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The impact of conservatism, internal control reliability, and experience on the use of analytical review.

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The Impact of Conservatism, Internal Control Reliability, and Experience on the Use of Analytical Review

A Dissertation Presented

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Abstract

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When conducting an audit, auditors could rely on tests of details and/or analytical review procedures as substantive tests. Preliminary research suggests that auditors may be utilizing analytical review results to extend testing but not to reduce it. The objective of this study is to evaluate the impact of this conservatism effect, along with the influences of internal control reliability, and experience on the use of analytical review. To test for these effects an audit of the sales and collection cycle is experimentally manipulated. Subjects are asked to determine the extent they would modify a sample audit plan, given analytical review results and a description of the internal control system. The primary dependent variable is the total hours allocated in the audit.

To test for conservatism, analytical review results are manipulated to either signal problems or not to signal problems in certain account balances. In addition, the reliability of the internal control system was manipulated as either strong or weak, and the experience of the subjects was considered. Fifty seniors and forty-six managers from eight national accounting firms participated in the study.

The results indicate that analytical review results and the reliability of the internal control system do have significant effects on modifications rendered to planned audit work. A conservatism tendency is evident among auditors in their use of analytical review results when compared to a base audit plan. Auditors are utilizing analytical review to extend testing when it signals problems, but they are reluctant to reduce testing when analytical review results signal account balances are in order.

While the main effect for experience was not significant, an examination of the individual cells suggests that seniors and managers differ in their modifications to the audit plan. These differences cancelled out in the aggregate because of the conflicting interactions between analytical review results and internal control reliability. For seniors only, similar modifications were made in all cells except where analytical review signalled no problems and internal control was strong. Conversely, investigating only managers, similar changes were rendered in all cells except where analytical review results signalled problems and internal control was weak.

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INTRODUCTION

One major goal of the auditing process is to evaluate and verify the reasonableness of financial statement items. This is achieved by examining and testing a firm's internal control system and by conducting substantive tests of account balances. Statement on Auditing Standards (SAS) No. 1 (1972) states that substantive tests can be performed with two general classes of auditing procedures: (a) tests of details of transactions and balances, and (b) analytical review procedures applied to financial information.

Tests of details are procedures which attempt to corroborate the reported account balance by tracing the flow of accounting transactions and verifying the accuracy of financial records from sources both inside and outside the firm, e.g., confirmations of receivables, physical observation of inventory, a review of cancelled checks, etc. Therefore, the objective of the tests of details, to reconstruct the aggregated balance, is achieved by a bottom-up approach.

Analytical review is a technique in which auditors evaluate the reasonableness of reported unaudited book balances by comparing the balances with an expected value based on a judgmental or quantitative based analysis. In contrast to tests of details,

analytical review is a top-down approach in which, according to Stringer and Stewart (1985, p. 5), "the reliability of individual recorded transactions and balances is inferred from evidence of the reasonableness of the aggregate balance."

SAS 23 (1978) highlights three stages of an audit where analytical review can be utilized:

1. The initial planning stages as a "red flag" attention directing device,
2. As a substantive test of an account balance, and
3. At the end of the audit to examine if the financial statements as a whole makes sense.

When performing the analytical review, SAS 23 states that auditors can use the results to identify areas where either additional testing needs to be done or where the extent of detailed testing may be reduced.

In recent years, fundamental changes in the accounting profession have occurred which enhance the attractiveness of using analytical review as a substantive test. Albrecht (1977), Bernstein (1978), Gordon and Dohan (1983), and Lightner, Leisenring and Winters (1983), have pointed out how increased competition for audit fees has put pressure on accounting firms to control audit costs. Holder and Collmer (1980) argue that the use of analytical review procedures could provide better and cheaper audit evidence than detailed tests of transactions and balances. Since tests of details

involve inspecting the documentation and tracing the flow of individual transactions, it is costly to implement. Consequently, relying heavily upon tests of details will put a firm at a disadvantage in an environment of cost control. If analytical review is utilized as a substantive test in revealing account balance errors, it could result in the reduction of the extent, if not the nature, of other more costly and time consuming substantive tests.

Another recent change in the auditing environment is the ever increasing computerization of most clients' accounting functions. Biggs (1982), Loebbecke, Mullarkey and Zuben (1983), and Daroca and Holder (1985) argue that this change has generated less visible audit trails, which in turn, has decreased the effectiveness of commonly used tests of details. In contrast, a premium is placed on tests, such as analytical review, that are less sensitive to the method in which accounting transactions are processed.

Despite these changes, the degree to which auditors rely upon analytical review procedures as a substantive test is unclear. Blocher, Esposito and Willingham (1983, p. 81), in an experimental study of analytical review based judgments, conclude "that the auditors in the aggregate perceived analytical review and tests of details to be substitutes and the mix does not appear to affect their perceptions of the strength of audit evidence."

In contrast, Wallace (1983b) contends that there are misconceptions concerning analytical review which impedes a wider application of the technique. Although Wallace did not conduct a survey of auditors, she posits that auditors perceive that analytical review provides only soft evidence since it's considering aggregated data and is a very subjective technique to implement. Moreover, Wallace asserts that auditors would be reluctant to implement analytical review procedures unless the data had first been validated as accurate through tests of details.

Purpose of the Study

Hylas and Ashton (1982), in a review of financial statement adjustments found that analytical review procedures were more effective than traditional substantive tests (e.g. test of details) in revealing account balance errors, across a variety of accounts. Consequently, the benefits of using analytical review to its fullest potential could be both increased efficiency (through a decrease in the nature and extent of testing) and substantial effectiveness. The purpose of this study will be to examine variables that affect the use and reliance upon analytical review procedures. Three specific topics are investigated:

1. The potential of a conservatism tendency to extend but not reduce testing.
2. The effect of the strength of the internal control system,

and

3. The impact of an auditor's experience on the use of analytical review.

SAS 23 states that auditors can use the results of analytical review to both extend and reduce the nature and extent of audit work. However, there has been some limited support that auditors are not utilizing analytical review to its fullest potential.

In an extensive examination of decision making with analytical review, Biggs, Mock and Watkins (1985) utilized protocol analysis to investigate various facets of analytical review judgments. One of their findings provides initial data suggesting that analytical review procedures are used to extend testing but not to reduce it. If auditors are primarily using analytical review to extend testing, the implication is that analytical review will be conducive to increasing, and not decreasing, the cost and extent of the audit work. However, the extensive data gathering requirements of the protocol analysis methodology allowed Biggs et al. to evaluate the decisions of only four auditors. In effect, while protocol analysis enabled Biggs et al. to analyze the decisions of the four auditors in detail, the generalizability of the results based on so few subjects is limited.

Payne, Braunstein and Carroll (1978) indicate that

protocol analysis is especially suitable for exploratory studies. Protocol analysis allows in-depth analysis of complex decisions suggesting hypotheses which can also be tested by other research methods. Payne et al. argue that a (p. 38) "valuable approach to studying decision behavior is to employ more than one form of data collection and analysis." Consequently, a major objective of this present study is to investigate whether this propensity to extend but not reduce testing based on analytical review results, can be generalized to a larger population of auditors.

The human information processing (HIP) literature is replete with studies demonstrating heuristics and simplifying strategies decision makers employ when searching and using information for decision making purposes (e.g., Tversky and Kahneman, 1974; Snyder and Swann, 1978; Bar-Hillel, 1980; Cohen, 1981). However, the results from auditing contexts have not always reflected findings from the psychological studies. A propensity towards conservatism may explain why some of these results have not been found when tested in auditing contexts. For example, Joyce and Biddle (1981a) detected in a test of the anchoring and adjustment heuristic, that when subjects were presented with a description of internal controls that changed from strong to weak, they overadjusted when determining the extent of testing. Tomassini, Solomon, Romney and Krogstad (1982) examined the

calibration of auditors' judgments. They found that auditors, unlike other judges, tend to be overcautious and underconfident in their assessment of prior probability distributions. Kida (1984) analyzed the impact of a firm's going concern status. Interestingly, the auditors were inclined to pay more attention to failure items than success items. This result occurred even for those auditors who were presented with an initial hypothesis that suggested success. Libby (1985) revealed another type of conservatism at work when he had audit managers generate hypotheses for possible causes of errors in an analytical review task. Subjects cited errors which overstated net income and liquidity to a greater extent than errors which understated net income and liquidity. Hence, the main objective of this study is to determine if a conservatism bias exists which will predispose auditors to use analytical review to extend planned tests of details but not to reduce planned tests of details.

Another variable which may affect the use of analytical review is the strength and reliability of the internal control system. The second standard of audit field work (1972), calls for the study and evaluation of a firm's internal control system when determining the extent of audit testing. Moreover, SAS 23 (1978) states that when auditors are planning and performing analytical review procedures, they should consider the reliability of the financial and

non-financial information.

Whether auditors are sensitive to the reliability of the data is an empirical issue. While Joyce and Biddle (1981b) and Bamber (1983) found in within-subjects designs that auditors are sensitive to changes in the reliability of information, Joyce and Biddle found that they did not attend to reliability in a between-subjects design.

Therefore, the issue concerning auditors ability to differentiate reliability of source information in a between-subjects design, which is more like the actual decision task, is questionable. Consequently, another objective of this study will be to examine the degree to which analytical review judgments are influenced by the reliability of the internal control system. It is expected that when auditors are performing analytical review judgments, they will attend to the reliability of source information. This should arise because, as Cushing and Loebbeck (1983) point out, for analytical review procedures to be effective, the numbers used in the analysis must be free from any manipulation. Under a strong internal control system, this assumption would most likely be met.

Experience may also affect analytical review judgments. Elstein, Shulman and Sprafka, (1978), in a study concerning expert versus novice decision making of physicians, found that experts are more likely than novices to construct an

overall picture and causal schemas when solving complex problems. However, the literature investigating the impact of experience on audit judgments has been varied. While experience has had little influence on the relatively straight forward internal control evaluations (e.g., Ashton, 1974; Ashton and Brown, 1980; Hamilton and Wright, 1982), it's been demonstrated that there is a positive association between experience and quality of judgments in the materiality area (e.g., Messier, 1983; Ettenson, Krogstad and Shanteau, 1981; and Krogstad, Ettenson and Shanteau, 1984).

Since the use of analytical review involves both an understanding of the complex interrelationships between account balances and an understanding of the link between the analytical review results and the extent of audit testing, it's expected that experience will influence the way one performs and uses analytical review. In fact, Biggs et al. (1985) found that managers and seniors acquired and evaluated information for analytical review in a different fashion. Although all four auditors were inclined to be conservative and use the results of analytical review to generally increase the extent of the audit work, the managers were likely to extend only the tests which directly related to the problem account (i.e. the collectibility of the receivables). In contrast, the seniors used the error in receivables to

increase testing throughout the sales and collection cycle. Accordingly, another purpose of this study will be to investigate the role of experience in analytical review judgments. It is expected that managers will be more efficient than seniors in utilizing analytical review procedures to modify testing only in areas where a problem exists.

The rationale for testing the impact of conservatism, internal control reliability, and experience in the same model is that the literature indicates that there should be significant interaction effects. For example, in this study, the differences between seniors and managers should be accentuated further because this study requires subjects to synthesize their evaluation of the reliability of the internal control system and the analytical review results with a determination of the nature and extent of the audit work. The findings from studies of expert decision making in other disciplines (e.g., Elstein, Shulman and Sprafka, 1978; Chi, Feltovich and Glaser, 1981; Charness, 1981) suggest that managers will be more effective than the less experienced seniors in performing this task because of their ability to identify and integrate complex inter-relationships. Similarly, Biggs and Mock (1983) found, in a protocol analysis study of audit scope decisions, that inexperienced auditors executed decisions in an ad-hoc serial fashion,

while more experienced auditors carried out the task by constucting an overall picture of the firm.

The reliability of the internal control system should interact significantly with the results of analytical review procedures. Holder and Collmer (1980) posit, that when there are adequate controls and the analytical review results confirm an auditor's prior expectations about account balances, then the auditors can limit other substantive tests. If the client has inadequate controls, and the analytical review procedures confirm the auditor's prior expectations, they argue that auditors should not limit the other substantive tests. However, Holder and Collmer contend that if there are inadequate controls and the analytical review procedures point to unusual fluctuations in the account balances, auditors should use these results to expand other substantive testing.

Moreover, the interaction of the internal control reliability and conservatism is suggested by the Biggs et al. (1985) study. One reason why auditors in that study might have been conservative in their use of analytical review results is because of possible weaknesses in the internal control system. For example, one weakness involved the lack of separation of duties between the posting of the cash receipts and sales to their respective journals and the posting of the transaction to the detailed accounts

receivables card. The literature on internal control evaluation has been overwhelming in citing the separation of duties variable as being the most important cue when evaluating the reliability of an internal control system. Therefore, auditors may not have used analytical review results to reduce audit work because they considered internal control to be weak. Whether similar decisions are made under strong internal control systems must be tested. Hence, one objective of this study will be to investigate the degree to which the conservatism tendency and the reliability of the information will interact with experience in influencing auditors' utilization and reliance upon analytical review results.

Overview

The remainder of the paper is organized as follows. Chapter II discusses the literature related to analytical review and highlights the need to study in greater detail the evaluative and judgmental processes of analytical review. Chapter III describes the task, task setting, the hypotheses to be tested, and the statistical methodology utilized to analyze the results. Chapter IV presents the statistical analysis of the study. Chapter V discusses the results of the study and the implications it has for the accounting profession and accounting research.

CHAPTER II

Literature Review

The literature studying analytical review has taken three general approaches:

1. Testing the relative merits of various quantitative techniques to analytical review.
2. Surveying auditors regarding their use of analytical review and analytical review procedures.
3. Studying in a descriptive and experimental manner judgmental approaches to analytical review.

Consequently, the literature review will correspond to the preceding taxonomy.

Quantitative Techniques to Analytical Review

Since analytical review involves the formation of expectations about predicted account balances, it's only natural that most of the analytical review research has concentrated on testing which statistical technique would be most accurate in predicting account balances. Kinney (1979) demonstrated how even limited information approaches (e.g., the expected value of an account balance proportion in the audit period is the account balance proportion in the previous period) did reasonably well in predicting when an unaudited account balance did or did not need a material adjustment. Therefore, the rationale behind this literature

is that by using formal structured models (and even naive approaches similar to Kinney, 1979) we will improve the effectiveness of analytical review judgments.

The use of regression analysis in analytical review by the "Big Eight" accounting firm, Deloitte, Haskins and Sells (DHS) was discussed by Stringer (1975). He explained how DHS used a stepwise regression approach utilizing 36 months of data to generate the model. Stringer and Stewart (1985, p. 25) in their discussion of the DHS approach, state "the extra effectiveness of statistical techniques provides a reasonable basis to support an increase in the relative reliance that is appropriate for analytical review and a resulting decrease in the extent of tests of details necessary in a given situation."

One reason auditors might be reluctant to rely upon analytical review could be their perception that reliance upon analytical review results will cause increased vulnerability in the event of a litigation suit. However, Wallace (1981) reviewed the law literature and found legal support for the use of regression analysis in auditing judgment. By using regression analysis in analytical review, she argues that auditors will have a more quantitative and objective basis for defense if they are brought to court.

Given that regression analysis is used in analytical review by at least one "Big Eight" firm, and that regression

analysis has legal support for use as evidence, one question addressed in the literature is to determine how effective is regression analysis as a substantive test.

Kinney (1978) tested how a regression approach would compare with a sophisticated time series model, Autoregressive Integrated Moving Average (ARIMA), and with naive models based on last year's data in predicting account balances for operating revenue for a sample of 6 railroads. Using the mean absolute error as the criterion, he found that regression did about as well as the more complex ARIMA models (.0468 for regression, .0556 for ARIMA, and .0401 for ARIMA with a transfer function), and that both regression and ARIMA did much better than the naive martingale and submartingale models (.0778 for martingale and .0728 for the submartingale).

In addition, models based on 36 months of data (similar to the DHS approach) performed better than models based on 120 months of data. Apparently, the dangers of structural changes in the underlying relationships during a 120 month period outweighed the disadvantages of using only 36 months of data.

Kinney and Salomon (1982) tested the ability of three alternative regression approaches, including the DHS approach, to detect material accounting errors (arbitrarily defined as 2% of the expected audited balance of the

account). Using a simulated time series on hypothetical firms, Kinney and Salomon found that the DHS approach based on a monthly materiality criterion yielded fewer Type I errors (the model indicates an investigation when no accounting error is present) and therefore was more efficient than the approach predicted on an annual materiality criterion. All three approaches generated Type II errors (the model indicates no investigation when an accounting error is present) at a rate less than the stated risk level.

Many other studies have examined the issue of using regression in analytical review. Kaplan (1979) did a case study of a large industrial firm and tried to build regression models from 36 months of data to predict account balances for both income statement and balance sheet accounts. He found that the models worked best for annual income statement accounts and performed poorly for balance sheet accounts.

Akresh and Wallace (1980) and Neter (1980) also used the case study approach to examine the effectiveness of analytical review. Akresh and Wallace assessed the use of regression to predict seven account balances for a public utility firm using both auditor specified and stepwise regression models. They found that both auditor specified and stepwise models did quite well (with adjusted R^2 s

ranging from .944 to .998 for models using 36 observations) and that using 36 as opposed to 84 observations yielded better predictions of account balances.

Neter used a case study of a large firm with many sales outlets to examine two issues. First, he compared how an auditor specified and a stepwise regression model would perform in predicting the accounts receivable balances for two divisions. Next, he investigated how multiple regression models would compare to auditors' judgments in identifying unusual performances of sales outlets. The results were similar to Akresh and Wallace. Both the auditor specified and the stepwise regression approaches were quite good in predicting the account balance (R^2s ranging from .869 to .940). However, the tendency towards conservatism on the part of auditors led to differences between the regression model and the auditors' judgments in identifying the unusual performances of sales outlets. The auditors tended to identify outlets with higher than expected sales or lower than expected cost of sales while the more objective regression approach put equal emphasis on whether the outlets were either higher or lower than expected for both accounts.

Imhoff (1981) and Lev (1980) employed a cross-sectional approach to testing regression approaches to analytical review. Imhoff studied 94 large industrial firms to determine which variables can best predict income statement

elements. The results indicated that only gross margin was consistent across firms in predicting sales and that sales was the best predictor of the other income items. Lev was interested in comparing the use of single index models (gross national product, or total corporate profit after taxes) versus double index models (which also included an industry factor) in predicting sales, operating income and net income. He used over 500 firms from COMPUSTAT to formulate his regression models and found that the single index models did better than a naive submartingale model. Interestingly, the inclusion of the industry factor increased the R^2s for the double index models. Hence, when auditors are doing analytical review procedures they should pay attention to industry data. One problem though in using industry data is that it is difficult to identify industries in which companies are clearly in the same line of business.

Taken as a group, the studies examining regression indicate that the use of regression as an analytical review procedure holds much promise. It has greater explanatory and predictive abilities than naive limited information techniques. Interestingly, it appears that a regression model based on approximately 36 months of observations (similar to DHS approach) often outperforms models from longer periods.

Surprisingly, regression holds its own against more

complex statistical techniques. Similar to the findings of the already cited study by Kinney (1978), Albrecht and McKeown (1977) demonstrated that regression was as effective as ARIMA in predicting operating revenues, operating expenses and payroll expense for three companies. Dugan et al. (1985) explain that a shortcoming of ARIMA is that it fails to pinpoint the relative contribution of the trend cycle, seasonal, and irregular components to changes that occur in the time series. Arrington, Hillison and Icerman (1983, p. 178) argue that, "ARIMA, in its multivariate form, is theoretically the most effective procedure since it subsumes both limited trend and regression analysis. However, due to extensive data requirements, the complex notational appearance, difficulty with the ability to interpret, and the direct and indirect costs of operationalizing, the ARIMA modelling process may be limited in terms of current applications." Table 2.1 summarizes the results of the studies investigating the effectiveness of the quantitative analytical review procedures.

Although none of the cited studies examined how and if auditors actually used these quantitative analytical review procedures, the findings would tend to imply that regression analysis would be a more valuable input to an Auditor's decision process than would ARIMA. This is because the regression approach is more easily understood and less costly

to develop than ARIMA. Wallace (1983b) argues that use of the more objective quantitative techniques to form expectations about account balances, as opposed to a more judgmental approach, could lead to a more effective audit. One issue that needs to be examined, is to determine how auditors' judgments will be influenced by the use of quantitative analytical review procedures.

