

Statistical or Non-statistical Sampling: Which Approach Is Best?

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Abstract

When planning sampling procedures, the auditor considers this question: should a non-statistical or a statistical approach be used? A statistical method provides an objective measure of risk, optimizes the sample size, and is best for a population of a large number of homogeneous transactions. If the population members are dissimilar or there are key items, a non-statistical approach is most suitable. Some practitioners believe a statistical sample is more defensible; others feel a non-statistical approach can be more readily justified.

Introduction

Many publications are available to aid the practitioner who is using sampling on an engagement. Besides Statement on Auditing Standards (SAS) 39, "Audit Sampling" (AICPA, 1981) and its related Audit Sampling Guide (AICPA, 1983), articles, chapters in auditing textbooks, and even entire books provide guidance on applying sampling methods in an audit context. Although these sources provide excellent coverage of specific sampling techniques, they often give only cursory attention to one of the first decisions the auditor must make when sampling: the decision to use a non-statistical or a statistical approach. This article focuses on the criteria the auditor should consider when deciding whether to utilize non-statistical or statistical sampling and the advantages and disadvantages of each method.

What's The Difference?

Sampling

Let's begin by defining what sampling is. Sampling is the application of auditing procedures to less than 100 percent of the population and the projection of the sample results to the population. The auditor selects the sample members in an orderly, rational manner; examines evidence supporting each member; and then logically projects the test results. Using the projection, the auditor draws a conclusion on some aspect of the population. For a test of controls, the conclusion relates to the rate of deviation from control procedures. In a substantive sample, the auditor's findings involve the dollar amount of error in the population.

Sampling is not being employed when an auditor examines all members of a population or when the

sample results are not projected to the population. Consider an example in which the auditor divides long-term investments into two classes: 1) related party investments and 2) all other investments. The auditor decides to examine 100 percent of the related party transactions. Of the remaining investments, the largest ten are tested. Those ten investments comprise 90 percent of the non-related party balance. The auditor does not project the results from the ten investments to include the last 10 percent of the non-related party balance because the balance is immaterial. In this situation, sampling has not been used for any portion of the long-term investment population.

Statistical Sampling

A sampling application may be either statistical or non-statistical. To be classified as statistical, the sample must meet these three criteria: 1) the sample size must be determined objectively or quantitatively, 2) the sample members must be selected randomly or approximately randomly, and 3) the sample results must be evaluated mathematically.

To determine the sample size for a statistical sample, the auditor explicitly considers several factors. These include materiality, the expected error rate or amount, the risk of over-reliance or the risk of incorrect acceptance, audit risk, inherent risk, control risk, standard deviation, and population size.(1) These factors are needed to obtain the required sample size from statistical tables.

Auditors generally use one of two ways to select a sample that is random or approximately random. A

random number table or a random number generator produces a truly random sample. The auditor can select a sample that is approximately random by using systematic sampling with five or more random starts. The auditor determines the sampling interval, X , by dividing the population sizes by the sample size. The sampling interval is multiplied by the desired number of random starts, say seven, to achieve the adjusted sampling interval, X' . After seven random starts, every X' th item in the population is selected for inclusion in the sample.

The professional standards allow another selection method: haphazard selection. In a haphazard sample the auditor judgmentally selects sample members in a neutral manner. Due to the potential for bias on the part of the auditor, this method is not generally recommended for use in statistical samples but is widely used for non-statistical applications.

When evaluating sample results statistically, the auditor makes two calculations. For a substantive test, the auditor first determines the most likely estimate of the dollar amount of error in the population and then calculates the range within which the true, but unknown, amount of error might fall, at a particular level of risk. In a test of controls, the auditor finds the error rate of the sample and then determines how high the actual error rate could be (the upper error rate), at a particular level of risk.

Non-statistical Sampling

A sample is non-statistical if it does not meet to one or more of the three criteria for a statistical sample. For example, assume an auditor uses audit software to select a random sample and employs statistical tables to evaluate the results. However, the auditor sets the sample size at 60, perhaps because that was the sample size used in the prior year. The auditor has not explicitly considered the factors noted above in determining the sample size (although they may have been implicitly considered). The sample is a non-statistical one. The evidence gathered may be appropriate for the assertions tested and the conclusions reached may flow logically from the projected results, but the sample size was not obtained objectively. Because there was not a statistical determination of the sample size, the auditor does not know that the number of population members examined was sufficient to support the conclusions reached. The auditor cannot label this a statistical sample.

In another example, an internal auditor at a land-grant university was assisting the external auditors from a large public accounting firm in performing "statistical" tests. The internal auditor observed that the sample size

was determined statistically and that the results were evaluated quantitatively. She examined the evidence for the sample, but was not sure how the external auditors had chosen the sample members. In response to her query, the external auditors replied that items which "looked interesting" had been selected! Clearly, this was a non-statistical sample.

