Client (Number of years the company has been a client of the audit firm)		
Mean		12.671
Standard Deviation		13.083
Minimum		1
Maximum		50
Knowledge of Client Industry (Number of in-charge accountant's clients in the same industry)		
Mean		0.989
Standard Deviation		1.650
Minimum		0
Maximum		7
Knowledge of Client Industry (Number of audit manager's other clients in the same industry)		
Mean		1.909
Standard Deviation		2.668
Minimum		0
Maximum		15
Knowledge of Analytical Procedures:		
	<u>No.</u>	<u>%</u>
1 (extremely limited)	1	1.1
3	2	2.3
4	3	3.4
5	6	6.8
6	13	14.8
7	20	22.7
8	32	36.4
9	10	11.4
10 (extremely extensive)	1	1.1
Perception of Analytical Procedures' Effectiveness:		
	<u>No.</u>	<u>%</u>
3 (1 = extremely ineffective)	3	3.4
4	8	9.1
5	8	9.1
6	3	3.4
7	19	21.6
8	25	28.4
9	15	17.0
10 (extremely effective)	7	8.0

Since this analysis was performed primarily to determine which factors affect the utilization of analytical procedures, the analysis of each of the independent variables are of the most concern. As noted in the discussions of the relevant variables, positive relationships were expected between the dependent variables and each of the independent variables. Thus, one-tailed significance tests were utilized. As shown in Table 3, two of the variables (in addition to the Office variable) were highly significant in the expected direction. The knowledge of the client is significant ($p=0.0074$), indicating that a greater familiarity with the client allows auditors to utilize a greater proportion of analytical procedures in the audit. The other significant variable, a measure of the auditor's knowledge of analytical procedures ($p=0.0109$), indicates that a greater knowledge of analytical procedures leads to a greater utilization of such procedures.

In order to examine the perceived effectiveness of analytical procedures, a second model analyzed the reliance placed upon the analytical procedures performed. Polychotomous probit analysis was used (see McKelvey and Zavoina, 1975) due to the ordinal nature of the reliance measure.(4)

Reliance upon analytical procedures was captured on the data summary sheets on a scale from one to ten. In order to reduce the computational complexity of the model, however, the number of reliance levels was reduced to six. No participant recorded the reliance as a one (no reliance) or ten (total reliance) on the scale. In addition, only seven audits (8% of the sample) were reported with reliance of an eight or nine on the scale, so these responses were grouped with responses of seven.

TABLE 3
REGRESSION ANALYSIS:
EXTENT OF ANALYTICAL PROCEDURES AS THE DEPENDENT VARIABLE*

Model					
	df	Sum of Squares	Mean Square	F Stat.	Prob>F
Model	19	.0790	.0042	1.73	.0527
Error	68	.1638	.0024		
Corrected Total	87	.2428			
R ² = .3254					
Independent Variables					
		Parameter Estimate	Prob>t**		
<u>Covariates</u>					
Office		NA***	0.0636		
Industry of Client		NA***	0.3067		
<u>Variables</u>					
Quality of Internal Control		-0.000647	0.5932		
Size of Client		0.000000	0.4234		
Type of Transactions of Client		-0.000676	0.5817		
Availability of Computer		-0.007216	0.7122		
Knowledge of Client		0.001241	0.0074		
Knowledge of Client Industry		0.001240	0.3727		
Knowledge of Analytical Procedures		0.010243	0.0109		
Perception of Effectiveness		0.003357	0.1643		

* Staff analytical procedures hours as a percentage of total staff audit hours.
 ** All Probabilities reflect one-tailed tests, except Office and Industry of Client.
 *** Not applicable.

The results of the probit analysis are presented in Table 4. Three of the variables in the model (knowledge of the client’s industry (p=0.0035), the auditor’s knowledge of analytical procedures (p=0.0332), and the auditor’s perception of the effectiveness of analytical procedures (p=0.0057)) are statistically significant.

Discussion and Conclusions

Although the variables in this study were consistently supported in auditing literature and by the auditors interviewed as being crucial to the decision regarding analytical procedures usage, only the factors describing the characteristics of the auditor were found to actually affect the extent of and reliance upon analytical procedures.

It appears that the auditor’s knowledge of the client

and client industry did have an effect on the utilization of analytical procedures. Knowledge of the client, as measured by the number of years the company had been a client of the audit firm, was a significant variable in the analysis of the extent of analytical procedures performed. The results, then, may imply that information handed down from year to year, either through continuity in the personnel of the audit team or through information included in the permanent files of the audit, allows a greater amount of analytical procedures to be performed and relied upon. Knowledge of the client’s industry significantly affected the auditor’s reliance on analytical procedures, indicating that greater experience in a particular industry leads to a greater utilization of analytical techniques.

Personal characteristics of the auditor also affected the tendency to use and rely upon analytical procedures.