TABLE 2.1
Summary of Quantitative Studies of Analytical Review Procedures

Study	Albrecht and McKeown (1977)	Kinney (1978)
Quantitative Techniques Analyzed	Regression ARIMA a. Univariate Box-Jenkins b. Bivariate Box-Jenkins	Regression ARIMA Naive models a. Martingale b. Submartingale
Sample Used	Three firms, Monthly Data. a. 30 months	6 railroad firms. Monthly data a. 36 months b. 120 months January 1959-December 1973.
Account Balances Investigated and Criterion Measured	Operating Expense, Revenue, and Payroll Expense. a. Predict account balance Criterion Variable. a. Residual Standard Error.	Operating Revenue. a. Predict monthly balances. Criterion Variables. a. Mean Square Error. c. Mean Absolute Error.
Results	Regression and ARIMA are effective techniques. Mixed results as to which approach is better.	Regression and ARIMA were better models than naive approaches. Regression and ARIMA performed approximately the same. Models using 36 months of data were superior.

Study	Kaplan (1979)	Kinney (1979)
Quantitative Techniques Analyzed	Regression	Only naive models. a. Normal earnings. b. Last year's earnings. c. Proportion of accounts to total financial statement of which it is a part. d. Ratio of accounts allowing consideration of different financial statements. e. Last year adjustment signals an adjustment this year.
Sample Used	One large industrial firm. Monthly data a. 36 months January 1974-December 1976.	44 manufacturing firms with sales between five and ten million dollars. 3 years of annual data
Account Balances Investigated and Criterion Measured	Various Balance Sheet and Income Statement Accounts. a. Predict monthly, quarterly and annual balances. Criterion Variable a. R 2	Various Balance Sheet and Income Statement Accounts. a. Predict material adjustments. Criterion Variable a. Type I errors - investigate when no adjustment needed. b. Type II errors - don't investigate when an adjustment is needed.
Results	Regression worked best for annual balances of income statement accounts.	Naive models do a good job in predicting an adjustment. Last year adjustment rule has

	Kaplan (1979) continued	Kinney (1979) continued
		least number of Type I errors but most number of Type II errors.
Study	Akresh and Wallace (1980)	Lev (1980)
Quantitative Techniques Analyzed	Regression a. Auditor specified. b. Stepwise.	Regression a. Single index models. b. Double index models.
Sample Used	One large public utility firm. Monthly data a. 36 months. b. 84 months.	COMPUSTAT firms Sales - 573, Operating Income - 531, Net Income - 587. Annual data. a. 19 years, 7 periods. 1949-1967, 1950-1968, 1951-1969, 1952-1970, 1953-1971, 1954-1972, 1955-1973.
Accounts Balances Investigated and Criterion Measured	Electric Revenue, Gas Revenue, Electric Production Expense, Gas Production Expense, Depreciation, Allowance for Borrowed Funds and interest. Predict annual account balance. Criterion Variables R^2 a. R b. Precision - one-half the monthly materiality cutoff.	Sales, Operating Income and Net Income. a. Predict annual account balances. Criterion Variable a. R^2
Results	Auditor-specified and stepwise models had high predictability. Assumptions of Regression were not seriously violated.	Single index models worked well. Adding an industry factor improved the model's predictive ability.

Study	Neter (1980)	Imhoff (1981)
Quantitative Techniques Analyzed	Regression a. Auditor specified b. Stepwise	Regression
Sample Used	One large firm. Monthly data. a. 48 months, January 1973-December 1976.	94 COMPUSTAT industrial firms. Annual data. a. 11 years.
Account Balances Investigated and Criterion Measured	1. Accounts Receivable Predict account balances for two divisions. Criterion Variables R^2 a. R b. Mean Relative Error 2. Seven Income Statement accounts for various sales outlets. Identify outlets with unusual performance.	Income Statement Accounts. a. Predict annual account balances. Criterion Variable R^2 a. R
Results	Auditor-specified and stepwise models had high predicability. Conservatism tendency in auditors when identifying sales outlets with unusual performances.	Sales is an excellent predictor of other income statement accounts.
Study	Kinney and Salamon (1982)	
Quantitative Techniques Analyzed	Regression a. Use of monthly materiality cutoffs to signal investigation (similar to DHS) b. Use of annual materiality cutoffs to signal investigation. c. Annual materiality cutoff in	

	Kinney and Salamon (1982) continued. conjunction with a monthly filter rule for large deviations.
Sample Used	Simulated Time Series. 48 Observations per years, 200 simulated audit years
Account Balances Investigated and Criterion Measured	Time Series Accounts. Determine when to investigate an account balance. Criterion Variables a. Type I errors - investigate when no adjustment is needed. b. Type II errors - don't investigate when an adjustment is needed.
Results	All approaches yield Type II errors less than stated risk level. The monthly materiality cutoff rule was the most efficient.

Surveys of Auditors

Another body of literature investigating analytical review utilizes surveys to ascertain the nature and extent that auditors in the field actually use analytical review procedures.

The surveys have uncovered an overwhelming tendency for auditors to use judgment based analytical review procedures. Biggs and Wild (1984), in a survey of 127 "Big Eight" accountants, found that over 90% of them use a judgment based procedure to analytical review such as scanning the data and ratio analysis. Daroca and Wilder (1985) canvassed members of the Private Companies Practice Session of the American Institute of Certified Public Accountants (AICPA) regarding the usage and applicability of various analytical review procedures. The most important procedures in order of usage for an audit were:

1. Comparison of current with prior year's financial statement figures,
2. Working capital,
3. Gross margin on sales,
4. Comparison of relationship of individual items with totals for each year,
5. Current ratio, and
6. Profit margin on sales.

The complex statistical procedures were less frequently used. Only 5.3% of the auditors stated they used regression analysis more than "rarely", while only 3.4% responded even "rarely" in their use of Box-Jenkins. Even those who did use a statistical technique generally did not place great importance on the procedures. Hence, in practice auditors tend to rely on analytical review procedures which require little, if any, statistical sophistication. The high degree of agreement among those surveyed by Daroca and Wilder (1985) and by Biggs and Wild (1984) implies that it is highly improbable that there would be a firm effect when studying analytical review judgments.

Tabor and Willis (1985) interviewed seven audit managers, from one office of a "Big Eight" firm, on their use of analytical review in actual audits (two clients per subject). The general consensus of the auditors was that there had been increased usage of analytical review procedures as a means of substantive testing in recent years. Most of the usage tended to be non-quantitative (e.g., scanning the data) or simple quantitative procedures (e.g., ratio analysis). However, in the future, five out of the seven auditors predicted increased use of regression analysis as an analytical review procedure. Although Tabor and Willis did not explicitly test how the reliability of the internal control system would impact on the use of analytical

review procedures, they found that for three out of the five audits where analytical review procedures were extensively used (which they defined as the use of analytical review procedures for over 80% of the audit planning time), a strong internal control system was present. The audit managers surveyed stated they could rely more upon analytical review procedures because of the client's strong internal control environment and that the clients had a long-standing relationship with the auditing firm.

It appears logical that if the numbers investigated with analytical review are produced by a system which is relatively free from bias, then an auditor could place greater reliance on analytical review as a substantive test. This would be congruent with Bamber's (1983) study which demonstrated that audit managers are sensitive to changes in the reliability of source information when determining the extent of audit testing. Furthermore, Cushing and Loebbecke (1983) argue that although material errors can occur under a good internal control system or a bad one, the analytical review procedure will be most effective in revealing errors which came within a firm possessing a good internal control system. They cite the example of using trend analysis in order to identify unusual fluctuations. For this analytical review procedure to be effective, one must assume that the base period data is correct and that this year's data can't

be manipulated to ensure a uniform trend. These assumptions would most likely be confirmed under a strong internal control system.

In addition, the second standard of audit field work states (1972), "There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the the determination of the resultant extent of the tests to which auditing procedures are to be restricted." Hence, one objective of this study is to test in a controlled setting, whether, and to what extent, auditors' use of analytical review procedures is affected by the strength of a client's internal control system (the assumption being that the stated controls are corroborated by compliance testing as being effective).

Another issue addressed by the surveys is to determine which auditing procedures are most effective in detecting errors in financial statement account balances. In a survey of auditors by Biggs and Wild (1984), it was found that over 40% of financial statement errors detected by auditors were initially detected by an analytical review procedure (median 45%, mean 41.5%, and a standard deviation of 25.9%). Although not a survey, another study which investigated the issue of the relative effectiveness of various auditing procedures was conducted by Hylas and Ashton (1982). They examined 281 errors requiring financial statement adjustments

on 152 audits conducted by Peat, Marwick, and Mitchell (PMM). Hylas and Ashton discovered that a greater number of errors occur in smaller companies, and that for these companies, errors tend to be greatest in the revenue cycle. Interestingly, analytical review procedures detected more errors than any other technique. Conversely, tests of details were found to be least effective in uncovering financial statement errors. An explanation for their finding is that the greatest causes of errors were attributable to client personnel and insufficient accounting knowledge while the causes of errors which lend themselves to extensive testing of details (e.g., mechanical errors, inadequate controls, etc.) were fewest in number. From the above results, one could infer that firms should spend less time on costly tests of details and put more emphasis and reliance on analytical review procedures. Table 2.2 summarizes the results of the surveys of the use of analytical review by auditors.

Table 2.2
Summary of Surveys of Auditors on
Use of Analytical Review Procedures

Study	Biggs & Wild (1984)	Daroca & Wilder (1985)
Subjects	127 "Big Eight" Accountants. Mean audit experience 4.5 years.	269 C.P.A.'s, members of the Private Practice Section of A.I.C.P.A.
Main Variable of Interest	1. Percentage of respondents using various analytical review procedure. 2. Perceived Value of Analytical Review Procedures (allocate 100 points). 3. Perceived Value of Procedure as Affected by Prior Use. 4. Percentage of Errors initially detected by Analytical Review.	Analytical review procedures applicable and used for both an audit and a review engagement.
Results	1.a. 95.9% - scanning. b. 89.4% - ratio analysis. c. 11.4% - regression. d. 8.1% - time series. 2. Mean Data a. 39.90 - scanning. b. 35.76 - ratio analysis. c. 4.78 - regression. d. 4.60 - time series. e. 15.00 - other. 3.a. Significant relationship between prior use and perceived value. b. Relationship especially strong	1. Little and insignificant difference between use of analytical review procedures in an audit or a review engagement. 2. Most important procedures were judgment or simple quantitative methods (e.g., comparing current year's financial statement figures, working capital, etc.) 3. Very little use of regression analysis and Box-Jenkins

	Biggs & Wild (1984) continued	Daroca & Wilder (1985) continued
	for quantitative procedures. 4.a. Median 45.0%. b. Mean 41.5%. c. Standard Deviation 25.9%.	approaches.
Study	Tabor and Willis (1985)	
Subjects	Seven audit managers of one "Big Eight" firm.	
Main Variables of Interest	1. Current role of analytical review procedures. 2. Has the use of analytical review procedures changed over time. 3. What is the future for analytical review procedures.	
Results	1. Analytical review procedures which are used tend to be non-quantitative or simple quantitative techniques. 2. Significant increase in use of analytical review procedures ($P < .005$) in simple quantitative techniques. 3. a. All of the respondents indicated increased use of analytical review. b. Five of the Seven auditors predict increased use of regression analysis.	

Studies of Judgment in Analytical Review

The literature investigating judgments using analytical review procedures has taken two directions. One approach has used descriptive case studies in which no variables are experimentally manipulated (e.g., Holder, 1983; and Biggs, Mock and Watkins, 1985). The other approaches taken an experimental design thrust, looking at the use of heuristics and the impact of situational variables (e.g., Blocher, Esposito and Willingham, 1983; Kinney and Uecker, 1982; Biggs and Wilder, 1985; and Libby, 1985).

Holder gave subjects (35 senior auditors with at least six months of supervisory audit experience) a description of a small wholesale consumer-products firm including the strengths and weaknesses of a client's internal control system, two years comparative financial statement data, and general economic and industry conditions. Based on the above information, subjects were to devise and execute a program of analytical review procedures and to identify audit risk areas. The main objective of the study was to determine how auditors use analytical review in the planning stages of an audit.

He found the most extensively used analytical review procedures were:

1. Inventory turnover,
2. Gross margin ratio, and

3. Accounts receivable aging analysis.

Trend analysis items (e.g., trend of accounts receivable level) were also frequently used but no use was mentioned for regression or time series data. The latter finding is probably an artifact of the study, since it might have required too much effort for subjects to derive this data on their own. Future studies investigating the significance of using different analytical review procedures on auditor's judgments should make available quantitative data as input to the decision process if an auditor requests it. The analytical review procedures found to be most important by Holder (1983) and by Daroca and Holder (1985) were presented to subjects in this study. It should also be noted that Holder found no significant differences between the analytical review procedures used by auditors from small firms and those used by auditors from large firms. This would suggest that there is little need to worry about a firm effect when studying judgments utilizing analytical review procedures.

A more ambitious case study was undertaken by Biggs et. al. (1985). Subjects were given a comprehensive case study, developed from an actual audit of an electronics firm carried out by a medium size auditing firm, in which the unaudited balance of accounts receivable needed to be adjsuted. Biggs et al. only used four subjects (two seniors and two managers)

because the process tracing technique of concurrent verbal protocols was employed to analyze how and why subjects made a decision. Subjects verbalized the steps they were taking at the same time as they were performing the task. The strength of protocol analysis is that by sifting through a subject's verbally expressed decision process, one can determine what information was acquired, how the information was evaluated, and how an action or a choice by a subject was implemented. However, since protocol analysis requires a voluminous quantity of data, only a few subjects can be studied, which limits the study's generalizability.

In the Biggs et al. study, subjects were provided with over 100 pages of background material, including four years of audited data, the current year of unaudited financial statement data, and background material on the economy, industry, and the company itself. The four subjects were asked to prepare and implement a program of analytical review procedures and evaluate the planned substantive audit program. All of the subjects were successful in utilizing analytical review to pinpoint an adjustment problem in accounts receivable. The criterion for accuracy was based on the actual adjustment to accounts receivable made by the auditing firm. Although the real world decision could have been incorrect, Biggs et al. argue that it had passed a "market" test.

In the analysis of the subjects' evaluations of the planned audit program, it was evident that they were using analytical review to extend the nature of the planned tests and not to reduce them. Although SAS 23 stated that analytical review procedures can be used to both extend and reduce audit testing, it appears that analytical review is not being used to its fullest potential.

Another important finding of the study was that managers and seniors acquired and evaluated information differently. Managers placed greater emphasis on industry and economy wide data than did seniors. In addition, seniors tended to use analytical review to increase tests for all areas of the revenue cycle while managers tended to be more selective in their increase in testing.

Biggs et al. argue that seniors tend to concentrate only on the surface features of a problem while managers were able to identify the subtle and complex relationships between analytical review evidence and audit program changes. They suggest that this ability is caused by the impact experience has on the internal causal schemas that experts bring to a task.

The role of experience has been extensively studied in the auditing judgment literature. Ashton (1983), in a review of research in audit decision making, concluded that the role of experience is inconclusive. In the widely

researched area of internal control evaluations he posits (p.22), "that quality of internal control evaluation has not been demonstrated to be a function of auditing experience." On the other hand, for materiality judgments, Ashton concluded that there was a positive relationship between experience and consensus. The differences between the findings he attributes to the nature of the task. The internal control judgment is a well-defined, continuously repeated task while the materiality judgment is ill-defined. Another explanation for the finding could be that the internal control judgment requires an evaluation of a discrete part of the audit work while the materiality judgment requires an understanding of the inter-relationships between different parts of the audit work.

The task of analytical review based judgments is more congruent with the materiality judgments than the internal control judgments. Anlaytical review requires not only forming an expectation of a single account balance but an expectation of how different accounts should interact with each other. Hence, one would expect that the more experienced managers would utilize analytical reivew in a more effective and efficient manner. Investigating the role of experience in using analytical review is one of the issues tested in this study.

Another approach used to study judgments based on

analytical review has been to investigate the impact of heuristics. The literature encompassing this approach has its roots in the seminal work of Tversky and Kahneman (1974) who describe "rules of thumbs" people utilize to cope with complex probabilistic decisions. Libby (1981) discusses the three heuristics:

1. Availability - the probability that an event or outcome will be recalled is affected by the event's perceived frequency of occurence.
2. Anchoring and adjustment - decision makers evaluate information against an initial value which then gets adjusted, and
3. Representativeness - decision makers will estimate the probability that an event or person comes from a certain population by the perceived degree of similarity of the event or person with members of that population.

Blocher et al. (1983) experimentally examined the impact of anchoring and adjustment, as well as the structuredness of one phase of the decision process on subjects' usage of analytical review procedures in a judgment involving payroll expense. Forty-four auditors from one firm took part, of whom 32 were audit supervisors and 12 were seniors (each of whom had at least two years of audit supervisory experience).

In the study, anchoring and adjustment was manipulated

by describing the scope of work executed in the prior year's audit (high/low). The structuredness of the decision process was manipulated by the use of a checklist for suggested analytical review procedures (provided a checklist/did not provide a checklist). Although the results of the study indicated high variability of judgments concerning the use of analytical review procedures in relation to tests of details, the effect of the independent variables was not significant. For example, providing a checklist of analytical review procedures tended to influence subjects to allocate more time for analytical review but it also caused more lengthy audit programs. Blocher et al. suggest that this result is probably an artifact of the research design, since subjects might have perceived that being provided a checklist was a signal for a "red flag" in the audit.

Two surprising findings of their study were:

1. In the aggregate, subjects treated analytical review procedures and tests of details as substitute tests, and
2. The typical revisions of last year's scope of audit work resulted in a reduction of audit testing.

The finding that subjects treated analytical review procedures and tests of details as substitute tests, was derived by conducting correlational analysis. For example, the correlation coefficient for budgeted analytical review

hours and budgeted tests of details hours was negative and significant ($r = .490$, $p = .001$). Moreover, the correlation between the ratio of budgeted analytical review hours and budgeted tests of details with subjects' ratings of the quality of audit evidence approached zero and was insignificant ($r = .09$, $p = .789$). This implies that not only did the auditors use the two classes of tests as substitutes, but they also perceived the quality of audit evidence to be comparable in strength.

It would appear that the results concerning the revisions of the scope of audit work contradict the earlier cited work by Biggs et al. (1985) which had concluded that auditors use analytical review to extend but not to reduce planned testing of details. The conflicting results could be caused because the Blocher et al. paper only examined the audit program for one account (payroll expense). In contrast, Biggs et al. looked at entire cycles of an audit (sales and collection cycle, and inventory cycle) in which one account did need an adjustment (accounts receivable).

The anchoring and adjustment heuristic was also examined by Kinney and Uecker (1982) and Biggs and Wild (1985). Both studies had subjects establish confidence intervals for investigating unaudited gross profit %'s. The rationale for conducting the studies is that in theory auditors should not be influenced by the unaudited book

values when forming expectations about the true book value. Otherwise, they would be increasing the likelihood of commiting a Type II error, not investigating when the unaudited account balance is really in error.

In the earlier study, Kinney and Uecker manipulated the anchor by giving subjects (154 audit seniors) either high or low unaudited book values. Although auditors in the low book value condition set a significantly lower investigation boundary than subjects in the high book value condition ($P < .01$), the results were less pronounced in the upper investigation boundary ($P < .09$). Because of the experimental design, the effect of the anchoring and adjustment heuristic is ambiguous. Subjects in the low book value condition had a gross profit % declining each year while in the high book value condition, the unaudited gross profit % was a reversal of the previous year's trend. The subjects, when setting a non-investigation region, could have been responding to a trend in the data rather than just being affected by whether the book value was high or low.

To counter this problem, Biggs and Wild added a control group who did not receive the unaudited book value. Their subjects, 121 auditors from four "Big Eight" accounting firms with a wide range of experience, were asked to estimate the expected audited value and to establish 95% confidence intervals for upper and lower limits of the gross profit %.

Using the control group as the base rate, they still detected a judgmental bias in the direction of the unaudited book values.

However, the bias was attenuated when subjects were provided with a longer information set of five years of audited data as opposed to the two years of data presented in the Kinney and Uecker experiment. One implication of these results is that by providing auditors with more complete information sets, their judgments using analytical review procedures might be improved. Although, Kinney (1980) argued for the need for research investigating the effectiveness of different approaches to analytical review, it is still open to question what will be the impact of different types and sources of information will have on analytical review based judgments.