Keep in mind that there is nothing inherently "bad" about using non-statistical sampling rather than statistical sampling; the auditor must simply be careful to label the sample appropriately.

Which Approach To Use?

Statistical Sampling

Statistical sampling is especially appropriate when the population is made up of a large number of similar transactions and internal control is good. If there are numerous homogeneous transactions in an account, the auditor can select relatively few items (the exact number is determined from the mathematical tables), examine them, and draw a valid conclusion on the whole population. However, if the transactions are dissimilar, it may be more appropriate for the auditor to use professional judgment in selecting sample members and sample size. In this way, the auditor can be sure to include each of the various types of transactions in the sample. When the population size is small, the cost and time involved in setting up, selecting, and evaluating a statistical sample may outweigh the benefits of its objectivity; the auditor may decide to utilize a non-statistical approach. Finally, when internal control is poor, the auditor may have a difficult time defining errors in advance and so may employ non-statistical sampling.

Besides a large number of homogeneous transactions recorded under a good system of internal control, there are other factors for an auditor to consider in deciding if a statistical sampling approach is warranted. One is the type of conclusion desired. As noted earlier, a statistical sample in a substantive setting produces 1) the most likely estimate of the dollar amount of error in the population and 2) a range within which the true amount of error falls at a given risk level. If the auditor employs non-statistical sampling, most likely error can still be estimated, but there is no basis on which to determine the range. A statistical test of controls yields the sample error rate and the upper error rate. If a non-statistical approach is used rather than a statistical one, the sample error rate is the only conclusion the auditor obtains; the upper error rate cannot be calculated.

Another factor for the auditor to consider in deciding

between a non-statistical and statistical sample is the expertise of the audit staff. If statistical sampling is selected, the professionals in the field, as well as the managerial personnel, must be trained in statistical techniques. The education should cover not only the mechanics of the particular statistical sampling method used, but also the judgments involved in planning and setting up the sample as well as in examining the sample members and evaluating the results.

The auditor should also consider the computer environment in deciding between a non-statistical and statistical sample. If the client's records are computerized, statistical sampling is generally easy to apply. In a manual system, non-statistical sampling may be more appropriate. Also, if an auditor's firm has statistical sampling software, the tendency would of course be to use a statistical approach.

Advantages of a Statistical Approach

The primary advantage of using a statistical sampling approach is that risk is objectively determined. Using statistical tables, the auditor might reach this conclusion in a substantive test: at 5 percent risk, the amount of error in the population is between \$5,000 and \$9,000. The auditor is able to quantify the risk that the conclusion is not valid: there is a 5 percent chance that the dollar amount of error is really less than \$5,000 or greater than \$9,000 (or a 95 percent chance that the conclusion is valid).

In a test of controls, the conclusion might be: at 10 percent risk, the rate of deviation from the control procedure does not exceed 4.2 percent. Here, there is a 10 percent chance that the true rate of deviation in the population is 4.2 percent or greater (or a 90 percent chance that the rate of deviation is less than 4.2%).

Many auditors believe that the ability to statistically measure the risk involved makes statistical sampling more defensible. Because of cost constraints, the auditor is not able to examine 100 percent of the population and must accept some risk that the sample does not exactly represent the population. Statistical sampling allows the auditor to know and control the low level that risk is limited to in a sampling application. Another advantage of statistical sampling is that the method optimizes the sample size. Statistical methods allow the auditor to balance the effectiveness and efficiency of the sample. That is, statistical methods produce a sample large enough to allow the auditor to gather sufficient evidence to meet the audit objectives. A sufficient sample size is related to the effectiveness of the sample. The sample size is also related to the

efficiency of the test. For a sample to be efficient, the minimum number of population members needed to meet the audit objectives should be examined. Statistical methods produce sample sizes that are sufficient to meet audit objectives but are not larger than necessary.

A final advantage is that statistical sampling requires the auditor to systematically plan before the sample size can be determined. Many factors (materiality, the expected error rate or amount, the risk of over-reliance or the risk of incorrect acceptance, audit risk, inherent risk, control risk, standard deviation, and population size) must be explicitly considered and specified in advance. Although these factors may be implicitly considered in a non-statistical application, the auditor may simply judgmentally choose a sample size without taking the effect of the factors into account. In a statistical setting that is not possible; the factors must be specified before the sample size can be determined.

