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# A Guide to Analytical Procedures

By Janet L. Colbert

## Introduction

When utilizing analytical procedures on an engagement, the auditor studies relationships among data in order to identify accounts which may contain material errors. The auditor expects the relationships between data to be plausible. The relationships are expected to continue over time, or if conditions change, to change in a predictable manner.

SAS 56, "Analytical Procedures," [AICPA, 1988], notes that analytical procedures *may be used* at three points in the audit. The three points are:

1. during the planning phase
2. as a substantive test
3. during the review phase.

The SAS *requires* the auditor to perform analytical procedures during the planning and review phases and *recommends* their use as a substantive test.

By using analytical procedures during the planning phase or as a substantive test, the auditor is looking for questionable relationships in the unaudited data. Further work would be performed to investigate any potential errors. When utilizing analytical procedures during the review phase, the auditor is attempting to determine whether the audited figures make sense or whether material errors may still be present in the accounts.

There are numerous types of analytical procedures available to the practitioner. Some methods are relatively simple while others require more voluminous data. Some procedures may be more useful to detect errors in particular types of accounts than others.

This article explains numerous types of analytical procedures available to the auditor. The data needed to apply a particular procedure and to which accounts the procedure can be applied, are discussed. Examples are also provided for each type of procedure.

## Reasonableness Tests

The auditor using reasonableness tests employs nonfinancial, or operating, data to develop an expected amount. The expected amount is compared to the client's unaudited figure to determine if the unaudited figure is reasonable. The difference between the expected amount and the unaudited balance may warrant investigation.

The auditor uses judgment or a predetermined decision rule to determine whether to study differences. For example, the auditor may decide to investigate all differences of ten percent or more.

The operating data used to develop the expected amount in a reasonableness test depends on the nature of the client and the account being examined. For example, consider the examination of Revenue at a day care center. Enrollment figures and the rate schedule are used to develop the expected amount for the account. Similarly, when testing the Dues Revenue for a professional society (e.g., attorneys or physicians), the auditor utilizes membership figures and dues schedules to estimate the balance).

Reasonableness tests are relatively simple to apply. Also, the information used to estimate the expected amount is usually easy to obtain, since the operating data is from the current period, prior years's figures are not used in reasonableness tests since period comparisons are not being made. Because operating data relate to flows, reasonableness tests are generally best applied to accounts that measure those flows – revenues and expenses.

## Trend Analysis

### Simple Trend Analysis

When employing trend analysis, the auditor compares the client's unaudited balance to the trend in the account. The method is generally more useful for revenue and expense accounts than for asset and liability balances. Trend analysis is relatively simple to apply and is used extensively in practice.

There are two approaches to trend analysis: the diagnostic approach and the causal approach. The diagnostic approach is simpler to employ, but the causal approach may be more useful to the auditor.

When applying the diagnostic approach, the auditor compares the unaudited balance in an account to the audited balances for past periods. For example, if Sales Revenue had been increasing by 5-6% for the last four years and increases 9% in the current period, the auditor would question the change.

The auditor using the causal approach to trend analysis

develops an expected amount and compares that figure to the unaudited balance. If the unaudited amount is significantly different from the expected amount, the reasons for the disparity are investigated.

The auditor may use various methods to develop the expected amount. The methods include basing the expectation on:

- last year's balance,
- last year's balance plus the percentage change between the two prior years,
- last year's balance plus the average percentage change for several previous years,
- simple average of the account for several years,
- budgeted figures,
- industry figures.

Typically, the auditor expects the account balance to behave as it has previously. However, if the auditor knows of conditions which might cause changes in the trend, the conditions must be incorporated into the expected amount. For example, assume production workers had been on strike and, late in the year, had negotiated a contract for higher wages. The auditor should consider those events when developing the expected amount for Wages Expense. These events should also be considered when auditing Cost of Goods Sold, Ending Inventory, Wages Payable, and accounts related to employee benefits.

Because the auditor must incorporate the conditions which affect an account balance into the expected amount, SAS 56, "Analytical Procedures," indicates a preference for the "causal" approach over the "diagnostic" approach for substantive tests. Still, both the causal and the diagnostic approaches are appropriate at the planning and review stages of an audit.

### *Regression*

Regression is a type of trend analysis that is more exact than simple trend analysis. An auditor may use simple or multivariate linear regression.

When using simple linear regression, the auditor statistically develops an equation of a line. The equation represents the best-fitting line through a set of points and is in the form  $y = a + bx$ . The variable  $y$

represents the amount being predicted. The variable  $x$  is the independent variable which is theoretically related to  $y$ . In the equation, "a" is the intercept and "b" is the coefficient of the independent variable which establishes the relationship between  $x$  and  $y$ . The auditor uses numerous past observations of  $x$  and  $y$  to estimate the parameters  $a$  and  $b$  in the equation. The amount of  $x$  in the current period is then used to predict  $y$  for the current year.

As an example of applying simple linear regression, consider Utility Expense for a production facility. To predict the current year's Utility Expense, the auditor might use the number of hours the facility was operating as the independent variable. The auditor gathers information on operating hours and Utility Expense for past periods. The auditor then mathematically estimates the equation of a line which best fits the data.