Libby (1985) examined the degree to which the availability heuristic would affect the generation of hypotheses for possible causes of errors in a preliminary planning stage use of analytical review. Thirty-seven audit managers of one "Big Eight" firm were provided with background information about a client and three financial ratios (gross margin, current ratio, and quick ratio) for the prior year's audited statements and for the current year's unaudited account balances. The current year's ratios were manipulated to contain a specific error. Subjects in the

treatment groups were presented with their superior's hypothesis about the error and were asked to generate six errors that might have caused fluctuations in the current year's ratios from last year's ratios. The control group received no prior hypotheses about the errors and were asked to list seven possible causes of the error. In addition, subjects were aksed to list the three most recent errors they encountered and to rate the frequency which they perceived a list of ten errors to occur in audits of manufacturing firms. An additional thiry-one audit managers were asked only to estimate the relative frequency that twelve types of financial statement errors occur in audits of manufacturing firms.

The results indicated that a recency bias had occurred. For example, the most recently experienced errors were more frequently cited as causes of the fluctuations of the financial ratios than errors not recently cited. The correlation, between the frequency which errors were generated as hypotheses and the ratings made by the second group of subjects of the frequency to which they perceived these errors to occur for all audits of manufacturing firms, was highly significant ($P < .01$).

Libby also tested the extent to which auditors' tendency towards conservatism would influence their perception of error frequency. He found that errors which

potentially could overstate net income and liquidity were cited significantly more often than errors which could possibly undersate net income and liquidity ($P < .001$ for sales errors, and $P < .011$ for purchase errors). Since the generation of hypotheses has been documented to be an integral component of a diagnostic task such as that performed by an analytical review (e.g., Elstein, Shulman and Sprafka, 1978), future studies should look at its impact on other parts of the analytical review judgment. Libby mentions how he did not have subjects identify unexpected fluctuations in account balances or determine the work they'd undertake to investigate these fluctuations. Those two judgments are examined in this study. Table 2.3 summarizes the results of the studies investigating analytical review based judgments.

Table 2.3
Summary of Studies of Judgment in Analytical Review

Study	Kinney and Uecker (1982)	Blocher, Esposito and Willingham (1983)
Subjects	154 audit seniors	44 auditors a. 32 audit supervisors b. 12 audit seniors.
Analytical Review Based Task	1. Set up boundary conditions for non-investigation of unaudited gross profit %.	1. Develop an audit program and time-budget for payroll expense. 2. Using analytical review identify the payroll expense accounts needing additional audit work.
Relevant Variables of Interest	1. Anchoring and adjustment heuristic. a. Unaudited book balance as either high or low.	1. Extent of tests of details in prior year's audit. 2. Checklist of suggested analytical review procedures.
Relevant Results	1. Unaudited book values had an impact on non-investigation intervals. a. For lower boundary the effect is significant ($P < .01$). b. For upper boundary the effect is less pronounced ($P < .09$).	1. High variability in time-budget allocation between tests of details and analytical review. 2. Most revisions of last year's audit work reduced testing. 3. Providing a checklist resulted in greater use of

	Kinney and Uecker (1982) continued	Blocher, Esposito and Willingham (1983) continued
		a more lengthy audit program. 4. In the aggregate subjects perceived tests of details and analytical review to be substitute substantive tests.
Study	Holder (1983)	Biggs and Wild (1985)
Subjects	35 audit seniors from national, regional, and local firms. 24 classified large firm participants, 11 classified as small firm participants.	Experiment One - 121 auditors. Experiment Two - 123 auditors. The experience of subjects for both experiments ranged from less than one year to more than twenty-four years.
Analytical Review Based Task	Analyze case study to: a. Devise and implement a program analytical review procedures. b. Identify audit risk areas.	Experiment One: 1. Estimate Gross Profit % and establish a noninvestigation 95% Confidence Intervals.
Relevant Variables of Interest	1. The manner in which different analytical review procedures are used in the planning stages by audit practitioners. 2. Firm size impact on analytical review procedures used.	Experiment One: 1. Variations in the amount of audited information available. a. two years. b. five years. 2. The presence or absence of unaudited information. Experiment Two: 1. The impact of

		Blocher, Esposito and Willingham (1983) continued
		six different deterministic time-series patterns.
Relevant Results	Based on all subjects the most extensively used procedures. a. Inventory turnover (85.7%) b. Gross Margin (82.9%) c. Accounts Receivable Aging Analysis (80.0%). d. Plant Asset Level - Trend Analysis (68.6%). e. Inventory Level - Trend Analysis (65.7%) f. Accounts Receivable Level - Trend Analysis (65.7%). 2. No significant difference in analytical review procedures used by members of small firms versus large firms.	Experiment One: 1. Judgments were biased in the direction of unaudited book values. 2. The bias was partially mitigated by providing long information sets. This implies that the amount of information supplied did not affect the the auditor's confidence in his decisions. Experiment Two: 1. Subjects were more accurate for increasing trends than decreasing trends. 2. Subjects more accurate for linear and log patterns than for exponential patterns.
Study	Libby (1985)	Biggs, Mock and Watkins (1985)
Subjects	Hypothesis generation task - thirty-seven audit managers. Frequency rating task Thirty-one additional audit managers.	4 auditors a. 2 seniors. b. 2 managers.

	Libby (1985) continued	Biggs, Mock and Watkins (1985) continued
Analytical Review Based Task	1. Generate possible errors which caused fluctuations in financial profile of firm. 2. List errors they recently experienced 3. Estimate the relative frequency of a number of financial statement errors for manufacturing firms.	Analyze case study in which the client was having problems with an account in sales and collection cycle. Subjects were to a. Prepare and implement a program of analytical review procedures. b. Evaluate and make revisions to the planned substantive program.
Relevant Variables of Interest	1. Availability and perceived frequency of error occurence. 2. The impact of recently experiencing an error on generation of hypotheses. 3. The role of conservatism. 4. The effect of listing superior's hypothesis of error.	1. The types of information auditors use in analytical review. 2. The decision process auditors use in analytical review. 3. The impact of experience on information acquistion, information evaluation, and the final decision made.
Relevant Results	1. Strong relationship between ratings of error occurrence and the error being generated as a hypothesis. 2. More recently experienced errors were cited more frequently as possible hypotheses.	1. All subjects pinpointed the error in accounts receivable. 2. Analytical review was used to extend substantive testing but not to reduce it.

Libby (1985) continued	Biggs, Mock and Watkins (1985) continued
3. Tendency towards conservatism strongly influenced types of errors cited (overstatement of net income rather than understatement). 4. Inclonclusive effect of receiving the inherited hypothesis.	3. Managers and seniors acquired and evaluated information differently. Experience appears to have influenced managers to understand complex inter-relationships between the analytical review results and audit work.

C H A P T E R III

Design of the Experiment

The primary purpose of this study is to examine if a conservatism tendency among auditors will influence auditors to use analytical review procedures to extend substantive testing but not to reduce the scope of audit work. Other objectives are to assess the effect of internal control reliability, experience and the type of information used on the utilization and reliance upon analytical review as a substantive test. This is tested by examining subjects' responses in a case study depicting the sales and collection cycle of an audit. Subjects were asked to use analytical review procedures as a substantive test to evaluate unaudited book values of accounts relevant to the sales and collection cycle. Given this data, subjects rendered a judgment on whether and to what degree they would modify the planned tests of details.

Case Selection, Case Description, and Subjects

The task setting involved a case study of the sales and collection cycle of an audit for a small to mid-size wholesale consumer products company. This setting is partially adapted from the case developed by Holder (1983) and modified by Biggs et al. (1985). Consequently, this allows some comparability between the results from this study and those found in their respective studies. In addition,

smaller companies were found by Hylas and Ashton (1982) to be most susceptible to account balance errors. For those companies, the most important account balance errors tend to occur in the sales and collection cycle.

The case was first developed from the setting used in the Biggs et al. study. It was then modified by discussions conducted with seven practicing auditors (three managers, one principal, and three partners) from national and regional firms, and through audit programs used by the firms to assist the auditors in planning and implementing an audit. Five more experienced auditors (three managers, one principal, and one partner) and five less experienced auditors (all seniors) took part in a pre-test in which they designed a detailed substantive audit program for the sales and collection cycle after receiving a brief description of the hypothetical client. During the pre-test auditors were asked to allocate audit hours to tests of details. The mean response of audit hours from the pre-test was used to establish a base rate for a sample audit plan. This process was necessary to ensure the face validity of the task.

Given this preliminary work, five types of information were made available to the subjects:

1. A brief description of the internal control system and results of compliance testing relevant to the sales and collection cycle.

2. Two years of audited financial statements and this year's unaudited account balances. It was presented in both absolute numbers and in common size terms. To facilitate the task, key ratios and trends relevant for implementing an analytical review of the sales and collection cycle were provided. From discussions held with practicing auditors, it was evident that computer software was used to generate an output containing trends and key ratios. The ratios and trends presented were based upon the analytical review procedures considered most important in the surveys of auditors cited in the literature review (e.g., Holder, 1983; Daroca and Wilder, 1985; and Biggs and Wild, 1984) data.
3. Industry data for ratios relevant to the sales and collection cycle. The average industry norms were adapted from a source used by at least two national accounting firms, the "Robert Morris Associates Annual Statement Studies."
4. Regression analysis based estimates of relevant sales and collection accounts. Subjects were told that the regression formulas were derived using four years of audited quarterly data to estimate the unaudited current year's account balances.
5. A description of planned tests of details for the sales and collection cycle. The audit plan was described to

subjects as being typical for a firm in this industry possessing an adequate internal control system. It was further noted that the plan involved tests of details only and did not consider analytical review results.

Subjects

One criterion for subject selection was that they have experience in planning an audit and using analytical review procedures. From discussions held with practicing auditors, it became evident that seniors and managers could both be used as subjects. Audit planning and the implementation of the audit work are initiated by the senior and reviewed by the manager, whose work in turn is reviewed by the partner in charge. Trotman (1985, p. 740) states, "The review process is an integral part of the standard operating procedures of audit firms."

Since one of the objectives of the study is to test the role of experience in the utilization of analytical review procedures, an equal number of questionnaires were distributed to managers and seniors. The use of practicing auditors, rather than students, as subjects is important because as Libby (1985, p. 649) points out, "Auditors bring a wealth of task related knowledge to the audit, acquired through years of training and experience. This is a key attribute that differentiates audit decision making from many

decision contexts examined in cognitive psychology."

Seven "Big Eight" firms and another large national accounting firm provided subjects from offices in Boston, Hartford, and New York. To ensure that the task was taken seriously, the questionnaires were distributed by a partner in each office. A total of one hundred and sixty eight questionnaires were distributed. Each of the partners received two follow-up phone calls. This resulted in ninety six questionnaires returned for a response rate of 57.14%. See Table 3.1 for a breakdown of response rate of subjects by firm and in total.

Table 3.1
Response Rate of Subjects by Firm and in Total

Firm	Responses Received	Questionnaires Distributed	Response Rate
Price Waterhouse	21	28	75.00%
Peat, Marwick, and Mitchell	17	40	42.50%
Arthur Young	14	18	77.78%
Arthur Andersen	13	20	65.00%
Coopers and Lybrand	12	20	60.00%
Laventhol and Horwath	9	14	64.29%
Ernst and Whinney	8	8	100.00%
Touche Ross	2	20	10.00%
Total	96	168	57.14%

Experimental Task

In this experiment, subjects were asked to generate two decisions:

1. Using analytical review procedures, they were to

determine whether any of the following sales and collection cycle unaudited account balances might possibly need an adjustment.

a. Sales,

b. Sales Returns and Allowances,

c. Bad Debt expense,

d. Accounts Receivable,

e. Allowance for Doubtful Accounts, and

f. Cash.

2. Determine if any modifications should be applied to the tests of details planned for the sales and collection cycle.

In order to make the experiment manageable to the subjects, only one cycle of the audit is examined. The sales and collection cycle is being used because this research is extending the work of Biggs et al. (1985). In that study, analytical review procedures pointed to an error in the unaudited balance of accounts receivable. Arens and Loebbecke (1980) list six sales and collection cycle accounts; sales, sales returns and allowances, bad debt expense, accounts receivable, allowance for doubtful accounts, and cash. Although cash is intertwined with other cycles of an audit (e.g., acquisition and payment cycle), it is included because there are audit tests

specifically tailored to examine the cash collections directly related to the sales and collection cycle.

The second decision involves the modification, if any is needed, to the planned tests of details. It was operationalized in the following manner. Subjects examined the basic audit plan which was developed in the preliminary discussions and pre-tests held with practicing auditors. Subjects were told that this plan was typical for companies in this industry possessing an adequate internal control system. They were asked to make changes, if any are needed, to the nature and quantity of testing. The rationale for including a question on modifications to the extent of the testing is because in the pre-test auditors indicated that the results of analytical review would most likely impact on the volume of testing and not the types of tests conducted.

For the second decision to have any research or practical implications, it was essential to design an audit plan which is realistic. To implement this goal, two approaches were used. First, the nature of tests to be conducted were derived from a review of substantive audit program guides obtained from a number of large national accounting firms. Second, ten practicing auditors (three managers, one principal, one partner, and five seniors) were asked to determine the extent of testing (the nature of tests were listed) for a hypothetical audit. The auditors were

provided with the current year's financial data and were told that the firm possessed an adequate internal control system. The auditors were asked to design the audit plan assuming no analytical review procedures are performed. This involved allocating audit hours to twelve categories of tests of details. The mean response in hours allocated for each category of audit work was used to establish the typical audit plan.[1] Margheim (1986) argues that an advantage to presenting subjects with a base plan, in planned audit hours, is that it probably would serve as an anchor. This, in turn, should reduce the high variability found in previous studies which examined auditors' judgments concerning the allocation of audit work (e.g., Joyce, 1976; Wright and Mock, 1986). Appendix A contains a description of the pre-test used to generate the sample audit plan.

After completing the case, subjects were asked to complete a questionnaire. In addition to biographical and background data, subjects evaluated the importance different types of information had as inputs to their analytical review based judgments. This was implemented in the following manner. On a seven point Likert-type scale subjects were

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1 One manager's response was thrown out for being an outlier. Without this subject included, the mean total hours was 46.78 with a standard deviation of 10.43. With this subject included, the mean response increases to 52.20 hours with a standard deviation of 19.76.

asked to evaluate the degree of importance they attributed to financial statement based ratio analysis, financial statement based trend analysis, industry comparisons, and the regression analysis generated estimates. Separate analyses were conducted on subjects' judgments to allow an indirect test on the effect different types of information have on analytical review judgments.

The final component of the questionnaire addressed the role of attitudes on analytical review judgments. It is strictly exploratory in nature and asked subjects to assess on a seven point Likert-type scale their perception of the strength of analytical review as a substantive test. The length of the questionnaire was 15 pages. The mean time to complete the questionnaire was 42.33 minutes (standard deviation of 18.98 minutes).

Summary of Design

Three treatment variables are manipulated:

1. Results of analytical review procedures either pointing to an error or not pointing to an error in account balances.
2. The reliability of the sales and collection cycle internal control system, and
3. Experience of the auditor.

Each of the treatment variables has two levels that are constant which results in a fixed effects model.

Analytical review results are manipulated to test if auditors are using analytical review procedures to reduce as well as extend planned substantive testing. Analytical review results either pointed to an error or no error in the unadjusted balances of accounts receivable, allowance for doubtful accounts, and bad debt expense. For all subjects, the analytical review results pointed to no errors for the unadjusted balances of sales, sales returns and allowances, and cash. The error involved an overstatement of accounts receivable and the allowance for doubtful accounts due to failure to write off questionable accounts.

The error for bad debt expense is less clear cut. It is assumed that the bad debt expense should be adjusted upwards for the current year because of the increasing problem of customers not paying off their open accounts. One could argue that no adjustment for bad debt expense should be made based on only three years of data. However, for the subjects who received analytical review results pointing to the error, forty-four (84.6%) did decide that bad debt expense might need an adjustment. This is opposed to fifteen subjects (34.1%) from the groups which received analytical review results pointing to no error.

The error in accounts receivable was adapted from the error used in the Biggs et al. (1985) study. That error had resulted in an adjustment rendered by an auditing firm to an

actual client. The modifications involve increasing the balance of accounts receivable and the allowance for doubtful accounts and changing the aging schedule in order that the error be more pronounced. This should result in a cleaner experimental manipulation of analytical review results. This was informally confirmed during the pretest involving the development of the sample audit plan. After completing the pretest, auditors were asked to examine the financial data and analytical review procedures which either pointed to an error or did not point to an error (the financial data and analytical review results for both the error and no error cases are found in Appendix C). For the five auditors who received the financial data pointing to error, the mean number of accounts which possibly needed an adjustment was 3, while for the other five auditors the mean number of possible adjustments was 0.8.

As an additional internal validity check, analysis was performed on the number of unaudited account balances subjects determined might need and adjustment. The analysis was performed separately for the number of adjustments made to all six accounts, to the three problem accounts and to the three non-problem accounts. It was expected that subjects who receive analytical review procedures pointing to an error will make adjustments to a significantly greater degree than subjects receiving analytical review procedures not pointing

to an error.

Since the judgment analyzed is a dichotomous decision (adjustment/no adjustment), a Chi-Square test was performed. For the analysis conducted on all six accounts and on the problem accounts, the analytical review manipulation was significant at the .001 level. In the non-problem accounts, analytical review was significant at the .05 level. This latter result was perhaps caused because subjects who had received the manipulation of analytical review signalling errors in some accounts had been somewhat cautious in their assessment of possible adjustments in the other accounts.[1]

The conclusion from the Chi-Square tests is that the analytical review manipulation was effective. Subjects who received analytical review results pointing to possible account balance errors, made a significantly greater number of adjustments. Therefore, the analytical review manipulation appears to be valid to test if auditors are conservative in their use of analytical review results.

The reliability of the internal control system was

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1 One possible confounding factor to the analysis was that subjects might have interpreted differently, the question of whether an account may possibly need an adjustment. At least two subjects interpreted the question in a very restrictive and conservative fashion. Both subjects expressed the opinion that until they had examined all of the audit evidence they could not rule out the possibility that an account needed an adjustment. Hence, they marked yes to all six accounts as possibly requiring an adjustment. Other subjects could have at least been influenced by this line of reasoning.

manipulated as stronger or weaker. To establish the face validity of the manipulation, twenty-eight questionnaires were mailed to audit professionals (not taking part in the experiment) who were randomly assigned to two groups. Subjects in each group were asked to examine a different internal control system for the sales and collection cycle, and evaluate on a ten point Likert-type scale the degree of reliance they would place on the internal control system when designing the substantive audit plan. The scale was anchored by (1) "No Reliance" and (10) "Maximum Reliance." The question and scale is patterned after one used by Libby, Artman and Willingham (1985). They argue that the use of a ten point scale will, (p. 221) "attempt to allow the auditors to make fine distinctions among internal control systems, while maintaining the tie to the actual scale used in practice." See Appendix B for a description of the two different internal control systems. A priori, it was expected that the difference between the evaluations of the two systems would be statistically significant. Twenty-three responses were received for a response rate of 82.1%. The mean (standard deviation) ranking assigned by the groups was 4.0 (1.7) for the group which had the description of the weaker system, and a 7.0 (1.7) for the group which had the description of the stronger system. A T-test demonstrated that the evaluations were significantly different between the

two groups ($P < .001$).

The role of experience was manipulated by distributing an equal number of questionnaires to seniors and managers. All seniors and managers were required to have performed analytical review judgments. The fact that subjects are already in the position of senior or manager creates some constraints in interpreting the results of the experience variable. This will be discussed in detail when describing limitations of the study. The mean (standard deviation) number of years of auditing experience was 3.04 (1.16) for seniors and 6.26 (1.58) for managers which a T-test found to be significantly different ($P < .001$). Other significant experience differences between seniors and managers were found for the degree of supervisory experience in audit planning ($P < .001$), the degree of experience in using analytical review procedures ($P < .01$) and the degree of experience in using statistically-based analytical review procedures ($P < .05$). All of the differences were in the expected direction of managers having more experience than seniors. Table 3.2 presents a summary of these tests of the manipulation of experience.

