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USING STATISTICS IN AUDITING

by R. Wayne Stoker
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I appreciate the opportunity of speaking to you this evening. This is a group to which I can easily relate. Some of you are clients of our Firm, several of you are my contemporaries in public accounting, and presumably many of you previously spent time as public accountants before transferring to your various jobs in industry.

Even those of us who don't have similar career histories have much in common–that is the nature of our work. As auditors we have similar technical problems and similar theoretical goals. Although my remarks tonight are necessarily couched in the experiences of public accounting I'm certain that the principles involved can easily be translated to fit into the activities of the internal auditor.

We live in an age of specialists and by definition that means that each of us is narrowly restricted in our expertise. I am not a statistician, but I apply statistical concepts. Accordingly this discussion tonight will be centered, not around statistical theory, but around the application of some basic concepts to auditing accounting data.

This is an important point to consider and perhaps will have answered a question many of you might have had in mind. That is, "As an accountant, can I effectively apply statistics without having technical training in statistical theory?" The answer, I believe, is a resounding, though carefully qualified, "Yes." The qualifications in the answer are these:

1. The auditor must have a well defined statistical sampling plan to follow, including clear guidelines for evaluating the sample results.
2. The auditor must have a basic understanding of the statistical concepts of reliability, precision, population definition, etc.

OUR AUDIT SAMPLING PLAN

Since my remarks today will relate to my experiences with the Audit

Sampling plan developed by Haskins & Sells, a brief review of the background of the Haskins & Sells sampling plan may be helpful in understanding the extent of study and experience on which it is based.

In the fall of 1958, Kenneth W. Stringer, a partner in our Executive Office, began a study of auditing objectives and procedures and of existing sampling plans, in an effort to determine whether or not we might use statistical sampling in our audit practice. His original efforts indicated that the available techniques and methods did not solve all our audit objectives. At about this time, the late Professor F. F. Stephan, an authority on statistical sampling from Princeton University, was retained as a consultant to work with Mr. Stringer in additional research and study on this subject. As a result of their efforts, the Haskins & Sells Audit Sampling plan was developed and submitted to the Firm for adoption.

Before this plan was adopted by the Firm as an official part of our auditing procedures, it was subjected to three separate reviews over a two-year period while we carried out a program of field testing by actual case application. These were:

1. A review by the Firm's legal counsel.
2. A concurring mathematical review by another recognized authority on statistical sampling, a statistician with no extensive experience in accounting or auditing.
3. A review by a special Firm committee comprising partners in charge of five different offices who had no special mathematical background.

The basic Audit Sampling plan has not been changed since it was adopted.

There have been significant changes, however, in the application of the plan, and these changes have increased our efficiency in applying it to everyday audit situations.

Since its adoption, Audit Sampling has gained widespread use in our practice. While applications were somewhat limited at inception, I can safely state that it has been my experience that statistical sampling is now used on virtually every engagement serviced by our office regardless of the size of the client.

I might comment here that in my opinion the greatest impact that statistical sampling has had in our local practice is not the increased efficiency that we have experienced, but the increased quality in the work of our staff that has resulted as a by-product of the more intense evaluation of internal

control and definition of population and direction of test demanded under the plan.

Before proceeding further with a description of the plan, I would like to comment briefly on the general posture and attitude of our local accounting community regarding the use of statistical sampling, as I have perceived it in my conversations with other practitioners and educators in our area.

I think that I could describe that attitude generally to be a giddap, whoa-back position. Statistical sampling seems to be on the horizon of the accounting practice; it has been demonstrated effectively in allied fields such as production and quality control in manufacturing, but auditors seem somewhat unsure as to how to fit this piece into the jigsaw of acceptable auditing techniques.

SOME OBJECTIONS TO STATISTICAL SAMPLING, AND REBUTTALS

Some of those with whom I've had discussions have raised objections to using statistical sampling. Some of these objections are:

1. Acceptable reliability and precision levels are not easily defined.
2. As accountants, we are usually interested in looking at large dollar transactions rather than an absolute random selection from all items.
3. Statistical sampling might replace the objectivity and judgment of the auditor.

I would like to present a rebuttal to these objections.

First, as to reliability levels, we accountants have always had an exceptional tool for their measurement at our disposal: our evaluation of internal control. To illustrate, picture in your mind a bi-variant graph with degrees of internal control measured inversely on the "Y" axis and the extent of audit test measured on the "X" axis. These two variables are complementary, that is, as the intensity of internal control increases the dependence on sample tests to obtain audit assurance decreases. Accordingly, the poorer the internal control situation the greater the reliability required in the audit tests. The actual numeric values corresponding to the reliability levels assigned to various degrees of internal control will be judgments that each user will make for the specific sampling plan.

