

White Paper // ***Basic Statistical Sampling***

There are two basic types of sampling methods, attribute sampling and variable sampling.

Attribute Sampling:

Used to determine rate of errors in a given population. For instance, finding the percentage of total timecards not in compliance with company policies.

Variable Sampling:

Used to estimate dollar amounts, such as the extent of unallowable costs included in the total amount of costs charged to the government.

These methods are used to determine the sample size necessary to satisfy the auditor's requirements. This provides an introduction to the different variables used in both methods. The basic fundamentals of attribute sampling are somewhat simpler than variable sampling; so more detail is given on variable sampling.



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Attribute Sampling

1.) Critical Error Rate: The maximum error rate in the population that the auditor is willing to accept.

Example: An auditor is testing internal controls to ensure that all timesheets are signed by the appropriate supervisor. There are 10,000 total timesheets in the population. A critical error rate of 5% means that up to 5% of the timesheets could be unsigned and the internal controls would still be judged to be effective.

Rule: The smaller the critical error rate, the larger the sample size.

Reasoning: If you can only accept a small number of errors, you need a bigger sample.

2.) Government (auditor) Risk: The maximum risk the auditor is willing to accept that the sample will give the wrong conclusion.

Example: An auditor assesses his/her risk to be 10%. This means the auditor is willing to risk a 10% chance that, based on the sample, he/she will conclude that the internal controls are effective when in fact, they are not. Another way of saying it is that the auditor is 90% sure he/she will come to the right conclusion.

Rule: The smaller the government risk, the larger the sample size.

Reasoning: If you can only risk a small amount, you need a bigger sample.

Variable Sampling:

1.) Presumed Error Rate: The auditor's best guess of the amount of misstatement he/she expects to find in the total population. Expressed as a percentage.

Example: A presumed error rate of 5% in an account totaling \$1,000,000 means the auditor expects to find \$50,000 of unallowable costs in that account.

Rule: The larger the presumed error rate, the larger the sample size.

Reasoning: If you expect to find more errors, you need a bigger sample



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2.) Precision Estimate: The amount the auditor is willing to accept that the projected questioned costs either overstate or understate the actual questioned costs.

Example: A sample determines that \$100,000 of a travel account is unallowable. A precision estimate of \$20,000 means the auditor is willing to accept that the actual amount of unallowable costs is between \$80,000 and \$120,000. This is known as the confidence interval.

Rule: The smaller the precision estimate, the larger the sample size.

Reasoning: If you need more accuracy, you need a bigger sample

3.) Confidence Level: The amount of confidence the auditor has that the actual total questioned costs will fall within the confidence interval.

Example: Using the above example, a confidence level of 90% means the auditor is 90% sure - based on the sample - that the total unallowable costs in the travel account will fall within the confidence interval of \$80,000 to \$120,000. The auditor is willing to risk a 10% chance that the amount is actually outside this range.

Rule: The larger the confidence level, the larger the sample size.

Reasoning: If you need to be more confident of your results, you need a bigger sample.



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CASE:

An auditor is conducting an incurred cost audit of a government contractor and selects a travel account to test for unallowable costs. The account consists of 1,500 transactions and has a total dollar amount of \$350,000.

Based on prior experience, the auditor estimates that 15% of the total costs in this account are actually unallowable (presumed error rate). The precision estimate is determined to be \$10,000 and the desired confidence level is 90%.

Based on this information, the sample size required would be 340 items (determined by EZ-Quant).

However, changing any of the variables can have a dramatic effect on the sample size.

Changing confidence level only:

Confidence Level	90%	85%	80%	75%	70%
Sample Size	340	274	225	186	154

Changing precision estimate only:

Precision Estimate	\$5,000	\$7,500	\$10,000	\$15,000	\$20,000
Sample Size	810	514	340	173	103

Changing presumed error rate only:

Presumed Error Rate	5%	10%	15%	20%	25%
Sample Size	148	257	340	404	452



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Selecting the Items to Sample:

Determining the sample size is the first step. The next step is to actually select the items to be sampled. This can be done in a number of ways; however, the best method is random selection. Random items can be selected by using random number generators contained in EZ-Quant, Excel, or similar software.

Another method is to systematically select the items. The auditor picks a random starting point and then selects every n^{th} item until all items in the sample are selected.

Judgmental selection is also an option. In this case the auditor would select samples based on his/her judgment, usually with an effort to be at least somewhat random.

Other things to consider include whether or not to stratify the population before selecting the sample or whether transactions occur more often in certain periods than others.

For example, if an account had 1,000 transactions totaling \$1.5 million and \$1 million of this amount came from just five or six transactions, you would most likely pull those out to test individually before determining a sample to test the remaining items. By the same token, if the majority of the transactions occurred in December, it would be logical to select more items from that month than others.

The DCAA EZ-Quant statistical sampling program can be downloaded from the DCAA website (www.dcaa.mil). It is under DCAA Publications.



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