Table 3.2
Summary of T-tests on Experience Manipulation

Variable	Mean	Std. Dev.	T-value	P
1. Years of experience			-11.43	.001
Seniors	3.04	1.16		
Managers	6.26	1.58		
2. Supervisory Audit Experience			-5.43	.001
Seniors	4.82	1.45		
Managers	6.17	0.90		
3. Experience in Using Analytical Review Procedures			-2.56	.006
Seniors	5.36	1.35		
Managers	5.96	0.83		
4. Experience in Using Statistical Analytical Review Procedures			-1.97	.027
Seniors	2.10	1.33		
Managers	2.70	1.63		

Note: Variables 2-4 are based on a seven point Likert-type scale anchored by (1) "No Experience" and (7) "Great Degree of Experience." For all four of the above tests, there were fifty seniors and forty-six managers. The tests are based upon a pooled variance estimate. All tests showed similar levels of significance when utilizing a separate variance estimate. Since it was expected that managers would have more experience than seniors, all levels of significance are presented for a one-tailed test.

For the purposes of the experiment, each factor will be considered orthogonal and each level for the factors will be fixed. This results in a between subjects 2x2x2 fixed effects model. Twenty-one questionnaires were randomly assigned to one of the eight cells for a total of one hundred and sixty-eight. Responses were received from ninety-six subjects. Appendix C contains the questionnaire administered

to subjects. See Figure 3.1 for a breakdown of subjects by cell and by each of the levels of the independent variables.

Figure 3.1
Breakdown of Subjects by Cell and by Independent Variable

Seniors	I. C. Weak	I. C. Strong	
An. Rev. Signals Error	13	15	28
An. Rev. Signals No Error	12	10	22
	25	25	

Managers	I. C. Weak	I. C. Strong	
An. Rev. Signals Error	11	13	24
An. Rev. Signals No Error	11	11	22
	22	24	

All Subjects: 96
Analytical Review Signals Error: 52
Analytical Review Signals No Error: 44
Internal Control Weak: 47
Internal Control Strong: 49
Seniors: 50
Managers: 46

The eight treatment groups are:

Group 1: Analytical review procedures pointing to an error, weaker internal control system, and seniors.

Group 2. Analytical review procedures not pointing to an error, weaker internal control system, and seniors.

Group 3. Analytical review procedures pointing to an error, stronger internal control system, and seniors.

Group 4. Analytical review procedures not pointing to an error, stronger internal control system, and seniors.

Groups 5-8. Same as groups 1-4 except managers are used as subjects instead of seniors.

Hypotheses and Statistical Tests

A three factor ANOVA is utilized to investigate the effects of conservatism, internal control reliability, and experience, on the extent, if any, subjects will modify the planned tests of details. F-tests were conducted to determine if there are any significant main effects and significant interaction effects for the following model.

$$Y_i = \mu + \alpha_i + B_j + \gamma_K + \alpha B_{ij} + \alpha\gamma_{iK} + B\gamma_{jK} + \alpha B\gamma_{ijK} + \epsilon_L(ijK) \quad (1)$$

where: Y is the judgment.

μ is the overall constant or grand mean.

α is the analytical review procedures effect.

β is the internal control.

γ is the experience effect.

ϵ is the experimental error and is distributed $\sim(0,\sigma^2)$.

The error term is nested within each individual observation. All other terms are interaction effects.

The dependent variable, the extent to which subjects will modify the planned tests of details, is operationalized as follows:

(a) Number of hours of planned tests of details. This measures the total number of hours a subject allocates to

tests of details. The base rate for the testing is forty-seven hours.

(b) Net change in audit tests where the extent of testing increased or decreased. For example, if a subject increases five tests and decrease three tests, the net change in audit tests is a positive change of two tests.

(c) Net weighted average change in audit tests where the extent of testing increased or decreased. To capture the direction of the weighted average change in audit tests, the weighted average change in tests which were decreased are subtracted from the weighted average change in tests which were increased.

The experimental model is employed to test each of the procedures applied to operationalize the dependent variable. Similar to the Blocher et al. (1983) study, equal weighting will be given to each of the audit tests. They argue (p. 86), "We have chosen to weigh all steps equally in the analysis, as any other weighting scheme would be more controversial." The rationale for including a net change approach to operationalizing the dependent variable is to ensure that the direction of the modifications is in the direction expected. For example, it is expected that the groups which have analytical review procedures pointing to an error will be likely to make modifications whose net result will be to increase the extent of testing.

A similar analysis was also separately conducted on the modifications made by subjects to the audit plan for accounts in which an error occurs (e.g., accounts receivable and the related accounts of allowance for doubtful accounts and bad debt expense) and the modifications applied to the audit plan for accounts in which no error occurs (e.g., sales, sales returns and allowances, and cash). This was considered to ensure that the changes implemented by subjects to the sample audit plan were primarily made to the problem accounts and not to the non-problem accounts.

Hypotheses

The following hypotheses are analyzed within the framework of the experimental design.

1. Whether analytical review procedures point to an error or not will have no effect on the extent subjects will modify the planned tests of details.

One objective of this study is to detect if the results of analytical review procedures will have an effect on modifications made to planned audit work. It is expected that subjects who receive analytical review results signalling errors will allocate more hours to tests of details than subjects who receive analytical review results signalling no errors. In addition, the role of conservatism on the use of analytical review results will be examined. Although no one has directly tested the impact of

conservatism, a factor that differentiates the results in the audit decision making literature from findings in the psychology literature appears to be the influence of conservatism (e.g., Joyce and Biddle, 1981; Tomassini, et al., 1982; Kida, 1984; Libby, 1985; Biggs, et al., 1985;). Because of this conservatism tendency, one would expect that if the analytical review procedures point to an error, auditors will likely extend the audit plan. However, if the analytical review procedures do not point to an error, auditors will most likely not modify the audit plan to reduce the nature and extent of the tests of details. The conservatism tendency will be investigated by comparing the total hours allocated to the base rate of forty-seven hours.

2. The reliability of the internal control system will have no effect on the extent subjects will modify the planned tests of details.

The official auditing literature (SAS 23) suggests that auditors consider the reliability of the information when implementing analytical review procedures. Joyce and Biddle (1981b), and Bamber (1983) found that auditors are sensitive to the reliability of information when tested in a within-subjects design. However, Joyce and Biddle (1981b) did not find this result in a between-subjects design. Consequently, whether auditors will be sensitive to the reliability of the information when using analytical review is open to question.

3. Experience will have no effect on the extent subjects will modify the planned tests of details.

The literature on the effect of experience on auditors' judgments has been mixed. However, for more complex tasks, such as materiality judgments, experience does have a positive impact on the decisions (e.g., Messier, 1983). Since the task in this study is complex (using the analytical review results to modify the nature and extent of the audit work), it is expected that managers and seniors will differ in their modifications to the audit plan.

4. There is no interaction between analytical review results and internal control reliability.

One would expect to reject this hypothesis. If the results of the analytical review procedures point to an error and the reliability of the internal control system is not strong, then the interaction effect should influence auditors to significantly increase the planned tests of details. The increase is likely to be greater than that which would occur from the main effects only. This should transpire because the auditor is looking for results of substantive procedures (e.g., analytical review) to corroborate the previous work of the audit (e.g., his evaluation of the internal control system). Moreover, Cushing and Loebbecke (1983) assert that relying substantially upon analytical review results only makes sense if the analytical review procedures are generated

from numbers that emanate from a reliable system. Therefore, it is expected that there will be a significant interaction between the analytical review results and the reliability of the internal control system.

5. There is no interaction between analytical review results and experience.

From the findings of the Biggs et al. (1985) study, one would anticipate that the more experienced managers will only modify the nature and extent of tests of details that examine the account balances in which errors might have occurred. However, the less experienced seniors may modify tests concerning the whole sales and collection cycle. This would transpire because the managers are expected to be more effective than the seniors in understanding the subtle and complex link between analytical review results and audit work.

6. There is no interaction between internal control reliability and experience.

In the review of the literature on internal control evaluations, Ashton (1983) concluded that experience had an inconclusive influence. He attributes this result to the relatively simple and discrete nature of internal control judgments. Accordingly, one would not expect a significant interaction between internal control reliability and experience.

7. There will be no interaction between the analytical

review results, internal control reliability, and experience.

The literature on expert decision making (e.g. Elstein et al., 1978; Chi et al., 1981; Charness, 1981; Biggs and Mock, 1983) indicates that there should be a significant interaction between experience and the ability to perform tasks which involve an understanding of complex interrelationships between variables. As a result, one would expect that managers and seniors will differ in their ability to integrate different parts of the audit work to determine whether any modifications are needed to the planned tests of details.

Other hypotheses of interest examined in this study follow.

8. Subjects who attach greater importance to regression analysis review procedures will have a greater tendency to modify planned tests of details in both directions (i.e., reduce, as well as extend) than subjects who attach less importance to the regression analysis analytical review procedures.

To generate systematic variance, two groups are formed based on the subjects' responses to the question regarding the importance they attribute to the regression analysis output. A seven-point scale was used, anchored by (1) "Extremely Unimportant" and (7) "Extremely Important". Subjects with responses below the median response (4) were assigned to one

group and those subjects with responses above the median were assigned to another group.

Although this is an exploratory indirect test, it is likely that subjects using quantitative information rely more on analytical review as a substantive test. It is expected that those using quantitative information will have a greater tendency to modify planned tests of details in both directions (i.e., reduce as well as extend). As Wallace (1981) points out, auditors, using regression analysis for analytical review procedures, would have some objective piece of information to rely upon in case of possible litigation suits.

9. Subjects who perceive analytical review to be a strong substantive test will modify the planned tests of details to the same extent as those who perceive analytical review to be a weak substantive test.

Blocher et al. (1983) found, in a test of the anchoring and adjustment heuristic, that subjects, in the aggregate, perceived analytical review procedures and tests of details to be substitute tests. Furthermore, Biggs and Wild (1984), in a survey of auditors, discovered that there was a strong relationship between the perceived value of analytical review procedures and its usage. Hence, the test for this hypothesis will examine if there exists a discrepancy between the perceptions auditors have concerning the strength of

analytical review procedures, and their utilization of analytical review results.

Subjects were asked to evaluate the strength of analytical review procedures as substantive tests. A seven-point scale was employed, anchored by (1) "Extremely Weak" and (7) "Extremely Strong". Subjects with responses below the median response (5) were assigned to one group, and those subjects with responses above the median were placed in another group.

C H A P T E R IV

Data Analysis and Results

This chapter presents (1) the descriptive statistics in total, by cell, and by independent variable for each of the dependent variables, (2) the results of the 2x2x2 ANOVA and subsequent statistical tests performed, (3) the statistical analysis examining the impact of the perceived importance of regression data on audit plan modifications, and (4) the statistical analysis investigating the impact of the perceived strength of analytical review tests on audit hours allocated.

Input to the Data Analysis

Ninety-six subjects took part in the study. Each subject's response was analyzed for the modifications rendered to the hours of the complete audit plan, and as supporting analysis, the number of tests modified were examined.

The major emphasis is placed upon the dependent variable total hours because ultimately it is the total hours of the audit and not the number of tests modified which most influences the cost of the audit. Supplementary analysis was conducted on the number of tests modified to allow a comparison between this study and the Blocher et al. (1983) study.

ANOVA with Unequal Cell Size and Heterogeneous Variances

Because of the problem of unequal cell size, the

classical experimental design of ANOVA is not appropriate (Herr, 1986). Instead, the analysis was conducted utilizing the Regression option of ANOVA in SPSS which allows the researcher to test hypotheses about unweighted cell means.

To guard against problems due to the lack of homogeneity of variances between cells[1], the Brown-Forsythe ANOVA procedure in BMDP7D was performed on all dependent variables using the group as a factor. This procedure, which is robust to violations of the homogeneity of variance assumption, produced similar results as those found when utilizing the Regression option of ANOVA in SPSS.

Analysis of Total Hours: Total Audit Plan

The first set of statistical analyses concerns the modifications rendered to the total hours of the audit plan. The variable, total hours, measures the total number of hours a subject allocated to tests of details. The base rate for the testing is forty-seven hours. The means and standard deviations for total audit hours planned are reported in Figure 4.1, while the statistical analysis is presented in Table 4.1.

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1 The results from the Levene test for equality of variances, which Brown and Forsythe (1974) demonstrated to be robust to non-normality of data, found that the assumption of homogeneity of variance was in order for all tests except for the net weighted average number of tests for the total audit and the total hours of the non-problem accounts. For those tests, the assumption of homogeneity of variance was violated at the .01 level of significance.

Figure 4.1
Means (Standard Deviations) for Audit Hours: Total Audit

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	63.54 (15.43)	61.27 (14.69)	62.23 (14.80)
An. Rev. Signals No Error	64.13 (12.64)	49.35 (10.38)	57.41 (13.66)
	63.82 (13.87)	56.50 (14.20)	

Managers

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	69.55 (16.63)	58.39 (9.40)	63.50 (14.09)
An. Rev. Signals No Error	54.86 (9.71)	53.91 (12.22)	54.39 (10.78)
	62.21 (15.27)	56.33 (10.78)	

Base Rate: 47.00
All Subjects: 59.67 (13.81)
Analytical Review Signals Error: 62.87 (14.35)
Analytical Review Signals No Error: 55.90 (12.26)
Internal Control Weak: 63.09 (14.30)
Internal Control Strong: 56.43 (12.64)
Seniors: 60.16 (14.38)
Managers: 59.14 (13.30)

Table 4.1
Analysis of Variance for Audit Hours: Total Audit

Source of Variation	D.F.	M.S.	F	P
Main Effects				
Analytical Review (AR)	1	1379.55	8.17	.005
Internal Control (IC)	1	1264.54	7.49	.008
Experience (EXP)	1	4.14	0.03	.876
Two-Way Interactions				
AR x IC	1	8.62	0.05	.822
AR x EXP	1	92.62	0.59	.461
IC x EXP	1	34.13	0.08	.654
Three-Way Interaction				
AR x IC x EXP	1	752.51	4.46	.038
Residual	88	168.93		

The main effects for analytical review and internal control are significant ($P < .01$) as is the three-way interaction ($P < .05$). The effect for analytical review indicates that as analytical review signals errors more hours are assigned to the audit plan. However, subjects did not use the case of analytical review signalling no errors to reduce the hours of the audit plan, when compared to the base rate of forty-seven hours. For example, an examination of Figure 4.1 shows that for the best scenario of analytical review signalling no errors and a strong internal control, the seniors allocated 49.35 hours and managers assigned 53.91 hours.

Similarly, the effect for internal control indicates is that for a weak internal control system, more hours are assigned. For a weak system, 63.09 hours were allocated as opposed to 56.43 hours for a strong system. Thus, it appears

that in a between-subjects design, auditors are able to discriminate the differing reliabilities of the internal control systems and adjust the extent of their audit work accordingly.

Although the main effect for experience was not significant, it appears that this occurred because of offsetting interactions between the cells. An examination of the means in Figure 4.1 suggests that a different approach was used by seniors and managers in determining the number of hours of audit planning. For seniors only, similar hours are assigned except when both analytical review and internal control are pointing to no errors (49.35 hours versus 61.27 to 64.13 hours for the other three cells). On the other hand, looking at only managers, it appears that similar audit hours are allocated except when both analytical review and internal control are pointing to errors (69.55 hours versus 53.91 to 58.39 hours for the other three cells). One possible explanation for these different approaches could be that managers are looking for at least one area to be strong to keep the auditing hours close to the base rate, while seniors are looking for at least one area to be weak to make large increases in testing. The contrasting behavior could be caused by seniors trying to gain some time flexibility in implementing the audit. Since the conduct of the audit involves a review process between seniors and managers it

would be interesting to examine in a future study how this possible conflict in planned audit hours is resolved.

Comparing the individual cells, it becomes evident why the main effect for experience was not significant. For example, when the internal control system was weak, seniors allocated 63.82 hours and managers allocated 62.21 hours. However, for the case of analytical review results signalling errors and a weak internal control system, managers allocated more hours than seniors (69.55 versus 63.54). This difference reversed itself when the weak internal control system interacted with analytical review results signalling no errors (64.13 hours for seniors versus 54.86 hours for managers). Similarly, when the internal control system was strong both seniors and managers allocated approximately the same number of hours (56.50 and 56.33 respectively). Again, the individual cells showed different patterns of allocated hours. Seniors allocated more hours than managers when analytical review results signalled errors and the internal control system was strong (61.27 hours for seniors and 58.39 hours for managers). Contrary to this, the managers assigned more hours when the analytical review results signalled no errors and the internal control system was strong (53.91 hours for managers and 49.35 hours for seniors).

Because of the offsetting effects between the cells and the significant three-way interaction, additional analysis

was conducted separately for seniors and for managers. The ANOVA conducted separately for seniors and for managers is reported in Table 4.2. For seniors, internal control is significant (P = .034), while for managers analytical review is significant (P = .011) and internal control is marginally significant (P = .098).[1] The effect of analytical review for managers is to significantly increase the hours when analytical review signals error (an increase of 9.11 hours over the case of analytical review results signalling no problems). For seniors, the difference in hours between analytical review results signalling errors and not signalling errors is 4.82 hours. Therefore, the seniors are not utilizing the results of analytical review as much as the managers. The effect of internal control is for seniors to significantly increase the hours when internal control is weaker (an increase of 7.32 hours over the case of a strong internal control system). A similar, although weaker tendency, is present for managers (an increase of 5.88 hours).

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1 Since there is an average of only twelve subjects per cell, it was decided to consider all effects up to the .10 level as significant.

Table 4.2
Analysis of Variance for Total Hours,
Seniors and Managers: Total Audit

	Seniors		Managers	
Source of Variation	F	P	F	P
Main Effects				
Analytical Review (AR)	2.10	.154	7.08	.011
Internal Control (IC)	4.75	.034	2.86	.098
Two-Way Interaction				
AR x IC	2.56	.117	1.94	.171

One reason why subjects might have been conservative in using the results of analytical review and the description of the internal control system to extend testing but not to reduce testing is because the base rate presented could have been too low. However, the base rate of forty-seven hours was determined in a pre-test. For each category of audit work, the mean response from the pre-test was used to establish the sample audit plan. In addition, nineteen subjects did in fact reduce the total hours of the testing. Figure 4.2 presents a breakdown of subjects who reduced testing, by cell and by each level of the independent variables.

An examination of Figure 4.2 indicates that approximately 20% of the subjects did reduce the hours allocated for tests of details. At least some subjects reduced testing in every cell except the case for managers when analytical review results signalled errors and the

internal control system was weak. The reduction of testing across the cells for some subjects suggests that the base rate was plausible as a benchmark to reduce, as well as increase testing.

To further rule out the alternative hypothesis that the base rate and not a conservatism tendency caused the auditors to extend testing but not reduce it, a one-way ANOVA was performed by comparing the number of hours assigned by the pre-test group (46.78) and the two groups (seniors and managers) which received the analytical review procedures signalling no errors and a description of the internal control system being strong (49.35 hours for seniors and 53.91 hours for managers). The F value of 1.07 (P = .358) leads one not to reject the hypothesis that the hours assigned by the pre-test groups, which was used to establish the base rate, was any different than the hours assigned by either the seniors or managers who received signals that everything was in order. The results of the ANOVA combined with the finding that nineteen subjects did reduce the testing indicates that the base plan was a reasonable starting point to either reduce or extend testing in light of the analytical review results and the description of the internal control system.

Figure 4.2
Number (%) of Subjects by Cell and by Independent Variable
Who Reduced Total Hours of Testing

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	3 (23.07%)	3 (20.00%)	6 (21.43%)
An. Rev. Signals No Error	1 (8.33%)	4 (40.00%)	5 (22.73%)
	4 (16.00%)	7 (28.00%)	

Managers

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	0 (0.00%)	2 (15.40%)	2 (8.33%)
An. Rev. Signals No Error	2 (18.18%)	4 (36.36%)	6 (27.27%)
	2 (9.09%)	6 (25.00%)	

All subjects: 19 (19.76%)
Analytical Review Signals Error: 8 (15.38%)
Analytical Review Signals No Error: 11 (25.00%)
Internal control Weak: 6 (12.77%)
Internal Control Strong: 13 (26.53%)
Seniors: 11 (22.00%)
Managers: 8 (17.39%)

Analysis of Total Hours: Non-Problem and Problem Accounts

To determine what caused the results for the modifications made to the total audit plan, a separate set of analyses investigated how the subjects modified the hours of the non-problem accounts and how they modified the hours of the problem accounts. It was expected that the changes in total hours for the audit occurred predominately in the

problem accounts and not in the non-problem accounts. The base rate plan had assigned sixteen hours for the non-problem accounts and thirty-one hours for the problem accounts.

Figure 4.3 reports the means (standard deviations) for the total hours of the non-problem accounts and Figure 4.4 presents the means (standard deviations) for the total hours of the problem accounts. The results of the ANOVA conducted on the hours of the non-problem and problem accounts are shown in Table 4.3.