TABLE 4
PROBIT ANALYSIS:
EFFECTIVENESS OF ANALYTICAL PROCEDURES AS THE DEPENDENT VARIABLE*

Model		
Estimated R ² measure:		0.26090
Percentage Correctly Classified:		0.31818
Spearman Rank Order Correlation (Predicted vs. Actual):		0.34901
Independent Variables		
Variable	Maximum Likelihood Estimate	Prob>t**
Quality of Internal Control	-0.01048	0.5751
Size of Client	0.00000	0.2065
Type of Transactions of Client	0.03634	0.2875
Availability of Computer	-0.17289	0.7470
Knowledge of Client	0.01075	0.1373
Knowledge of Client Industry	0.14499	0.0035
Knowledge of Analytical Procedures	0.14750	0.0332
Perception of Effectiveness	0.17213	0.0057

* Perceived reliance upon analytical procedures in developing the overall opinion regarding the financial statements.

** All Probabilities reflect one-tailed tests.

The auditor's knowledge of analytical procedures was a significant factor in both models and the auditor's perception of the effectiveness of such techniques significantly affected the perceived reliance upon analytical procedures. Thus, the greater the auditors' confidence in their understanding of and the effectiveness of such methods, the more likely they are to incorporate these analytical methods in the examination of the client.

These results suggest that the factors determining the utilization of analytical procedures are more related to the auditors themselves than the audit situation. The great degree of variability noted in the application of analytical procedures appears due in great part to auditor preferences. In addition, differences in the extent of analytical procedures performed were found to be related to the office in which the audit was performed, while no differences were noted between audit firms. These results imply that these auditors were influenced by their immediate supervisors and peers, rather than the policy of the audit firm as a whole.

The implications behind these findings suggest that auditing is an extremely subjective process, dependent upon the experience, training and perceptions of the individual auditor. However, since certain client characteristics should also help determine the applicability of analytical procedures, it is possible that the personal preferences of the auditor may result in analytical procedures being utilized in a less than optimal situation or in the omission of such procedures when they would be an effective and efficient audit tool.

In a study of this nature, certain limitations are present that limit the effectiveness of the study. Since actual audit situations were examined, numerous uncontrolled factors were present and may have exerted influence on the auditors' utilization of analytical procedures. While much of the value of this study arises from its examination of actual situations, rather than laboratory settings, the trade-off lies in the presence of the uncontrolled factors.

It is also possible that the measures used to operationalize certain factors of interest failed to adequately

capture the influence of the factors. While experimental settings can reduce the effect of these limitations, additional evidence can still be provided by the results presented in this study.

Suggestions for Future Research

While this study sought to provide information concerning a wide variety of audits, future research possibilities include more focused studies of particular audit decisions. Case studies could be completed in which a small number of audits were examined in greater detail. In particular, studies would be helpful that attempted to record the actual decision processes of the auditors, rather than observing the results of the decisions after the fact. Such research would provide further insight into the factors important in auditors' analytical procedures decisions.

Footnotes

1. Although the use of analytical procedures is expected to be affected by the auditor's experience with that particular client, it is not clear if the relevant factor would measure the audit firm's experience with the client (and would assume that pertinent information is documented and maintained in client permanent files) or the experience of the particular audit team. The experience of the audit firm with the client was measured by the number of years the firm has audited the client. The measurement of the audit team experience with the client may also have more than one dimension. Both the experience of the audit manager or the in-charge accountant could have an effect on analytical procedures utilization, so both factors were quantified by requesting the number of years the manager and the in-charge accountant had been involved with the audit of the client. Analyses of the extent of and reliance upon analytical procedures were performed with each of these experience variables to determine the factor(s) with the greatest explanatory power, resulting in the use of the number of years the company had been a client of the audit firm.

The variable quantifying knowledge of the industry was also measured for both the audit manager and the in-charge accountant. Each factor was quantified by the number of other clients the auditor services in the same industry as the client in question. Analyses were again conducted with each of the variables to determine which variable had the greatest explanatory power. The extent of analytical procedures utilized was best explained by the number of clients the in-charge accountant served in the same industry, while the number of clients the audit manager served in the same industry provided the most explanatory power in the analysis of the

reliance upon analytical procedures.

2. A copy of the data summary sheets may be obtained, upon request, from the author.
3. In order to determine whether the regression analysis met the requirements of general linear regression models, several diagnostic checks were performed. A Spearman rank correlation of the absolute value of the residuals and the value of the independent variables indicated no serious heteroscedasticity. Normal probability plots, plotting the residuals against their expected values under normality, indicated no gross departures from normality. In addition, the effect of multicollinearity was evaluated through the calculation of Variance Inflation Factors. Among all of the independent variables, the maximum Variance Inflation Factor was 1.56, indicating that multicollinearity did not decrease the validity of the model.
4. Noreen [1988] indicates that, for sample sizes similar to this study, ordinary least squares regression may be at least as accurate as probit analysis. The use of regression analysis with this model yielded the same three significant variables. In addition, a generalized jackknife procedure [Mosteller and Tukey, 1977], which does not require an assumption concerning the density function of the dependent variable, was applied with similar results. The same variables were again significant at an alpha level of .10.

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