As to precision levels, we find it convenient under our sampling plan to express precision in monetary terms. That is, precision limits are an

expression of the maximum dollar amount of errors that would be considered immaterial in relation to the total dollar value of the population being sampled, or the overall financial position and results of operations of the entity being audited. For example, we might agree that on a million dollar balance sheet an error of $10,000 would be immaterial. $10,000 then becomes the monetary precision limit upon which we design the sample.

Now keeping in mind the concept of relating statistical precision to monetary amounts we can move into the area of the second objection mentioned – the fear that large dollar value transactions might escape audit scrutiny under pure random selection techniques.

Let's consider that each accounting transaction has two characteristics, an incidence of occurrence, and a monetary value, or in other words a numeric value of one and a monetary value equal to the dollars involved.

Under traditional sampling techniques with random selections being made which give each transaction a unitary or numeric value, a large dollar value item has no greater chance of being selected than a small dollar value item. Indeed, because large dollar items occur less frequently than small dollar amounts in accounting populations, it is likely that most of the selection items will be of inconsequential amounts. Accountants have understandably been reluctant to accept such samples as a basis for drawing conclusions as to the financial condition of a company.

With the stratification in the sampling plan used by Haskins & Sells, selections are made from the monetary amounts of the individual items in the population. Under this method each single dollar, regardless of which individual transaction it falls in, still has an opportunity for selection, but the probability that it may fall in a large dollar transaction is recognized. Accordingly, by use of the plan small samples of individual items ordinarily result in a large volume of dollars being examined. Items whose amounts exceed a calculated limit are not sampled but are selected 100 per cent.

And now for the third objection which seems to be the most popular but least founded: that statistical sampling might replace the objectivity and judgment of the auditor.

Lets look at auditors' judgment without regard to statistical sampling.

Several years ago the American Institute of Certified Public Accountants issued a case study on the "Extent of Audit Samples." Eight accountants of different firms were given facts and figures about a hypothetical business concern and were asked to use their judgment and suggest the extent of testing appropriate in the circumstances. The variations in the extent of

testing considered appropriate in the circumstances by these eight accountants were significant. Some of the results were as follows:

Test of payrolls relating to hours, rates, deductions and the like: The suggestions ranged from 30 per cent of one payroll to 100 per cent of two payrolls.

Accounts receivable confirmation: The range was from 30 per cent to 60 per cent of the number of accounts and 60 per cent to 100 per cent of their value.

Examination of sales invoices: The range was from 20 per cent of one month to 100 per cent of two months.

Inventory test counts: The range was from 5 per cent of value to 60 per cent of value.

Inventory pricing: The range was from 10 per cent of value to 50 per cent of value.

Cash transactions (check inspection and tracing to cash register; footings; etc.): The range was from 100 per cent of one month to 100 per cent of three months.

I believe we can conclude that this study indicates some inconsistency in judgment, and I am certain that a similar poll of all of you here this evening would reveal equally divergent opinions. This is the kind of judgment (or divergency in judgment) that statistical sampling supplants.

THE AUDITOR'S JUDGMENT

I think everyone will agree that an auditor's judgment is important. Statistical sampling is not a substitute for the auditor's judgment, but supplements it. The only area in which the auditor will not have to exercise judgment when using statistical techniques in sampling is the area of determining how much to sample and how to sample. As stated earlier, precision is measured by materiality. This requires judgment by the auditor. The precision limit to be used on a particular engagement is a judgment by those responsible for the engagement.

The extent of sampling will also depend on the auditor's appraisal of internal control. However, once these decisions are made, the extent of the sample is dependent upon the sampling plan. (Incidentally, in view of the ever

increasing tendency of third parties to involve companies and their accountants in legal suits, it might be comforting to be able to demonstrate mathematically the degree of risk one assumes in audit tests.)

I'd like to turn now to some of the other areas in which the auditor's judgment is used. I mentioned earlier that I felt that a great benefit that we derive from the use of statistical sampling is the increased quality of audit work of our staff accountants, particularly in establishing the direction of audit test and definition of accounting populations. Audit sampling has directed the auditor to apply his judgment in these areas which previously might have been neglected, all because it is so essential that audit sample results be evaluated in terms of the populations to which they relate. If we have not correctly defined the population and direction of test we run the risk of drawing wrong conclusions from our tests.