Figure 4.3
Means (Standard Deviations) for Total Hours:
Non-Problem Accounts

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	21.50 (10.86)	18.20 (5.60)	19.73 (8.45)
An. Rev. Signals No Error	22.29 (6.63)	17.85 (5.63)	20.27 (6.46)
	21.88 (8.90)	18.06 (5.49)	

Managers

	I.C. Weak	I. C. Strong	
An. Rev. Signals Error	25.55 (10.74)	18.46 (3.89)	21.71 (8.43)
An. Rev. Signals No Error	18.00 (4.98)	16.82 (7.55)	17.41 (6.27)
	21.77 (9.03)	17.71 (5.78)	

Base Rate: 16.00
All Subjects: 19.82 (7.60)
Analytical Review Signals Error: 20.64 (8.42)
Analytical Review Signals No Error: 18.84 (6.45)
Internal Control Weak: 21.83 (8.87)
Internal Control Strong: 17.89 (5.58)
Seniors: 19.97 (7.57)
Managers: 19.65 (7.70)

An examination of the results concerning the non-problem accounts shows that for all subjects only the internal control variable was significant (P = .010). The subjects increased the testing when the internal control system was weak (17.89 hours when internal control was strong

to 21.83 hours when internal control was weak). Interestingly, for managers, the significant effect of analytical review (P = .036), caused them to increase testing in the non-problem accounts when analytical review signalled errors in other accounts. This result is in contrast to Biggs et al. (1985) who found that managers only increased testing for the actual problem area. However, this effect was primarily caused by the case when analytical review signalled errors and the internal control system was weak. Investigating the individual cells in Figure 4.3, one finds that managers allocated 25.55 hours as opposed to seniors who allocated 21.50 hours. In the other cells managers only allocated between 16.82 hours and 18.46 hours which was close to the base rate of 16 hours.

Figure 4.4
Means (Standard Deviations) for Total Hours:
Problem Accounts

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	42.12 (7.85)	43.13 (12.43)	42.66 (10.38)
An. Rev. Signals No Error	41.75 (8.60)	31.60 (5.95)	37.14 (8.98)
	41.94 (8.05)	38.52 (11.69)	

Managers

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	44.00 (8.61)	39.92 (7.15)	41.79 (7.95)
An. Rev. Signals No Error	36.96 (8.20)	36.96 (9.25)	36.96 (8.53)
	40.48 (8.96)	38.56 (8.14)	

Base Rate: 31.00
All Subjects: 39.87 (9.32)
Analytical Review Signals Error: 42.26 (9.26)
Analytical Review Signals No Error: 37.05 (8.66)
Internal Control Weak: 41.26 (8.43)
Internal control Strong: 38.54 (10.00)
Seniors: 40.23 (10.08)
Managers: 39.48 (8.50)

For the problem accounts, the analytical review manipulation was significant (P = .003), the three-way interaction was significant (P = .039), and the internal control effect was marginally significant (P = .074). Although the main effect for experience was not significant,

Table 4.3
Analysis of Variance for Total Hours:
Non-Problem and Problem Accounts

	All subjects		Seniors		Managers	
Source of Variation	F	P	F	P	F	P
Non-Problem Accounts						
Main Effects						
Analytical Review (AR)	2.09	.152	0.01	.919	4.71	.036
Internal Control (IC)	6.98	.010	3.22	.079	3.81	.058
Experience (EXP)	0.03	.867	N.A.	N.A.	N.A.	N.A.
2-Way Interactions						
AR x IC	0.62	.434	0.07	.793	1.95	.170
AR x EXP	2.53	.115	N.A.	N.A.	N.A.	N.A.
IC x EXP	0.01	.931	N.A.	N.A.	N.A.	N.A
3-Way Interaction						
AR x IC x EXP	1.35	.248	N.A.	N.A.	N.A.	N.A.
Problem Accounts						
Main Effects						
Analytical Review (AR)	9.03	.003	4.94	.031	4.18	.047
Internal Control (IC)	3.28	.074	2.91	.095	0.69	.410
Experience (EXP)	0.01	.917	N.A.	N.A.	N.A.	N.A.
2-Way Interactions						
AR x IC	0.95	.334	4.35	.043	0.69	.410
AR x EXP	0.07	.797	N.A.	N.A.	N.A.	N.A.
IC x EXP	0.48	.490	N.A.	N.A.	N.A.	N.A.
3-Way Interaction						
AR x IC x EXP	4.37	.039	N.A.	N.A.	N.A.	N.A.

an examination of the cell means in Figure 4.4 indicates that the previously mentioned pattern for differences between managers and seniors is evident. For the managers only, the testing is about the same, except when internal control is weak and the analytical review results are signalling problems (44.00 hours versus 36.96 to 39.92 hours for the other cells). While looking at only seniors, the hours assigned are approximately the same, except when internal control is strong and the analytical review results are signalling no problems (31.60 hours versus 41.75 to 43.13

hours for the other cells).

The implication from the analyses conducted separately for the non-problem and problem accounts is that the changes to the audit plan for the problem accounts occurred primarily because of the analytical review results ($P = .003$ for all subjects). In contrast, the changes to the non-problem accounts were caused by the perceived strength of the internal control system ($P = .010$ for all subjects). Furthermore, the significance of the analytical review results for managers in the non-problem accounts ($P = .036$) was a function of changes made in only one cell. In the case where the analytical review results signalled problems in other account balances and the internal control system was weak the managers allocated 25.55 hours (base rate of 16 hours). Hence, the statistical results reported for the hours of the total audit plan are primarily caused by the analytical review results for the problem accounts and the strength of the internal control system for the non-problem accounts.

Summary of Results for the Variable Total Hours

The analysis performed on the variable total hours indicates a general tendency for auditors to use analytical review results to extend testing to a significantly greater degree than they use analytical review to reduce testing. For example, subjects who received the analytical review

results signalling errors allocated 62.87 hours to tests of details, while subjects who received the analytical review results signalling no errors allocated 55.90 hours. Subjects were able to discriminate in a between-subjects design the varying reliabilities of the internal control system and adjust the audit plan accordingly. The effect of internal control is to extent testing when it is weaker. Across all subjects, when the case presented a description of a weak internal control, a mean of 63.09 hours were allocated. This is in contrast to a mean of 56.43 hours when subjects received a description of a strong internal control system.

Although the main effect for experience was not significant, an examination of the individual cells suggests that this was caused because of conflicting interactions between analytical review results and internal control reliability. For example, in cases where the internal control system was strong, the managers allocated a mean of 56.33 hours and seniors allocated a mean of 56.50 hours. However, breaking this down by individual cells, when a strong internal control system is combined with the analytical review results signallign errors the managers allocated a mean of 58.39 hours and the seniors assigned a mean 61.27 hours. This difference was cancelled out by the cells of strong internal control and the analytical review results signalling no problems (53.91 hours for managers and

49.35 hours for seniors). Furthermore, examining only seniors the modifications to hours of testing appears to be approximately the same except when both analytical review and internal control are strong. On the other hand, managers tend to make approximately the same changes except when both analytical review and internal control are weak.[1]

Hypothesis Test Results

The test of the hypotheses involved an examination of the difference in means across cells for audit hours allocated to tests of details.

H1: H1 tests for an effect in the utilization of analytical review results. The null hypothesis of no effect is rejected for audit hours (P = .005) Subjects are using analytical review to a significantly greater extent when the analytical review results signal errors than when it is

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1 An analysis was also conducted on the absolute change in hours made to the total audit. The variable is defined as the change in hours from the base rate of 47 hours. For example, if two subjects allocated 37 and 57 hours respectively, the absolute change in hours for both subjects would be ten hours. This variable was intended to allow an additional test for the conservatism tendency by examining if the magnitude of modifications, in either an increasing or a decreasing fashion, is influenced by the independent variables. However, since there were subjects who increased and decreased testing in almost every cell, this variable contained too much noise to be utilized as a main variable. The results from the ANOVA performed on the absolute change in hours did corroborate the findings from the total hours variable with significant effects found for analytical review (P = .041), internal control (P = .041), and the three-way interaction (P = .033).

not signalling errors.

In addition, the subjects appear to be conservative in their utilzation of analytical review results. Over 80% of the subjects increased the testing above the base rate of 47 hours. Of the 44 subjects who received the analytical review results signalling no errors only 11 (25%) reduced the testing below the base rate. This suggests that auditors will primarily use the analytical review results to extend testing, but will be reluctant to use it to reduce the extent of testing.

H2: The test of H2 is whether internal control reliability will affect the extent of audit work. The null hypothesis of no effect is rejected for audit hours (P = .008). Subjects are attending to, in a between-subjects design, the reliability of the internal control system when making modifications to planned audit hours.

H3: Whether experience had an impact on modifications to planned audit hours is the focus of H3. The null hypothesis of no effect is not rejected. However, as discussed in the summary of results, the finding of no main effect for experience was caused by conflicting interactions between analytical review and internal control reliability.

H4 - H6: The question of whether there are any significant two-way interaction effects, is examined in the

tests for H4, H5, and H6. For all three hypotheses, the null hypothesis of no effect can not be rejected. This is partially attributable to the counteracting trends of the individual cells.

H7: H7 examines if there is a significant three-way interaction between analytical review results, internal control reliability, and experience. As hypothesized, the null hypothesis of no effect can be rejected for total hours (P = .038). Managers and seniors differed in the manner which they modified the planned tests of details in light of the analytical review results and the internal control reliability.

Analysis for the Modifications Rendered to the Number of Audit Tests

An additional set of analyses was performed on the number of tests in which the extent of testing either increased or decreased. They also examine the modifications in testing in a weighted average form. Since the examination of the number of tests modified is designed to supplement the analysis conducted on the variables concerning hours, only modifications rendered to the total audit plan will be presented.

The analyses investigating the number of tests modified, were conducted for two reasons. First, a previous study in the area of analytical review judgments used the number of tests modified as one of their primary independent variables

(Blocher et al., 1983). By examining the number of tests modified, a better comparison between the results of this study and the Blocher et al. study can be made. In addition, from a methodological point of view, it would be interesting to ascertain how the results derived from analyzing the number of hours allocated, converges with the analysis performed on the number of tests modified.

Analysis for the Net Number of Tests Modified

To determine the direction in which testing was modified, an analysis was performed on the net number of tests modified. The net number was calculated by subtracting out the number of tests in which the extent of testing was decreased from the number of tests in which the extent of testing was increased. For example, if a subject increased three tests and decreased two tests, the net number of tests modified is +1. Figure 4.5 reports the means (standard deviations) for the net number of tests modified. The ANOVA performed is found in Table 4.4.

Figure 4.5
Means (Standard Deviations) for the Net Difference in Number of Tests Modified: Total Audit

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	2.92 (3.88)	2.33 (4.45)	2.61 (4.13)
An. Rev. Signals No Error	4.58 (3.50)	1.00 (4.30)	2.96 (4.20)
	3.72 (3.73)	1.80 (4.35)	

Managers

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	4.64 (3.23)	2.31 (2.90)	3.38 (3.21)
An. Rev. Signals No Error	1.46 (3.14)	1.64 (4.95)	1.55 (4.04)
	3.05 (3.51)	2.00 (3.89)	

Base Rate: 12.00
All Subjects: 2.64 (3.91)
Analytical Review Signals Error: 2.96 (3.72)
Analytical Review Signals No Error: 2.25 (4.14)
Internal Control Weak: 3.42 (3.57)
Internal Control Strong: 1.85 (4.12)
Seniors: 2.76 (4.12)
Managers: 2.50 (3.71)

Table 4.4
Analysis of Variance for Net Number of Tests Modified: Total Audit

	All Subjects		Seniors		Managers	
Source of Variation	F	P	F	P	F	P
Main Effects						
Analytical Review (AR)	1.25	.266	0.02	.889	3.28	.077
Internal Control (IC)	4.55	.036	3.23	.079	1.47	.232
Experience (EXP)	0.07	.795	N.A.	N.A.	N.A.	N.A.
2-Way Interactions						
AR x IC	0.09	.770	1.66	.204	0.93	.341
AR x EXP	1.75	.189	N.A.	N.A.	N.A.	N.A.
IC x EXP	0.25	.620	N.A.	N.A.	N.A.	N.A.
3-Way Interaction						
AR x IC x EXP	2.54	.115	N.A.	N.A.	N.A.	N.A.

Internal control was the only variable which had a significant effect (P = .036) for the overall analysis. A weak internal control had the impact of increasing the net number of tests modified. This effect was more pronounced for seniors (P = .079) than for managers (P = .232).

However, for managers, analytical review had a marginally significant effect (P = .077). When analytical review signalled problems, the net number of tests modified increased. Similar to what was found with the variables total hours, the managers tend to generate similar increases in net number of tests modified except when both analytical review and internal control indicate problems (4.64 net tests modified versus 2.31 net tests modified for the next largest cell).

Unlike the findings from the variable total hours, the overall effects for analytical review and the three-way interaction were not significant. One explanation for this lack of convergence of results is that the variable net number of tests modified is ignoring the size of the modifications. This possible weakness, will be addressed by the next set of tests.

Net Weighted Average Number of Tests Modified

A problem with the preceding analysis is that all changes to tests are given equal weight. This set of analysis will discriminate between the magnitude of the

changes by examining the weighted average number of tests modified.

To determine the direction in which the weighted average number of test was modified, an analysis was performed on the net weighted average number of tests modified. The variable is calculated by subtracting the weighted average number of tests decreased from the weighted average number of tests increased. Figure 4.6 reports the means (standard deviations) for the net weighted average number of tests modified. The statistical analysis is presented in Table 4.5.

Figure 4.6
Means (Standard Deviations) for Net Weighted Average Number of Tests Modified

Seniors

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	5.54 (6.52)	4.42 (4.93)	4.94 (5.64)
An. Rev. Signals No Error	6.62 (5.32)	2.24 (4.59)	4.63 (5.37)
	6.06 (5.88)	3.55 (4.83)	

Managers

	I.C. Weak	I.C. Strong	
An. Rev. Signals Error	9.11 (8.29)	3.45 (2.59)	6.04 (6.45)
An. Rev. Signals No Error	3.28 (3.05)	2.12 (5.13)	2.70 (4.16)
	6.19 (6.79)	2.84 (3.92)	

Base Rate: 12.00
All Subjects: 4.63 (5.54)
Analytical Review Signals Error: 5.45 (6.00)
Analytical Review Signals No Error: 3.67 (4.85)
Internal Control Weak: 6.06 (6.20)
Internal Control Strong: 3.20 (4.42)
Seniors: 4.80 (5.47)
Managers: 4.44 (5.68)

Table 4.5
Analysis of Variance for Net Weighted Average
Number of Tests Modified: Total Audit

	All Subjects		Seniors		Managers	
Source of Variation	F	P	F	P	F	P
Main Effects						
Analytical Review (AR)	3.68	.058	0.12	.726	5.65	.022
Internal Control (IC)	8.12	.005	3.15	.083	5.14	.029
Experience (EXP)	0.05	.824	N.A.	N.A.	N.A.	N.A.
2-Way Interactions						
AR x IC	0.07	.801	1.11	.297	2.04	.161
AR x EXP	2.01	.160	N.A.	N.A.	N.A.	N.A.
IC x EXP	0.11	.743	N.A.	N.A.	N.A.	N.A.
3-Way Interaction						
AR x IC x EXP	3.07	.083	N.A.	N.A.	N.A.	N.A.

For the overall analysis, internal control was significant (P = .005). The internal control effect was to increase the weighted average number of tests modified when the internal control system was weak (6.06 versus 3.20 when the internal control system was strong). Analytical review (P = .058) and the three-way interaction (P = .083) were marginally significant. The effect for analytical review indicates that subjects made significantly greater increases when analytical review signalled problems. An examination of the results in Table 4.5 for seniors and managers discloses that, for seniors, internal control was marginally significant (P = .083), and, for managers, analytical review (P = .022) and internal control (P =.029) were significant.

Comparing the results from this variable, with the analyses conducted on total hours, there seems to be a moderate degree of convergence. For example, the effect of

analytical review to increase the net weighted average number of tests modified when the analytical review results signal potential problems is similar to the effect of increased hours found with the total hours. Of the two variables analyzed in conjunction with the number of tests modified, the net weighted average appears to best capture subjects' judgments. This is because the variable takes into account both the magnitude and the direction of the tests modified.

Summary of Results for the Variables Net Number and Net Weighted Average Number of Tests Modified

The analysis performed on the net number and net weighted average number of tests modified tends to support the contention that analytical review results are utilized to a greater degree to extend testing than they are used to reduce testing. Furthermore, internal control will influence auditors to expand testing when it is weaker. Although the main effect for experience was not significant, an examination of the individual cells suggests that seniors and managers are modifying the audit testing differently. Similar to the results found when analyzing modifications made to the hours of the audit plan, the seniors expand the testing approximately the same except when analytical review results signal no problems and the internal control system is strong. On the other hand, the changes managers are implementing are only significantly different when the analytical review results project potential problems and the

internal control system is weak.

A problem with relying upon the analysis concerning the net number and net weighted average number of tests modified is that it is the total hours of the audit and not the number of tests which ultimately determines the cost of the audit. Therefore, this analysis was designed to supplement and corroborate the analysis performed upon the modifications made to the hours of the audit.[1]

From a methodological point of view, it appears that if a researcher is analyzing the modifications in tests, the best variable to utilize is the net weighted average number of tests modified. This variable at least partially captures the magnitude and direction in which changes in audit testing are being implemented. In this study, the net weighted average variable demonstrated moderate convergence with the results found with the variable total hours. For example, examining the ANOVA conducted on all subjects the net weighted average variable had significant effects for internal control ($P = .005$) and marginal effects for analytical review and the three-way interaction ($P = .058$ and $P = .083$ respectively). This compares with significant

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1 The analysis was also performed separately for the non-problem and problem accounts. Although more tests were modified for the problem accounts (over all subjects, a mean of 3.90 out of a base of six tests), a large number of non-problem acocunts were also modifled (a mean of 3.19 tests out of a base of six.)

effects found in the ANOVA conducted on total hours for analytical review (P = .005), internal control (P = .008), and the three-way interaction (P = .038).

Analysis for the Effect of Regression Analysis on the Hours Allocated to Audit Testing

Hypothesis 8 is interested in the effect of the perceived importance of regression analysis on the extent of audit testing. It was hypothesized that subjects who placed greater emphasis on the regression analysis results would allocate less hours to tests of details than those subjects who placed less emphasis on the regression analysis results. To test this hypothesis, subjects were divided into two groups based upon their evaluation on a seven-point scale of the importance regression analysis data had upon their evaluation of the sample audit plan. The seven-point scale was anchored by (1) "Extremely Unimportant" and (7) "Extremely Important". Subjects with responses below the median response (4) were assigned to group 1 and those subjects with responses above the median were assigned to group 2.

Table 4.6 reports the results of T-tests conducted on the hours allocated to tests of details for all subjects and for the two levels of each of the independent variables. Although none of the results are significant at the .05 level, in every instance group 2, which perceived regression

analysis to be more important, assigned less hours for audit testing that those subjects who perceived regression analysis to be less important. The magnitude of the difference is much more pronounced for managers (54.38 hours versus 61.17 hours with P = .053) than for seniors (59.79 hours versus 59.98 hours with P = .484). This difference is probably attributable in part to the greater degree of experience managers have in using regression analysis as an analytical review procedure (see Table 3.2 for the differences in experience between the managers and seniors). Overall, the results suggest that to be more efficient in their auditing, firms could place greater emphasis on the application of regression analysis as a viable substantive test.

Table 4.6
Summary of T-tests on the Effect of Perceived Importance of Regression Analysis on the Total Hours Allocated

Subjects	N. of Cases	Mean	Std. Dev.	T-value	P
All	GRP1-46	60.58	15.15	1.01	.158
	GRP2-29	57.55	10.72		
Seniors	GRP1-23	59.98	16.51	0.04	.484
	GRP2-17	59.79	11.04		
Managers	GRP1-23	61.17	14.00	1.67	.053
	GRP2-12	54.38	9.82		
An.Rev. Error	GRP1-24	65.08	16.93	1.46	.077
	GRP2-17	59.21	8.54		
An. Rev. No Error	GRP1-22	55.66	11.37	0.10	.461
	GRP2-12	55.21	13.28		
I.C. Weak	GRP1-22	63.39	16.57	0.83	.206
	GRP2-17	59.68	11.27		
I.C. Strong	GRP1-24	58.00	13.55	0.89	.192
	GPR2-12	54.54	9.54		

Note: Because of the the large differences in sample size and variances between groups, all T-tests were conducted assuming a separate variance estimate. All significance levels are presented for a one-tailed test.