Multivariate regression is a more sophisticated technique than simple regression; it uses two or more independent variables to establish a relationship with the dependent variable. For example, rather than using operating hours as the sole predictor of Utility Expense, the auditor may also use the number of units produced and utility rate. Depending on the strength of the relationship of the independent variables to the dependent variable, multivariate regression may provide the auditor with a better estimate of the dependent variable than would simple regression.

### *ARIMA*

Autoregressive integrated moving average (ARIMA) is another statistical form of trend analysis. The auditor develops the ARIMA model based on patterns of data within a given period of time and over several periods. Experts in ARIMA suggest that, generally, at least 50 observations are needed to estimate the ARIMA model. However, some work has shown that it is possible to develop a useful model with fewer observations. Because ARIMA is a complex procedure and numerous observations may be needed to estimate the statistical model, ARIMA is used to a limited extent in practice. As with other trend analysis

procedures, ARIMA is applicable to income statement accounts.

### **Ratio Analysis**

When employing ratio analysis, the auditor examines the relationships among account balances by developing and analyzing financial ratios or common-size statements. Both methods are useful for examining income statement accounts as well as balance sheet accounts.

Either a time-series approach or a cross-sectional approach to ratio analysis may be used. The auditor, using a time-series approach, compares financial ratios or common-size statements across a number of periods. Cross-sectional analysis involves comparing the client's results to those of other companies or to industry "average" figures. An example of both the time-series approach and the cross-sectional approach is given in Exhibit 1.

Special care should be exercised when interpreting data which compares the client to other firms or to the industry (cross-sectional analysis). For example, the use of different accounting principles (FIFO vs. LIFO) can make financial statements of otherwise similar entities appear quite different. Besides the accounting principles used by the companies, the auditor should also consider that demographics, technology, and particularly financial leverage may affect the comparability between entities.

### *Financial Ratios*

Financial ratios may be categorized into four groups: profitability ratios, activity ratios, liquidity ratios, and leverage ratios.

Profitability ratios measure how effective the entity is at making a profit. The gross margin percentage, return on total assets, and return on common stockholders's equity are common profitability ratios.

Activity ratios are used to analyze how well a client utilizes its resources. The inventory turnover ratio estimates how many times a year inventory is sold. Similarly, the accounts receivable turnover ratio measures how many times receivables are collected per year. Other activity ratios include the age of inventory ratio, the age of receiv-

### Exhibit 1

#### Time-Series and Cross-Sectional Approaches to Ratio Analysis

##### Current Ratio (Current Assets/Current Liabilities)

		CLIENT	FIRM A	FIRM B	FIRM C	INDUSTRY FIGURE
	19X1	2.2				
	19X2	2.3				
	19X3	2.1				
Cross- Sectional Analysis	19X4	2.3				
	19X5	2.1	1.9	1.8	2.3	2.2
		Time Series Analysis				

ables ratio, and total asset turnover.

Liquidity ratios provide the auditor with both a measure of the solvency of the entity and an indication of the firm's ability to meet its short-term obligations. The current ratio and the quick ratio are examples of liquidity ratios.

Because leverage ratios measure the extent a client is financed by debt, they provide the auditor with an estimate of the riskiness of the client to its creditors. The debt ratio, the long-term debt ratio, and times interest earned are commonly computed leverage ratios.

#### Common-Size Statements

To develop common-size statements, the auditor calculates the percentage each of the component parts of the income statement or balance sheet is of an aggregate amount. The aggregate figure used for the income statement might be net sales; for the balance sheet, the base figure often used is total assets.

#### Conclusion

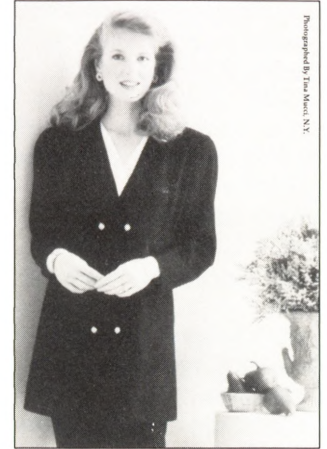
Analytical procedures provide the auditor with an efficient and effective means to identify areas within the client's financial statements which may contain material errors.

Reasonableness tests are fairly simple analytical procedures that involve using either financial or operating data to predict the expected amount of the account

balance. Trend analysis is the most commonly used analytical procedure in practice. When utilizing simple trend analysis, the auditor either compares the client's book value to the trend in prior periods or develops an expected amount for the current period from the past trend and compares it to the book value. Regression and ARIMA are more complex approaches to trend analysis. Both methods involve utilizing prior period observations to develop a statistical model. The model is then used to predict the current amount of the account. Ratio analysis is also commonly used by practitioners. Auditors may compute various financial ratios and/or may develop common-size financial statements. Because SAS 56 requires the use of analytical procedures at two stages of the audit and recommends their use at a third stage, it is imperative that auditors be aware of the various approaches to analytical procedures which are available. This article has shown how relatively simple techniques can be used to efficiently and effectively gather audit evidence.

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