Non-statistical Sampling

There are many situations in which a non-statistical approach is more appropriate than a statistical test. If an account has a small number of transactions, the time and cost to set up a statistical sample is generally not justifiable; a non-statistical method is usually best. Also, if the account totals to an immaterial amount but the auditor still wants to examine its contents, a non-statistical approach should be used. This may occur in an account made up of "key items." Key items are interesting for reasons besides their dollar magnitude. Miscellaneous expense and sales from by-products are examples.

Key items may also make up balances that are material and non-statistical sampling may be best for these material amounts as well. For example, assume that accounts from related parties make up a significant portion of the accounts receivable balance and the remaining balance in the account is immaterial. The auditor may decide not to sample from the immaterial portion and to non-statistically select accounts from various related parties to confirm. Using professional judgment, the auditor can consider such factors as how close the related party relationship is and the size and age of the receivable when choosing sample members. This is not possible when using a statistical approach.

Non-statistical sampling is also more appropriate than statistical sampling if the population and/or potential errors are difficult to specify in advance. In a first year audit, for instance, the auditor is still gaining familiarity with the client's accounting system and may not be aware of every type of transaction that flows into an

account. Or, the auditor may not be able to define every possible substantive error prior to a variables test. For example, if a revenue account contains sales from several main products as well as sales of by-products, the auditor may want to test the various revenues differently. In future years, the auditor might stratify the revenue account by product line and sample from each stratum statistically, but in the first year, the auditor simply may not know enough to divide up the population. A non-statistical approach is most effective in this instance.

Besides being more appropriate than statistical sampling in certain circumstances, non-statistical sampling is the only appropriate approach in some instances. Examples are numerous. In an inventory observation, the auditor cannot specify in advance how many product counts will be tested. The number depends on the condition of the warehouse, the controls over the count, and the accuracy of the client's counts. Only a non-statistical approach is appropriate. Non-statistical methods would also be used in sensitive areas such as legal expense and political donations. The auditor may select expenses paid to particular attorneys for example. Based on findings from the initial sample, the auditor may judgmentally choose to test more transactions, perhaps other fees paid to the same attorneys, or may decide that the evidence gathered is sufficient.

A non-statistical approach is also best when the auditor is relating transactions from two or more accounts. For example, the auditor may decide to examine and relate the transactions in these accounts: consulting expense, tax consultation and preparation expense, and outside accounting expense. By doing this, the auditor may discover fees being paid to a third party that are material in total, whereas the amount in each of the three accounts to the third party is immaterial. The only approach the auditor can take that assures that payments to a third party from all three accounts are scrutinized together is a non-statistical one.

Advantages of Non-statistical Sampling

One advantage of non-statistical sampling is that personnel do not have to be trained in statistical techniques. Although both the professionals applying non-statistical sampling in the field and the reviewers must have a background in sampling concepts, they do not have to be able to work through the mechanics of statistical methods. Also, statistical sampling software is not needed and computer access is not necessary.

One of the advantages of statistical sampling mentioned earlier was that many auditors believe it to be

more defensible than a non-statistical approach. Other auditors believe just the opposite: that non-statistical methods are more defensible. Professionals supporting statistical sampling cite the fact that the risk associated with the sample is objectively measurable. Auditors favoring a non-statistical approach believe that the use of professional judgment is a better defense--say in court--than a statistical measure of risk. They would prefer to have expert witnesses explain how critical professional judgment is on an audit than have a statistician explain that there is a known chance, say 5 or 10 percent, that the auditor's conclusion was incorrect.

Conclusion

While auditors receive training and gain expertise in applying sampling concepts and specific sampling methods, they many times fail to adequately consider whether a non-statistical or statistical test is most appropriate for a particular test. When planning the procedures to be performed in an audit area, the professional must first determine whether sampling is appropriate at all, and then whether to apply non-statistical or statistical techniques.

Which sampling approach is best, statistical or non-statistical? It depends! It depends on the type of results required and on the capabilities of the auditing firm. If an objectively determined measure of risk is needed, a statistical approach is obvious. The professional who prefers to rely on judgment would use a non-statistical method. If the upper error rate or a range of the dollar amount of error is desired, the auditor most utilize a statistical method. A statistical sample is more appropriate than a non-statistical if the population is composed of a large number of homogeneous transactions generated under a system of good control. Auditors not trained in statistical techniques should use a non-statistical approach. Firms with computer access and sampling software would tend to employ statistical methods. If the population is made up of dissimilar members or errors are difficult to define in advance, non-statistical sampling should be utilized.

Footnote

- 1 Some of these factors are used in planning an attribute sample (test of controls); others are used in planning a variables sample (substantive test).

References

- 1 AICPA, *Audit Sampling Guide*, 1983
- 2 AICPA, "Statement on Auditing Standards 39--Audit Sampling," 1981.