Analysis of the Effect of Perceived Strength of Analytical Review as a Substantive Test

A similar analysis, as that conducted on the regression analysis data, was performed on subjects' evaluations of the strength of analytical review procedures as a substantive test. The seven-point scale was anchored by (1) "Extremely Weak" and (7) "Extremely Strong". The subjects were divided by the median response (5) into high and low strength groups.

The hypothesis of interest, H9, focused on whether subjects who perceived the analytical review procedures to be a stronger substantive test would modify tests of details to a greater extent, than subjects who perceived the analytical review procedures to be a weaker substantive test. Table 4.7 reports the results of T-tests conducted on the hours allocated to tests of details for all subjects and of the two levels of each of the independent variables. The results were insignificant with the highest level of significance achieved being only .325 (for internal control being strong). No discernible effect emerged on the total hours from the evaluation by subjects of the strength of analytical review as a substantive test. Hence, there appears to be a discrepancy between the perception of the strength of analytical review procedures as a substantive test, and the extent to which auditors will rely upon their results to modify tests of details.

Table 4.7
Summary of T-tests on the Effect of Perceived Strength of Analytical Review Tests on the Total Hours Allocated

Subjects	N. of Cases	Mean	Std. Dev.	T-value	P
All	GRP1-24	61.46	12.40	0.29	.772
	GRP2-43	60.43	16.08		
Seniors	GRP1-14	60.96	11.65	0.00	.997
	GRP2-18	60.94	18.35		
Managers	GRP1-10	62.15	14.00	0.39	.698
	GRP2-25	60.06	14.62		
An. Rev. Error	GRP1-14	64.79	11.68	-0.05	.964
	GRP2-24	65.00	16.97		
An. Rev. No Error	GRP1-10	56.80	12.44	0.43	.670
	GRP2-19	54.66	13.13		
I.C. Weak	GRP1-9	65.28	15.54	0.11	.912
	GRP2-25	64.60	15.26		
I.C. Strong	GRP1-15	59.17	9.98	1.00	.325
	GRP2-18	54.64	15.78		

Note: Because of the large differences in sample size and variances between groups, all T-tests were conducted assuming a separate variance estimate. Since it was hypothesized that there would be no differences between the groups, all significance levels are presented for a two-tailed test.

Additional Analysis

Statistical analysis was conducted to see if any of the cells differed in the time it took to complete the task and the degree to which subjects found the task and materials in the study to be interesting. In both cases, the results from ANOVA found no significant differences between the cells (P = .335 for minutes and P = .595 for the degree to which the

task was perceived to be interesting). This indicates that differences in the extent of audit planning across the cells was not caused by either the amount of time it took to complete the task or the degree to which subjects found the task to be interesting.

Another question of interest was whether subjects would differ in the importance they placed on different types of information. Subjects were asked to evaluate on a seven-point scale the importance of industry data, financial ratios, financial statement trends, and the description of the internal control system. For all four types of information, the ANOVA found no significant differences across the cells ($P = .788$ for industry data, $P = .449$ for financial ratios, $P = .935$ for financial statement trends, and $P = .623$ for the description of the internal control system). Apparently, the perceived importance of various types of information did not cause the differences between the cells in the allocation of audit hours.

C H A P T E R V

Conclusions

This chapter will first summarize the results of the study and compare the findings to those disclosed in other studies in the area of analytical review. Next, the implications of the findings for the accounting profession and accounting research will be discussed. An assessment of the limitations of the study will then be presented. The final section will examine possible future research to evaluate analytical review based judgments.

Summary and Findings of the Study

The primary objective of this study was to examine whether a conservatism tendency will predispose auditors to utilize the results from analytical review procedures to only extend, but not reduce, the planned tests of details. The study also assesses the extent to which analytical review based judgments are affected by internal control reliability, experience, and the type of information used. This is tested by examining subjects' responses in a case study depicting the sales and collection cycle of an audit. Ninety-six auditors, representing eight national public accounting firms from offices in Boston, New York, and Hartford, took part in the study.

The results of the analytical review procedures, internal control reliability and experience were each

manipulated to have two levels. For the purpose of the study, each factor is considered orthogonal resulting in a between-subjects 2x2x2 fixed effects model.

The analysis focused on subjects' modifications made to planned tests of details for the sales and collection cycle. Total hours is the main dependent variable because ultimately it is the number of hours of audit work which primarily determines the cost and relative efficiency of an audit. Supplementary analysis was also conducted on the number of tests of details modified.

It was hypothesized that the results of analytical review procedures, the reliability of internal control, and experience would influence subjects' decisions to modify planned tests of details. The results for total hours revealed significant main effects for analytical review (P = .005), internal control reliability (P = .008), and a three-way interaction (P = .038).

The major finding of the study is that there is a conservatism tendency among auditors in their use of analytical review results. Auditors utilized analytical review results when it signalled possible errors to extend planned tests of details. However, when the analytical review results signalled that the account balances were in order, the auditors did not reduce the planned testing. For example, in the best case scenario of analytical review

results signalling no errors and a strong internal control system, the mean hours allocated were 49.35 for seniors and 53.91 for managers (base rate of 47 hours).

Another important finding of the study is that, in a between-subjects design, auditors were able to discriminate between the varying reliabilities of the internal control system and adjust the audit plan accordingly. The mean total hours allocated was 63.09 hours for a weak internal control system, and 56.43 hours for a strong internal control system.

Experience, operationalized as either seniors or managers, and all two-way interactions did not have significant effects. However, the main effect for experience was not significant because of conflicting interactions between the individual cells. For example, although seniors and managers allocated approximately the same hours when the internal control was strong (56.50 and 56.33 respectively) the individual cells had different patterns. In the case of an interaction with the analytical review results signalling errors, the seniors allocated more hours (61.27 versus 58.39 for managers). The magnitude of the difference was cancelled out when the analytical review results signalled no errors (53.91 hours for managers and 49.35 hours for seniors).

Another interesting difference to emerge when examining the individual cells is that for seniors only, the same changes to the audit plan were implemented in all cases

except when the results of the analytical review procedures signalled no errors and the internal control system was strong (49.35 total hours allocated to tests of details versus a range of 61.27 to 64.13 total hours allocated for the other cells of the seniors). On the other hand, managers kept the same changes to the audit plan in all cases except when the results of the analytical review procedures signalled errors and the internal control system was weak (69.55 total hours allocated versus a range of 53.91 to 58.39 total hours allocated for the other three cells).

The results of the ANOVA conducted separately for seniors and managers also revealed some interesting differences. For seniors, only internal control was significant ($P < .05$), while for managers the analytical review manipulation emerged as the most significant variable ($P < .05$). The differences between managers and seniors will be discussed further in the chapter when comparing the results of this study with previous studies.

Subjects were also asked to indicate how important the regression analysis data was in their evaluation of the sample audit plan. In addition, they were asked to assess the strength of analytical review as substantive tests. Dividing subjects into two groups (either above or below the median response), T-tests were conducted on both questions to determine if there were any effects on the dependent

variable, total hours. No significant effects were found. However, for all tests (for all subjects and for each of the two levels of the independent variables) those who ranked regression analysis as more important in their evaluation of the sample audit plan, assigned less hours to the audit plan. It would be interesting to examine in a further study if relying more on regression analysis data will result in a more efficient and less costly audit.

It is interesting that the perceived strength of analytical review procedures as a substantive test had no impact on the modifications made to the planned tests of details. Hence, there appears to be a discrepancy between the perception of the strength of analytical review procedures and the use of analytical review results. One explanation could be that to understand and predict an auditor's use of analytical review procedures, one must gather data on an auditor's attitude towards possible outcomes associated with utilizing analytical review results. This issue will be discussed further in conjuction with possible future studies.

Comparing the results of this study to those of Biggs et al. (1985), the effect of analytical review on the audit work is quite similar. Biggs et al. also observed, in an in-depth protocol analysis of four auditors, that the results from analytical review procedures influences auditors to

extend audit testing when it signals problems but not to reduce audit testing when it signals no problems. This conservatism tendency found in a protocol analysis of four auditors from a single firm was corroborated in this study on a larger sample of ninety-six auditors across eight firms.

Biggs et al. also found a difference in the decisions of seniors and managers which they attribute to the superior ability of managers to identify the subtle and complex relationships between analytical review evidence and audit program changes. In this study, since there was no unambiguous criterion variable, it is less evident whether the judgments of the managers were superior to the judgments of the seniors. It is interesting though, that one of the differences that emerged between the seniors and managers is that the results of analytical review procedures was the most significant variable for the managers, while the reliability of internal control was the most significant variable for the seniors. One possible explanation for this outcome could be that managers simply have more experience in using analytical review procedures. On the other hand, the literature on internal control evaluations has demonstrated no significant effects for experience (e.g., Ashton, 1974; Ashton and Brown, 1980; and Hamilton and Wright, 1982). Hence, since seniors are competent in internal control evaluations, they might be predisposed to rely more on the internal control information

than on the less familiar and more complex results emanating from analytical review testing.

Wright and Mock (1986), in a study of evidential planning decisions for an audit of the inventory account, found that although auditors had high consensus on the attributes they were seeking in audit evidence, they had low consensus in applying audit hours for testing. Furthermore, auditors disproportionately allocated audit hours to tests of details as opposed to analytical review procedures and physical observation. This outcome occurred even though the auditors did not agree in their evaluations of which audit procedures were superior in the attributes considered important for audit evidence. One explanation for their results could be the conservatism bias revealed in this study that auditors generally utilize the results of analytical review procedures to extend the tests of details but rarely to reduce them.

The results of this study and the studies of Biggs et al. (1985) and Wright and Mock (1986) tend to support the idea that auditors are not utilizing analytical review to its fullest potential. Apparently, auditors are effectively using analytical review as a red flag to highlight areas of potential problems where more work is needed. However, they appear reluctant to use analytical review procedures to reduce the tests of details. This transpires even if, as in

the Wright and Mock study, auditors don't consider tests of details to be superior to analytical review procedures in the attributes they consider important for audit evidence.

The conservatism tendency is in contrast to what is suggested by Blocher et al. (1983). Their study, of an audit of the payroll expense account, found that auditors are primarily using analytical review results to reduce testing. However, their finding is based on the number of audit steps reduced. As discussed in this study, it is the number of hours of testing, and not the number of tests, which ultimately determines the cost of the audit. Furthermore, in this study the number of tests modified was examined. The results indicate that if one wants to examine the modifications in tests, the net weighted average number of tests modified is the best dependent variable to use. This is because the net weighted average takes into consideration both the direction and magnitude of any changes.

Implications for Accounting

Given the extremely volatile and competitive market conditions facing auditing firms, it will be necessary for auditors to exercise greater cost control in the future. Analytical review is an officially accepted auditing technique (SAS 23, 1978) which could help auditors achieve greater efficiency without relinquishing a material amount of accuracy. In fact, Hylas and Ashton (1982) suggest that

analytical review is highly effective in revealing account balance errors.

The results of this study indicate that auditors are conservative in their use of analytical review. An outcome of this conservatism tendency is that analytical review will be conducive to increasing, and not decreasing, the cost and extent of the audit work. Perhaps auditing firms should focus increasing attention and resources on educating auditors to utilize analytical review not only as a "red flag", but also as a substantive test.

On the other hand, the results of the internal control manipulation demonstrate that auditors are evaluating the reliability of the information when utilizing analytical review procedures. Although the main effect for internal control was significant, the two-way interaction between analytical review and internal control was not statistically significant. However, a comparison of the individual cells shows, that for both the case of analytical review signalling errors and for the case where it is signalling no errors, a weak internal control system resulted in more total hours allocated to tests of details. This is in accordance with SAS 23 (1978, p. 43) which states when planning and performing analytical review procedures, "The auditor should consider the possibility that financial or nonfinancial information might not be reliable based on his knowledge of

the entity, including his knowledge of the means by which the information is produced."

The reason why seniors and managers differed in the pattern of interactions of the individual cells is open to speculation. One explanation which is suggested by the expert decision making literature is that the more experienced decision makers (i.e. the managers) are focusing in on the most salient pieces of information. The significance of the analytical review manipulation for managers in the non-problem accounts (P = .036) appears to contradict this explanation. However, an examination of the hours allocated in each of the cells demonstrates that this result was primarily caused by changes made in the case where the analytical review results signalled errors in other account balances and the internal control was weak (25.55 hours as compared to a range of 16.82 to 18.46 hours for the other three cells and a base rate of 16 hours). Perhaps an attempt should be undertaken to model the decision processes of auditors to gain a better insight to why the patterns of the judgments of seniors and managers are so different. This is an issue to be addressed in a future study.

The results of the study also have implications for accounting research. In Chapter I it was hypothesized that one reason why some findings in psychology were not corroborated when examined in an auditing context was because

of a conservatism tendency among auditors (e.g., Joyce and Biddle, 1981a; Tomassini, et al., 1982; and Kida, 1984). The results of this study suggest that the judgments of auditors will be influenced by a propensity towards conservatism. Thus, when accounting researchers are testing hypotheses emanating from the psychology discipline, they should attempt to either control for conservatism or else test for conservatism as a rival hypothesis.

Limitations of the Study

Like most experimental research this study has limitations. First, although the task was generated with assistance from practicing auditors, it still is a simplified representation of the auditing process. To gain more external validity, it would have been preferable to use actual audit workpapers. However, client confidentiality precludes their accessibility to most research.

As mentioned in the design section, a second limitaiton of the study might be in interpreting the results from the experience variable. The typical approach in operationalizing an independent variable is to randomly assign subjects to the different levels of the factor. In the case of the experience variable this would result in randomly assigning subjects to be either a senior or a manager. Since this is impossible to accomplish when using real auditors as subjects, the effect of the experience

variable could be attributable in part to other factors which distinguish managers and seniors. A future study could address this issue by trying to match up seniors and managers on such characteristics as technical ability, education, etc.

Probably the most important limitation is the possibility that the base rate was set too low. If the base rate of forty seven hours was too low, then the finding of a conservatism tendency in the utilization of analytical review results would not be surprising. However, the base rate was established from a pre-test. In addition, the fact that nineteen subjects across a variety of cells did reduce the total hours of testing suggests that the base rate was a reasonable starting point.

Another limitation arises because of the lack of a single unambiguous measure of the dependent variable. To rectify this limitation, the dependent variable was operationalized by a number of different procedures. It is hoped that by utilizing a multiple approach, the extent to which subjects modified the planned tests of details was effectively captured. Furthermore, at least the general direction for the results derived from the variable total hours was corroborated by the supplementary analysis conducted on the netnumber and the net weighted average number of tests modified.

In addition, some experimental control was forfeited

because subjects completed the questionnaire without the experimenter present. This could result in subjects not taking the questionnaire seriously. However, since the mean time to complete the task was 42.33 minutes (standard deviation of 18.98 minutes), it appears that subjects were at least attempting to analyze the materials distributed to them.

Directions for Future Research

The finding in this study of a conservatism tendency among auditors in their use of analytical review results raises the question of what other variables affect the reliance upon analytical review procedures. One factor could be an auditor's perspective of possible costs that might emanate from his decisions. Auditors could be willing to incur the extra costs of extensive tests of details for lowering their perceived probability that they would miss a material misstatement of the financial statements. A future study could address this issue by trying to develop an auditor's loss function. Perhaps a process tracing technique could be utilized to reveal an auditor's decision processes as well as his judgments.

Libby (1985) found that auditors are more likely to generate hypotheses for errors that would overstate net income and liquidity rather than understate net income and liquidity. One explanation for his result is that the perceived costs associated with overstating net income and

liquidity is greater than the perceived costs of understating net income and liquidity. It would be interesting for a future study to examine if the type of account balance error (e.g., overstatement or understatement of net income and liquidity) would affect the use of analytical review judgments. It appears likely that for the potentially less costly understatement errors, auditors would rely to a relativly large degree on analytical review procedures as substantive tests.

The reason why there is a discrepancy between the perceived strength of analytical review procedures and the utilization of analytical review results could be addressed by investigating the impact of attitudes upon analytical review based judgments. It's suggested by the attitude literature (e.g., Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980; Kida, 1980) that an auditor's use and reliance upon analytical review as a substantive test will be heavily influenced by their attitudes towards possible outcomes associated with using it as a test. This would involve eliciting possible outcomes associated with using analytical review procedures (e.g., the reliance upon analytical review as a substantive test will result in increased litigation against the auditing firm). It would be of interest to determine how the beliefs about the outcomes associated with using analytical review procedures will

affect an auditor's judgment and consequent behavior concerning the extent to which they will rely upon analytical review results.

Finally, an extension could be made to the exploratory work in this study concerning the usefulness of regression analysis data as an analytical review procedure. Although the results were not statistically significant, the direction of the data gathered in this study suggests that auditors who utilize regression analysis as an analytical review procedure may be more efficient in their audit. A possible extension to this research would be to investigate the effect of providing or not providing the regression analysis data, holding all other factors constant. Since the review of the literature in Chapter II reveals that regression analysis is an effective substantive test (e.g., Albrecht and McKeown, 1977; Kinney, 1978; Kaplan, 1979; Akresh and Wallace, 1980; etc.), it would be interesting to determine if using regression analysis will result in less audit work. If so, firms could become more cost efficient in their audit without adding a material amount of risk to their firm.

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Appendices

Appendix A

Questionnaire for Development of the Sample Audit Plan

Appendix A contains the questionnaire used to develop the sample audit plan. All subjects participating in the pretest completed the same questionnaire.

General Instructions

Assume you are designing an audit plan for substantive testing to be performed on the sales and collection cycle. The client involved is a wholesaler of consumer products. It has been a client for several years and has typically received an unqualified opinion. This year's sales are approximately 13 million dollars and its assets are approximately 7 million dollars. This industry is expected to experience growth in the foreseeable future.

Other factors concerning the firm include the following:

1. The internal control system is considered adequate. It has been decided to place a moderate degree of reliance on the internal control system when determining the extent and nature of the auditing plan.

2. The company has its own credit department.

3. Accounts Receivable represents approximately 15-25% of the firm's total assets.

4. All sales are for credit, with terms, net 30. Seasonality is not considered an important factor in sales.

A summary of the current year unaudited financial statements are attached. Based on the above description, and a review of the current year's unaudited financial statements, you will be asked to determine the nature and extent of substantive tests of details that you would typically use to test the following accounts: (a) sales, (b) sales returns and allowances, (c) accounts receivable, (d) allowance for doubtful accounts, (e) bad debt expense, and (f) cash. Note, we are interested in what you consider to be the typical nature and extent of tests for the size and type of firm presented here. You are to design the audit plan assuming that no analytical review procedures are performed.

Tests of details, relevant to testing the account balances of sales, sales returns and allowances, accounts receivable, allowance for doubtful accounts, bad debt expense and cash are listed after the financial statement data. Please indicate whether you would perform each test and the extent to which you would perform the test. Assume that last year it took approximately 80 person hours to perform this section of the audit. Your current audit plan does <u>not</u> have to equal 80 hours. As stated, design the audit plan assuming no analytical review procedures are performed.