Here is a little story that illustrates how an erroneous conclusion can be drawn from a given set of facts. One hundred lumberjacks went into the woods to cut trees. They took two women with them to cook meals. After several months, two of the lumberjacks married the cooks. A statistician observed this and proclaimed: 2 per cent of the men marry 100 per cent of the women. I am sure you will all agree that the statistics are—to say the least—misleading.

Perhaps another example will strike closer to home. Assume you are responsible for auditing a company that your company is going to acquire. You have performed many tests including satisfying yourselves as to all assets on the balance sheet and all expenses. You have now directed your attention to the company's revenue and are going to test sales. To demonstrate my point, I would like to pose this question for you: In which direction should the test of sales be made? That is, is the primary test of sales a test for overstatement or for understatement?

The correct answer in this instance is "a test for understatement," for this reason: All recorded sales have already been tested by scrutinizing the debit half of the sales entries as follows:

1. If the sale was a cash sale, and our cash audit procedures showed no irregularities, the proceeds must have been collected; hence a proper sale took place.
2. If the sale was a credit sale and has not been collected, it was subject to audit verification under our test confirmations of accounts receivable.
3. If the debit was misposted to another account it was subject to testing

during our investigation of other asset or expense accounts.

The only question remaining, then, is, "Have all sales been recorded?"

At this point it is probably clear that no amount of sampling of recorded sales would reveal a sale that was not there. The sample should not be made from the sales register because we are interested in sales which have not been recorded.

This illustrates that correctly defining the population to be sampled is critical. In this case the correct population would be some independent control, such as shipping records, customer purchase orders or the like.

I hope my comments so far have been sufficient to give you an idea as to some of the concepts behind the sampling plan we are using.

I'd like to point out that Audit Sampling has not reached a plateau at this stage in its development.

We have been discussing the use of statistical sampling as a tool in selecting detail items for examination in connection with our review of detail transactions and account balances.

REVIEW OF RATIOS

A second source of an auditor's assurance is his review of important ratios, trends and other relationships reflected in financial data and his investigation of significant fluctuations therein. Gross profit rates, variations from historical data, interrelationships of expense and revenue accounts and comparison to production data are examples of such relationships.

The auditor's study of these and other similar relationships, which is referred to by our Firm as an "analytic review" and by various other terms by other auditors, is somewhat similar to the concept of "management by exception."

With the advent of the computer and relatively inexpensive time sharing services, we have recently applied statistical techniques to this "analytic review" by using regression analysis to identify on a mathematically sound basis, variations from normal or anticipated results. This is done through the use of a computer terminal in our office, and the system includes the ability to adjust the variables for growth trends and seasonal adjustment factors.

The ability to make these types of statistical computations in a reasonable amount of time and for a multitude of different comparisons is, of course, dependent upon the use of the computer.

In conclusion, it seems that statistical techniques are suitable for many areas of auditing. The most important advantage of these techniques is to enable the auditor to demonstrate, objectively, the adequacy of his test; they do not replace his judgment on the more important aspects of sampling such as the precision desired and the reliability assigned to internal control; it may also help him to be more explicit in these areas.

Many of you work in companies where close cooperation with company statisticians is possible in developing your own techniques. Some packaged programs are available. For example, the Audit Sampling plan I've described tonight is available for computer application through Auditape, a set of generalized audit programs that Haskins & Sells has developed and made available to other accounting firms and industry through the American Institute of Certified Public Accountants.

However, there is no shortcut available to assist you in applying these tools to your specific auditing problems. Since the whole matter deals with the auditing purpose and specific procedures to be applied to individual situations, every accountant must become, in varying degrees, acquainted with the concepts we have talked about tonight.

In summary I would report that our experience with statistical sampling has been highly satisfying. We have enjoyed significant time reductions in many instances, and the integrity of our audit tests has increased in all cases where sampling has been applied. The increased awareness on the part of our staff of audit purpose and direction of test is a benefit that is hard to place a value on. Not the least of the benefits enjoyed is the fact that auditing in this context is not only less tedious but often can be described as fun.

If my comments this evening have kindled your interest in applying statistical techniques in your work, I have accomplished my purpose. Get involved, enjoy it, but keep things in perspective. A ninety-seven year old man managed to do this when his application was rejected by a life insurance company. "Why?" he inquired. "Your statistics show that very few men die after they have reached the age of ninety-seven." ●