Balance Sheet Current Year--Unaudited

Assets	$ Amount	% of Total Assets
Cash	331,440	4.9
Gross Accounts Receivable	1,190,478	17.6
Less: Allowance for Doubtful Accts.	(101,461)	(1.5)
Net Accounts Receivable	1,089,017	16.1
Inventory	2,408,012	35.6
Note Receivable--Current	47,348	0.7
Other Current Assets	459,957	6.8
Total Current Assets	4,335,774	64.1
Property Plant and Equipment	2,332,609	34.5
Less: Accumulated Depreciation	(297,619)	(4.4)
Net Property, Plant and Equipment	2,034,990	30.1
Intangibles--Net	83,820	1.2
All Other Non-Current Assets	309,494	4.6
Total Assets	6,764,078	100.0
Accounts Payable	2,462,125	36.4
Current Portion--Long Term Debt	561,418	8.3
Other Current Liabilities	229,979	3.4
Total Current Liabilities	3,253,522	48.1
Long Term Debt	1,496,893	22.1
Other Non-Current Liabilities	20,292	0.3
Common Stock	234,750	3.5
Retained Earnings	1,758,621	26.0
Total Shareholder's Equity	1,993,371	29.5
Total Liability and Owner's Equity	6,764,078	100.0

Income Statement Current Year--Unaudited

Income	$ Amount	% of Net Sales
Sales	13,854,089	101.9
(Sales Returns & Allowances)	(252,155)	(1.9)
Net Sales	13,601,934	100.0
(Cost of Sales)	(9,087,943)	(66.8)
Gross Profit	4,513,991	33.2
(Bad Debt Expense)	(489,670)	(3.6)
(Other Operating Expenses)	(2,990,435)	(22.0)
Operating Income	1,033,886	7.6
(All Other Expenses--Net)	(81,612)	(0.6)
Earnings Before Taxes	952,274	7.0
(Income Taxes)	(285,682)	(2.1)
Net Income	666,592	4.9

Accounts Receivable Aging Analysis

	Total	0-30 days	31-60 days	61-90 days	Over 90 days
Current Year--Gross Accounts Receivable	1,190,478	440,447	346,429	222,619	180,983
% of Gross Accounts Receivable	100%	37.0%	29.1%	18.7%	15.2%

AUDIT PROCEDURE	WOULD YOU PERFORM THIS PROCEDURE:	IF YES, THE APPROXIMATE TIME ALLOCATED TO PERFORM THIS PROCEDURE
I. Accounts Receivable		
1. Confirmation of Accounts Receivable: includes choice of sample; preparation and mailing of initial and (where needed) second confirmation requests; checking of confirmation replies and investigation of discrepancies; summarization of results of confirmation requests.	YES_____ NO _____	Approximate time allocated _____ hour(s).
2. Review accuracy of valuation of accounts receivable: includes footing pages of the aged trial balance; totaling the aged trial balance and comparing it to the total in the general ledger; tracing of accounts from the subsidiary ledger to the aged trial balance and from the aged trial balance to the subsidiary ledger.	YES_____ NO _____	Approximate time allocated _____ hour(s).
3. Review of cash collections of accounts receivable subsequent to balance sheet date: includes examination of cash receipts for open accounts that are collected after the balance sheet date.	YES_____ NO _____	Approximate time allocated _____ hour(s).

AUDIT PROCEDURE	WOULD YOU PERFORM THIS PROCEDURE:	IF YES, THE APPROXIMATE TIME ALLOCATED TO PERFORM THIS PROCEDURE
II. Allowance for Doubtful Accounts and Bad Debt Expense		
1. Review of accounts written off as uncollectible: includes preparation of an Analysis of Allowance for Doubtful Accounts and reconciliation with related bad debt expense and general ledger; examination of authorizing documents for accounts written off; investigation of suspicious write-offs; confirmation of selected charged-off accounts; examination of remittance advices not responding last year and not outstanding at the end of the client's current fiscal year.	YES_____ NO _____	Approximate time allocated _____ hour(s).
2. Determination of adequacy of Allowance for doubtful accounts: includes examination of past-due accounts selected from aging schedule not paid subsequent to balance sheet date; discuss with credit department the collectibility of past-due or unusually large accounts; review client correspondence with past-due or unusually large accounts.	YES_____ NO _____	Approximate time allocated _____ hour(s).

AUDIT PROCEDURE	WOULD YOU PERFORM THIS PROCEDURE:	IF YES, THE APPROXIMATE TIME ALLOCATED TO PERFORM THIS PROCEDURE
3. Review mathematical accuracy valuation of allowance for doubtful accounts: includes examination of the arithmetical accuracy of the allowance for doubtful accounts and comparing balance against the total in the general ledger; relating the balance in the Allowance for Doubtful Accounts against the Bad Debt Expense.	YES_____ NO _____	Approximate time allocated _____ hour(s).
III. Sales and Sales Returns and Allowances		
1. Review of year-end sales cutoff: includes comparison of shipping and receiving records with sales invoices and credit memos for period one week before and one week after the balance sheet date.	YES_____ NO _____	Approximate time allocated _____ hour(s).
2. Review accuracy of valuation of sales: includes tracing sales from sales journals to invoices; tracing items from invoices to shipping documents and from shipping documents to invoices; reviewing sales invoices for terms, prices and mathematical accuracy.	YES_____ NO _____	Approximate time allocated _____ hour(s).

AUDIT PROCEDURE	WOULD YOU PERFORM THIS PROCEDURE:	IF YES, THE APPROXIMATE TIME ALLOCATED TO PERFORM THIS PROCEDURE
3. Review accuracy of valuation of sales returns and allowances: includes reviewing credit memos and supporting documents for returned merchandise and sales allowances; comparing receiving records of returned merchandise with credit memos for returned merchandise.	YES_____ NO _____	Approximate time allocated _____ hour(s).
IV. Cash Receipts		
1. Review of proper cut-off for cash receipts: includes review of cash receipts one week before and one week after the balance sheet date.	YES_____ NO _____	Approximate time allocated _____ hour(s).
2. Review accuracy of valuation of cash: includes footing pages of cash receipts journal; tracing postings from cash receipts journal to the general ledger; tracing postings from cash receipts to individual customer accounts records.	YES_____ NO _____	Approximate time allocated _____ hour(s).
3. Confirm cash balances at year end with banks: includes testing of bank reconciliations.	YES_____ NO _____	Approximate time allocated _____ hour(s).

If there are any other relevant tests of details you might perform to test the account balances of sales, sales returns and allowances, accounts receivable, allowance or doubtful accounts, bad debt expense, and cash, please list them below. In addition, state the extent of testing to be planned in approximate hour(s).

Other Auditing Procedures	The Extent of Testing

Please fill out the following biographical information. This will be used for demographic analysis only.

Firm Name: _____

Number of Years of Auditing Experience: _____ Years.

Current Position (e.g., Senior, Manager, etc.):

Again, thank you for your cooperation.

Appendix B

Questionnaire on the Internal Control Evaluation

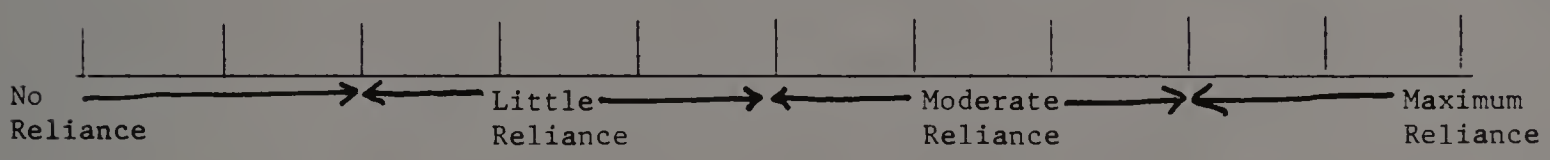
Appendix B contains the questionnaire used to establish the reliability of the internal control systems. Page 142 was presented to all subjects who took part in this pretest. Pages 143 and 144 were presented to subjects who evaluated the weaker internal control system. The last two pages were presented to subjects who evaluated the stronger internal control system.

General Instructions

Assume you are a new in-charge accountant on an audit engagement with the primary responsibility of the sales and collection cycle. The client is involved in the wholesale consumer industry. Your client maintains its own credit department with receivables representing approximately 15-25% of the firm's total assets.

A review of the internal control system relevant to the sales and collection cycle has been completed. Based on a description of the strengths and weaknesses of the system and the results of the compliance testing, you will be asked to respond to the following statement.

Given the description of the client's sales and collection cycle internal control system, and a description of the results of the compliance testing, the degree of reliance you would place on the internal control system when designing the substantive audit plan for the sales and collection cycle would be



Place an X in the space which best approximates the degree of reliance you would place on the client's internal control system.

That is:

Client's Sales and Collection Cycle Internal Control System

A. Strengths

1. Recording of sales is supported by authorized pre-numbered shipping documents and approved customer orders.
2. Sales invoices are pre-numbered and accounted for.
3. Billing, recording of sales, and deposit of cash receipts are done on a daily basis.

B. Weaknesses

1. Credit sales are made using customer credit worthiness criteria that have remained unchanged for several years.
2. An up-to-date job description and procedural manual is not in use at this time.
3. The clerk responsible for posting cash receipts and sales to their respective journals, also posts transactions to the detailed accounts receivable cards.

C. Results of Compliance Testing

The compliance testing has found the following controls not to be effective:

1. The system calls for rotation of jobs between the accounting clerks. In practice, there is no rotation of jobs.
2. The system calls for a separate clerk to review invoices for mathematical accuracy, prices used, quantities billed, and credit terms. In practice, the clerk responsible for preparing the invoice is usually the only one who reviews this information.
3. The system calls for the controller to approve all sales returns and allowances, discounts, and bad debt charge-offs. In practice, the salespeople and the marketing department have handled this function.

D. Other Information

1. All other aspects of the internal control system were found by compliance testing to be effective.
2. A management override on these controls seems highly improbable.

Given the description of the client's sales and collection cycle internal control system, and a description of the results of the compliance testing, the degree of reliance you would place on the internal control system when designing the substantive audit plan for the sales and collection cycle would be:

Please fill out the following biographical information. This information will be used for demographic analysis only. Thank you again for your generous help in this research project.

Firm Name: _____

Number of Years of Auditing Experience: _____ Years

Current Position (e.g., Senior, Manager, etc.): _____

Client's Sales and Collection Cycle Internal Control System

A. Strengths

1. Recording of sales is supported by authorized pre-numbered shipping documents and approved customer orders.
2. Sales invoices are pre-numbered and accounted for.
3. Billing, recording of sales, and deposit of cash receipts are done on a daily basis.
4. Regular monthly statements are sent to customer and all correspondence is sent directly to the president of the company.
5. Credit sales are made using customer credit worthiness criteria that are updated at least once a year.
6. The clerk responsible for posting cash receipts and sales to their respective journals is different than the clerk posting transactions to the detailed accounts receivable cards.
7. The bookkeeper reviews all invoices prepared by the billing clerk for mathematical accuracy, prices used, quantities billed and credit terms.
8. All sales returns and allowances, discounts and bad debt charge offs must get the approval of both the credit department and the controller of the company.

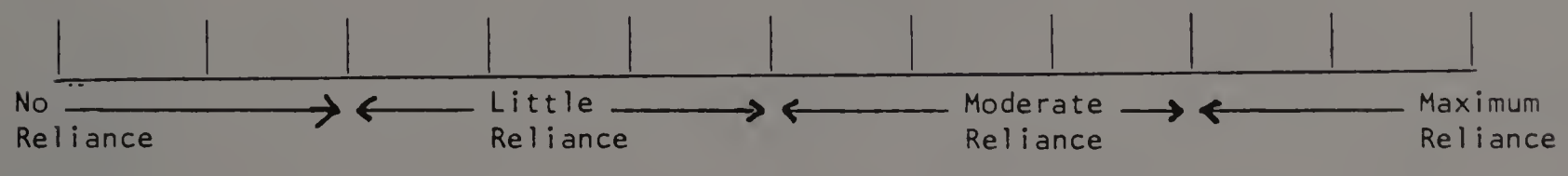
B. Results of Compliance Testing

Compliance testing found the controls of the internal control system to be in place and with errors significantly less than the maximum tolerable error rate.

C. Other Information

1. All other aspects of the internal control system appear adequate.
2. A management override on these controls seems highly improbable.
3. The client's staff is competent, well experienced and primarily college educated.

Given the description of the client's sales and collection cycle internal control system, and a description of the results of the compliance testing, the degree of reliance you would place on the internal control system when designing the substantive audit plan for the sales and collection cycle would be:



Please fill out the following biographical information. This information will be used for demographic analysis only. Thank you againn for your generous help in this research project.

Firm Name:_____

Number of Years of Auditing Experience: _____ Years

Current Position (e.g., Senior, Manager, etc.):_____

Appendix C

Experimental Task and Questionnaire

Appendix C contains the experimental task and questionnaire.

General Instructions: All Subjects

General Instructions

This study is designed to investigate several issues concerning the audit procedures of the sales and collection cycle. The client is a wholesaler of consumer products. It has been a client for several years and has typically received an unqualified opinion.

You will be provided with the following information about the client:

1. A description of the internal control system relevant to the sales and collection cycle.

2. Two years of audited financial statements and this year's unaudited financial statements.

3. Analytical review procedures relevant to the sales and collection cycle for the past two years of audited data and this year's unaudited data.

4. The current year and past two years of industry financial data.

5. Regression analysis based estimates of the sales and collection cycle account balances.

After reviewing the information, you will be asked to determine whether any of the following unaudited account balances might need an adjustment:

1. Sales,
2. Sales Returns and Allowances,
3. Bad Debt Expense,
4. Accounts Receivable,
5. Allowance for Doubtful Accounts, and
6. Cash.

You will then be asked to determine if any modifications are needed to the nature and/or extent of the sales and collection cycle portion of the sample audit plan. This plan was produced by the research staff of your firm, and is typical for firms in your client's industry possessing an adequate internal control system. The plan involves tests of details only and does not consider analytical review results. Your firm is interested in validating this audit plan by examining its applicability to specific clients, taking all relevant information into account. Specific instructions for this decision are provided immediately preceding the audit plan.

Description of the Weak Internal Control System

Client's Sales and Collection Cycle Internal Control System

A. Strengths

1. Recording of sales is supported by authorized pre-numbered shipping documents and approved customer orders.

2. Sales invoices are pre-numbered and accounted for.

3. Billing, recording of sales, and deposit of cash receipts are done on a daily basis.

B. Weaknesses

1. Credit sales are made using customer credit worthiness criteria that have remained unchanged for several years.

2. An up-to-date job description and procedural manual is not in use at this time.

3. The clerk responsible for posting cash receipts and sales to their respective journals, also posts transactions to the detailed accounts receivable cards.

C. Results of Compliance Testing

The compliance testing has found the following controls not to be effective:

1. The system calls for rotation of jobs between the accounting clerks. In practice, there is no rotation of jobs.

2. The system calls for a separate clerk to review invoices for mathematical accuracy, prices used, quantities billed, and credit terms. In practice, the clerk responsible for preparing the invoice is usually the only one who reviews this information.

3. The system calls for the controller to approve all sales returns and allowances, discounts, and bad debt charge-offs. In practice, the salespeople and the marketing department have handled this function.

D. Other Information

1. All other aspects of the internal control system were found by compliance testing to be effective.

2. A management override on these controls seems highly improbable.

Description of the Strong Internal Control System

Client's Sales and Collection Cycle Internal Control System

A. Strengths

1. Recording of sales is supported by authorized pre-numbered shipping documents and approved customer orders.
2. Sales invoices are pre-numbered and accounted for.
3. Billing, recording of sales, and deposit of cash receipts are done on a daily basis.
4. Regular monthly statements are sent to customers and all correspondence is sent directly to the president of the company.
5. Credit sales are made using customer credit worthiness criteria that are updated at least once a year.
6. The clerk responsible for posting cash receipts and sales to their respective journals is different than the clerk posting transactions to the detailed accounts receivable cards.
7. The bookkeeper reviews all invoices prepared by the billing clerk for mathematical accuracy, prices used, quantities billed and credit terms.
8. All sales returns and allowances, discounts and bad debt charge offs must get the approval of both the credit department and the controller of the company.

B. Results of Compliance Testing

Compliance testing found the controls of the internal control system to be in place and with errors significantly less than the maximum tolerable error rate.

C. Other Information

1. All other aspects of the internal control system appear adequate.
2. A management override on these controls seems highly improbable.
3. The client's staff is competent, well experienced and primarily college educated.

Financial Statement DATA and Analytical Review Procedures Signalling Errors

Client's Comparative Balance Sheet Data

Assets	Current Year--Unaudited $ Amount	Current Year--Unaudited % of Total Assets	Last Year--Audited $ Amount	Last Year--Audited % of Total Assets	Two Years Ago--Audited $ Amount	Two Years Ago--Audited % of Total Assets
Cash	331,440	4.9	300,902	4.7	285,809	4.5
Gross Accounts Receivable	1,589,533	23.5	1,167,433	18.2	1,049,008	16.4
Less: Allowance for Doubtful Accts.	(174,500)	(2.6)	(91,729)	(1.4)	(88,958)	(1.4)
Net Accounts Receivable	1,415,033	20.9	1,075,704	16.8	960,050	15.0
Inventory	2,408,012	35.6	2,426,363	37.9	2,365,404	37.0
Note Receivable--Current	47,348	0.7	61,595	1.0	41,778	0.7
Other Current Assets	459,957	6.8	328,834	5.1	566,921	8.9
Total Current Assets	4,661,790	68.9	4,193,398	65.5	4,219,962	66.1
Property Plant and Equipment	2,006,593	29.7	1,933,011	30.2	1,894,606	29.6
Less: Accumulated Depreciation	(297,619)	(4.4)	(236,150)	(3.7)	(160,422)	(2.5)
Net Property, Plant and Equipment	1,708,974	25.3	1,696,861	26.5	1,734,184	27.1
Intangibles--Net	83,820	1.2	93,199	1.5	100,649	1.6
All Other Non-Current Assets	309,494	4.6	416,574	6.5	333,006	5.2
Total Assets	6,764,078	100.0	6,400,032	100.0	6,387,801	100.0
Accounts Payable	2,462,125	36.4	2,276,312	35.6	2,171,536	34.0
Current Portion--Long Term Debt	561,418	8.3	481,811	7.5	514,192	8.0
Other Current Liabilities	229,979	3.4	306,622	4.8	461,566	7.2
Total Current Liabilities	3,253,522	48.1	3,064,745	47.9	3,147,294	49.2
Long Term Debt	1,496,893	22.1	1,631,211	25.5	1,793,105	28.1
Other Non-Current Liabilities	20,292	0.3	21,772	0.3	55,225	0.9
Common Stock	234,750	3.5	234,750	3.7	234,750	3.7
Retained Earnings	1,758,621	26.0	1,447,554	22.6	1,157,427	18.1
Total Shareholder's Equity	1,993,371	29.5	1,682,304	26.3	1,392,177	21.8
Total Liability and Owner's Equity	6,764,078	100.0	6,400,032	100.0	6,387,801	100.0

Client's Comparative Income Statement Data

Income	Current Year--Unaudited		Last Year--Audited		Two Years Ago--Audited	
	$ Amount	% of Net Sales	$ Amount	% of Net Sales	$ Amount	% of Net Sales
Sales	13,854,089	101.9	13,635,882	101.8	13,003,270	101.9
(Sales Returns and Allowances)	(252,155)	(1.9)	(243,364)	(1.8)	(245,162)	(1.9)
Net Sales	13,601,934	100.0	13,392,518	100.0	12,758,108	100.0
(Cost of Sales)	(9,087,943)	(66.8)	(9,001,906)	(67.2)	(8,586,206)	(67.3)
Gross Profit	4,513,991	33.2	4,390,612	32.8	4,171,902	32.7
(Bad Debt Expense)	(489,670)	(3.6)	(488,738)	(3.7)	(459,292)	(3.6)
(Other Operating Expenses)	(2,990,435)	(22.0)	(2,977,151)	(22.2)	(2,696,188)	(21.1)
Operating Income	1,033,886	7.6	924,723	6.9	1,016,422	8.0
(All Other Expenses--Net)	(81,612)	(0.6)	(77,936)	(0.5)	(64,133)	(0.5)
Earnings Before Taxes	952,274	7.0	846,787	6.4	952,289	7.5
(Income Taxes)	(285,682)	(2.1)	(254,028)	(2.0)	(285,687)	(2.3)
Net Income	666,592	4.9	592,759	4.4	666,602	5.2

Relevant Analytical Review Procedures

	Current Year	Last Year	Two Years Ago
Working Capital	1,408,268	1,128,653	1,072,668
Current Ratio	1.44	1.37	1.34
Quick Ratio	0.70	.58	.59
Net Sales ÷ Net Receivables	9.61	12.45	13.29
Days Net Receivables Outstanding	37.97	29.31	27.47
Profit Before Taxes ÷ Total Assets	14.08%	13.23%	14.91%
Working Capital ÷ Total Assets	20.8%	17.6%	16.8%
Net Sales ÷ Total Assets	2.01	2.09	2.00
Net Sales ÷ Working Capital	9.66	11.87	11.89
Allowance for Doubtful Accounts ÷ Gross Accounts Receivable	11.0%	7.9%	8.5%
Bad Debt Expense ÷ Net Sales	3.6	3.7	3.6
Bad Debt Expense ÷ All Operating Expenses	14.1%	14.1%	14.6%
Sales Returns and Allowances ÷ Gross Sales	1.9%	1.8%	1.9%

Accounts Receivable Aging Analysis--All sales are made on credit with terms, Net 30.

	Total	0-30 days	31-60 days	61-90 days	Over 90 days
Current Year--Gross Accounts Receivable	1,589,533	423,438	337,478	384,717	443,900
% of Gross Accounts Receivable	100%	26.6%	21.2%	24.2%	28.0%
Last Year--Gross Accounts Receivable	1,167,433	421,444	332,718	215,975	197,296
% of Gross Accounts Receivable	100%	36.1%	28.5%	18.5%	16.9%
Two Years Ago--Gross Accounts Receivable	1,049,008	400,721	310,506	181,478	156,303
% of Gross Accounts Receivable	100%	38.2%	29.6%	17.3%	14.9%

Industry Data--Source: Robert Morris Associates--Median Values

A. Common Size Financial Statements	Current Year	Last Year	Two Years Ago
Assets	%	%	%
Cash and Equivalents	4.6	4.9	4.8
Accounts and Notes Receivable (Net)	17.1	16.9	16.5
Inventory	40.1	40.9	40.1
All Other Current	6.4	6.7	6.6
Total Current	68.2	69.4	68.0
Fixed Assets (Net)	28.2	27.4	28.6
Intangibles (Net)	0.5	0.7	0.3
All Other Non-Current	3.1	2.5	3.1
Total	100.0	100.0	100.0
Liabilities and Owner's Equity Notes			
Payable--Short	13.9	14.8	13.6
Current Maturity Long Term Debt	2.2	1.6	2.2
Accounts and Notes Payable	29.2	31.0	28.6
Accrued Expenses	4.2	4.4	5.4
All Other Current	3.6	3.8	4.3
Total Current	53.1	55.6	54.1
Long Term Debt	7.3	6.2	7.5
All Other Non-Current	1.3	1.0	1.0
Net Worth	38.3	37.2	37.4
Total Liabilities and Owner's Equity	100.0	100.0	100.0
Income Data	%	%	%
Net Sales	100.0	100.0	100.0
Cost of Sales	67.0	67.5	68.0
Gross Profit	33.0	32.5	32.0
Bad Debt Expense	3.5	3.5	3.5
Other Operating Expenses	22.6	23.6	22.8
Operating Profit	6.9	5.4	5.7
All Other Expenses (Net)	1.2	0.4	0.5
Profit Before Taxes	5.7	5.0	5.2

B. Key Industry Ratios - Median Values	Current Year	Last Year	Two Years Ago
Current	1.29	1.25	1.26
Quick	.53	.51	.52
Receivables Turnover	12.40	12.30	12.60
Days Net Receivables Outstanding	29.44	29.70	29.00
Inventory Turnover	4.30	4.40	4.60
Days Inventory	85.00	83.00	79.00
(% Profit Before Taxes) ÷ (Total Assets)	13.10	12.90	13.20
Sales ÷ Working Capital	11.10	10.80	11.10
Sales ÷ Total Assets	2.10	2.10	2.10

Quantitative Data

The following estimates of account balances were generated through regression analysis. It is based on the past four years of quarterly audited data. Gross profit was utilized to derive the prediction for the sales account, and sales was employed to predict the following account balances:

Sales Returns and Allowances,
Accounts Receivable,
Allowance for Doubtful Accounts,
Bad Debt Expense, and
Cash.

In addition to the predicted account balance, each account will have a standard error of the estimate. This will give some indication of the variability of the data used to generate the predicted account balances.

Accounts	Predicted Account Balances	Standard Error of the Estimate
Gross Sales	13,835,000	691,750
Sales Returns and Allowances	248,000	12,400
Gross Accounts Receivable	1,184,000	59,200
Allowance for Doubtful Accounts	103,400	5,170
Bad Debt Expense	474,674	23,734
Cash	345,115	17,256

Financial Statement DATA and Analytical Review
Procedures Signalling No Errors

Client's Comparative Balance Sheet Data

	Current Year--Unaudited		Last Year--Audited		Two Years Ago--Audited	
Assets	$ Amount	% of Total Assets	$ Amount	% of Total Assets	$ Amount	% of Total Assets
Cash	331,440	4.9	300,902	4.7	285,809	4.5
Gross Accounts Receivable	1,190,478	17.6	1,167,433	18.2	1,049,008	16.4
Less: Allowance for Doubtful Accts.	(101,461)	(1.5)	(91,729)	(1.4)	(88,958)	(1.4)
Net Accounts Receivable	1,089,017	16.1	1,075,704	16.8	960,050	15.0
Inventory	2,408,012	35.6	2,426,363	37.9	2,365,404	37.0
Note Receivable--Current	47,348	0.7	61,595	1.0	41,778	0.7
Other Current Assets	459,957	6.8	328,834	5.1	566,921	8.9
Total Current Assets	4,335,774	64.1	4,193,398	65.5	4,219,962	66.1
Property Plant and Equipment	2,332,609	34.5	1,933,011	30.2	1,894,606	29.6
Less: Accumulated Depreciation	(297,619)	(4.4)	(236,150)	(3.7)	(160,422)	(2.5)
Net Property, Plant and Equipment	2,034,990	30.1	1,696,861	26.5	1,734,184	27.1
Intangibles--Net	83,820	1.2	93,199	1.5	100,649	1.6
All Other Non-Current Assets	309,494	4.6	416,574	6.5	333,006	5.2
Total Assets	6,764,078	100.00	6,400,032	100.0	6,387,801	100.0
Accounts Payable	2,462,125	36.4	2,276,312	35.6	2,171,536	34.0
Current Portion--Long Term Debt	561,418	8.3	481,811	7.5	514,192	8.0
Other Current Liabilities	229,979	3.4	306,622	4.8	461,566	7.2
Total Current Liabilities	3,253,522	48.1	3,064,745	47.9	3,147,294	49.2
Long Term Debt	1,496,893	22.1	1,631,211	25.5	1,793,105	28.1
Other Non-Current Liabilities	20,292	0.3	21,772	0.3	55,225	0.9
Common Stock	234,750	3.5	234,750	3.7	234,750	3.7
Retained Earnings	1,758,621	26.0	1,447,554	22.6	1,157,427	18.1
Total Shareholder's Equity	1,993,371	29.5	1,682,304	26.3	1,392,177	21.8
Total Liability and Owner's Equity	6,764,078	100.0	6,400,032	100.0	6,387,801	100.0

Client's Comparative Income Statement Data

Income	Current Year--Unaudited		Last Year--Audited		Two Years Ago--Audited	
	$ Amount	% of Net Sales	$ Amount	% of Net Sales	$ Amount	% of Net Sales
Sales	13,854,089	101.9	13,635,882	101.8	13,003,270	101.9
(Sales Returns and Allowances)	(252,155)	(1.9)	(243,364)	(1.8)	(245,162)	(1.9)
Net Sales	13,601,934	100.0	13,392,518	100.0	12,758,108	100.0
(Cost of Sales)	(9,087,943)	(66.8)	(9,001,906)	(67.2)	(8,586,206)	(67.3)
Gross Profit	4,513,991	33.2	4,390,612	32.8	4,171,902	32.7
(Bad Debt Expense)	(489,670)	(3.6)	(488,738)	(3.7)	(459,292)	(3.6)
(Other Operating Expenses)	(2,990,435)	(22.0)	(2,977,151)	(22.2)	(2,696,188)	(21.1)
Operating Income	1,033,886	7.6	924,723	6.9	1,016,422	8.0
(All Other Expenses--Net)	(81,612)	(0.6)	(77,936)	(0.5)	(64,133)	(0.5)
Earnings Before Taxes	952,274	7.0	846,787	6.4	952,289	7.5
(Income Taxes)	(285,682)	(2.1)	(254,028)	(2.0)	(285,687)	(2.3)
Net Income	666,592	4.9	592,759	4.4	666,602	5.2

Relevant Analytical Review Procedures

	Current Year	Last Year	Two Years Ago
Working Capital	1,082,252	1,128,653	1,072,668
Current Ratio	1.33	1.37	1.34
Quick Ratio	.59	.58	.59
Net Sales ÷ Net Receivables	12.49	12.45	13.29
Days Net Receivables Outstanding	29.22	29.31	27.47
Profit Before Taxes ÷ Total Assets	14.08%	13.23%	14.91%
Working Capital ÷ Total Assets	16.0%	17.6%	16.8%
Net Sales ÷ Total Assets	2.01	2.09	2.0
Net Sales ÷ Working Capital	12.57	11.87	11.89
Allowance for Doubtful Accounts ÷ Gross Accounts Receivable	8.5%	7.9%	8.5%
Bad Debt Expense ÷ Net Sales	3.6	3.7	3.6
Bad Debt Expense ÷ All Operating Expenses	14.1%	14.1%	14.6%
Sales Returns and Allowances ÷ Gross Sales	1.9%	1.8%	1.9%

Accounts Receivable Aging Analysis--All sales are made on credit with terms, Net 30.

	Total	0-30 days	31-60 days	61-90 days	Over 90 days
Current Year--Gross Accounts Receivable	1,190,478	440,447	346,429	222,619	180,983
% of Gross Accounts Receivable	100%	37.0%	29.1%	18.7%	15.2%
Last Year--Gross Accounts Receivable	1,167,433	421,444	332,718	215,975	197,296
% of Gross Accounts Receivable	100%	36.1%	28.5%	18.5%	16.9%
Two Years Ago--Gross Accounts Receivable	1,049,008	400,721	310,506	181,478	156,303
% of Gross Accounts Receivable	100%	38.2%	29.6%	17.3%	14.9%

Industry Data--Source: Robert Morris Associates--Median Values

A. Common Size Financial Statements	Current Year	Last Year	Two Years Ago
Assets	%	%	%
Cash and Equivalents	4.6	4.9	4.8
Accounts and Notes Receivable (Net)	17.1	16.9	16.5
Inventory	40.1	40.9	40.1
All Other Current	6.4	6.7	6.6
Total Current	68.2	69.4	68.0
Fixed Assets (Net)	28.2	27.4	28.6
Intangibles (Net)	0.5	0.7	0.3
All Other Non-Current	3.1	2.5	3.1
Total	100.0	100.0	100.0
Liabilities and Owner's Equity Notes			
Payable--Short	13.9	14.8	13.6
Current Maturity Long Term Debt	2.2	1.6	2.2
Accounts and Notes Payable	29.2	31.0	28.6
Accrued Expenses	4.2	4.4	5.4
All Other Current	3.6	3.8	4.3
Total Current	53.1	55.6	54.1
Long Term Debt	7.3	6.2	7.5
All Other Non-Current	1.3	1.0	1.0
Net Worth	38.3	37.2	37.4
Total Liabilities and Owner's Equity	100.0	100.0	100.0
Income Data	%	%	%
Net Sales	100.0	100.0	100.0
Cost of Sales	67.0	67.5	68.0
Gross Profit	33.0	32.5	32.0
Bad Debt Expense	3.5	3.5	3.5
Other Operating Expenses	22.6	23.6	22.8
Operating Profit	6.9	5.4	5.7
All Other Expenses (Net)	1.2	0.4	0.5
Profit Before Taxes	5.7	5.0	5.2

B. Key Industry Ratios - Median Values	Current Year	Last Year	Two Years Ago
Current	1.29	1.25	1.26
Quick	.53	.51	.52
Receivables Turnover	12.40	12.30	12.60
Days Net Receivables Outstanding	29.44	29.70	29.00
Inventory Turnover	4.30	4.40	4.60
Days Inventory	85.00	83.00	79.00
(% Profit Before Taxes) ÷ (Total Assets)	13.10	12.90	13.20
Sales ÷ Working Capital	11.10	10.80	11.10
Sales ÷ Total Assets	2.10	2.10	2.10

Quantitative Data

The following estimates of account balances were generated through regression analysis. It is based on the past four years of quarterly audited data. Gross profit was utilized to derive the prediction for the sales account, and sales was employed to predict the following account balances:

Sales Returns and Allowances,
Accounts Receivable,
Allowance for Doubtful Accounts,
Bad Debt Expense, and
Cash.

In addition to the predicted account balance, each account will have a standard error of the estimate. This will give some indication of the variability of the data used to generate the predicted account balances.

Accounts	Predicted Account Balances	Standard Error of the Estimate
Gross Sales	13,835,000	691,750
Sales Returns and Allowances	248,000	12,400
Gross Accounts Receivable	1,184,000	59,200
Allowance for Doubtful Accounts	103,400	5,170
Bad Debt Expense	474,674	23,734
Cash	345,115	17,256

Evaluation of Unaudited Account Balances and Sample Audit Plan: All Subjects

Based on the preceding information, please determine whether any of the following sales and collection cycle current year's unaudited account balances may need an adjustment. Please place a check mark next to "Yes" if you think an account may need an adjustment, and next to "No" if you think the account does not need an adjustment.

Accounts	Will the Account Possibly Need an Adjustment?
Sales	Yes _____ No _____
Sales Returns and Allowances	Yes _____ No _____
Bad Debt Expense	Yes _____ No _____
Accounts Receivable	Yes _____ No _____
Allowance for Doubtful Accounts	Yes _____ No _____
Cash	Yes _____ No _____

Your firm has developed a typical audit plan for a firm in this industry possessing an adequate internal control system. The plan involves tests of details only and does not consider analytical review results. Based on the preceding information, please determine if the nature and/or extent of this typical audit plan will require any modifications.

AUDIT PROCEDURE	TIME ALLOCATED BY SAMPLE AUDIT PLAN:	APPROXIMATE TIME YOU WOULD ALLOCATE TO PERFORM THIS PROCEDURE
I. Accounts Receivable		
1. Confirmation of Accounts Receivable: includes choice of sample; preparation and mailing of initial and (where needed) second confirmation requests; checking of confirmation replies and investigation of discrepancies; summarization of results of confirmation requests.	Time allocated by sample audit plan 16 hour(s).	Approximate time you would allocate. _____ hour(s).
2. Review accuracy of valuation of accounts receivable: includes footing pages of the aged trial balance; totaling the aged trial balance and comparing it to the total in the general ledger; tracing of accounts from the subsidiary ledger to the aged trial balance and from the aged trial balance to the subsidiary ledger, reviewing general ledger for unusual entries relating to accounts receivable.	Time allocated by sample audit plan 3 hour(s).	Approximate time you would allocate. _____ hour(s).
3. Review of cash collections of accounts receivable subsequent to balance sheet date: includes examination of cash receipts for open accounts that are collected after the balance sheet date.	Time allocated by sample audit plan 4 hour(s).	Approximate time you would allocate _____ hour(s).

AUDIT PROCEDURE	TIME ALLOCATED BY SAMPLE AUDIT PLAN:	APPROXIMATE TIME YOU WOULD ALLOCATE TO PERFORM THIS PROCEDURE
II. Allowance for Doubtful Accounts and Bad Debt Expense		
1. Review of accounts written off as uncollectible: includes preparation of an Analysis of Allowance for Doubtful Accounts and reconciliation with related bad debt expense and general ledger; examination of authorizing documents for accounts written off; investigation of suspicious write-offs; confirmation of selected charged-off accounts; examination of remittance advices not responding last year and not outstanding at the end of the client's current fiscal year.	Time allocated by sample audit plan 2 hour(s).	Approximate time you would allocate. ____ hour(s).
2. Determination of adequacy of Allowance for doubtful accounts: includes examination of past-due accounts selected from aging schedule not paid subsequent to balance sheet date; discuss with credit department the collectibility of past-due or unusually large accounts; review client correspondence of past-due or unusually large accounts.	Time allocated by sample audit plan 5 hour(s).	Approximate time you would allocate. ____ hour(s).

AUDIT PROCEDURE	TIME ALLOCATED BY	APPROXIMATE TIME YOU WOULD ALLOCATE TO PERFORM THIS PROCEDURE
3. Review accuracy of valuation of allowance for doubtful accounts: includes examination of the arithmetical accuracy of the allowance for doubtful accounts and comparing balance against the total in the general ledger; relating the balance in the Allowance for Doubtful Accounts against the Bad Debt Expense.	Time allocated by sample audit plan 1 hour(s).	Approximate time you would allocate. ____ hour(s).
III. Sales and Sales Returns and Allowances		
1. Review of year-end sales cutoff: includes comparison of shipping and receiving records with sales invoices and credit memos for period one week before and one week after the balance sheet date.	Time allocated by sample audit plan 4 hour(s).	Approximate time you would allocate. ____ hour(s).
2. Review accuracy of valuation of sales: includes tracing sales from sales journals to invoices; tracing items from invoices to shipping documents and from shipping documents to invoices; reviewing sales invoices for terms, prices and mathematical accuracy; reviewing general ledger for unusual transactions relating to sales.	Time allocated by sample audit plan 2 hour(s).	Approximate time you would allocate. ____ hour(s).

AUDIT PROCEDURE	TIME ALLOCATED BY SAMPLE AUDIT PLAN:	APPROXIMATE TIME YOU WOULD ALLOCATE TO PERFORM THIS PROCEDURE
3. Review accuracy of valuation of sales returns and allowances: includes reviewing credit memos and supporting documents for returned merchandise and sales allowances; comparing receiving records of returned merchandise with credit memos for returned merchandise, reviewing of credit memos and sales returns subsequent to balance sheet date.	Time allocated by sample audit plan 2 hour(s).	Approximate time you would allocate. ____ hour(s).
IV. Cash Receipts		
1. Review of proper cut-off for cash receipts: includes review of cash receipts one week before and one week after the balance sheet date.	Time allocated by sample audit plan 1 hour(s).	Approximate time you would allocate. _____ hour(s).
2. Review accuracy of valuation of cash: includes footing pages of cash receipts journal; tracing postings from cash receipts journal to the general ledger; tracing postings from cash receipts to individual customer accounts records.	Time allocated by sample audit plan 2 hour(s).	Approximate time you would allocate. ____ hour(s).
3. Confirm cash balances at year end with banks: includes testing of bank reconciliations.	Time allocated by sample audit plan 5 hour(s).	Approximate time you would allocate. ____ hour(s).

If there are any other relevant tests of details you might perform to test the account balances of sales, sales returns and allowances, accounts receivable, allowance for doubtful accounts, bad debt expense, and cash, please list them below. In addition, state the extent of testing to be planned in approximate hour(s).

Other Auditing Procedures	The Extent of Testing

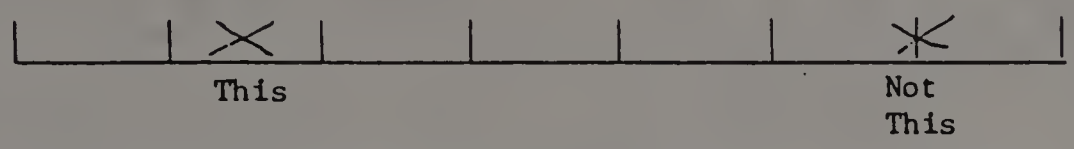
Evaluative and Demographic Questions: All Subjects

Evaluative and Demographic Questionnaire

Please respond to the following evaluative and demographic questions. This information will be used for research analysis only.

Place an "X" in the space (not on the line) which best indicates your belief about the statement.

That is:



The closer you place an "X" to the end points indicates stronger agreement with the phrase at that end of the scale.

1. Industry data was:

in my evaluation of the sample audit plan.

2. The client's financial ratios were:

in my evaluation of the sample audit plan.

3. The client's financial statement trends were:

in my evaluation of the sample audit plan.

4. The description of the client's internal control system was:

in my evaluation of the sample audit plan.

5. The regression analysis estimates of the account balances were:

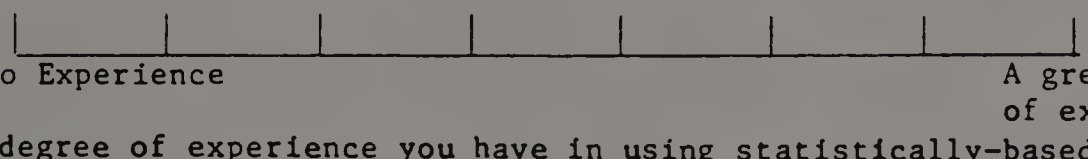
in my evaluation of the sample audit plan.

6. Analytical review procedures are:

7. In direct testing of account balances, the degree of reliance I'd place on analytical review results is:

8. The degree of supervisory experience you have in audit planning is:

9. The degree of experience you have in using analytical review procedures is:



10. The degree of experience you have in using statistically-based analytical review procedures (e.g., regression analysis) is:

11. I found the task and materials in this study to be:

Demographic Information

Firm Name:_____

Number of Years of Auditing Experience: _____ Years

Current Position in Firm: (a) Manager _____ (b) Senior _____

Approximate Time to Complete This Task:_____

Once again, thank you for your generous cooperation in this research project.