Chapter 11
Audit Sampling Concepts

Review Questions

11-1 A representative sample is one in which the characteristics of interest for the sample are approximately the same as for the population (that is, the sample accurately represents the total population). If the population contains significant errors, but the sample is practically free of errors, the sample is non-representative, which is likely to result in an improper audit decision. The auditor can never know for sure whether he or she has a representative sample because the entire population is ordinarily not tested, but certain things, such as the use of random (probabilistic) selection, can increase the likelihood of a representative sample.

11-2 Statistical sampling is the use of mathematical measurement techniques to calculate formal statistical results. The auditor therefore quantifies sampling risk when statistical sampling is used. In nonstatistical sampling, the auditor does not quantify sampling risk. Instead, conclusions are reached about populations on a more judgmental basis.

For both statistical and nonstatistical methods, the three main parts are:
1. Planning the sample
2. Selecting the sample and performing the tests
3. Evaluating the results

11-3 In replacement sampling, an element in the population can be included in the sample more than once if the random number corresponding to that element is selected from a random table more than once. In nonreplacement sampling, an element can be included only once. If the random number corresponding to an element is selected more than once, it is simply treated as a discard the second time. Although both selection approaches are consistent with sound statistical theory, auditors rarely use replacement sampling; it seems more intuitively satisfying to auditors to include an item only once.

11-4 In systematic sampling, the auditor calculates an interval and then methodically selects the items for the sample based on the size of the interval. The interval is set by dividing the population size by the number of sample items desired.

To select 35 numbers from a population of 1750, the auditor divides 35 into 1750 and gets an interval of 50. He or she then selects a random number between 0 and 49. Assume the auditor chooses 17. The first item is the number 17. The next is 67, then 117, 167, and so on.
The advantage of systematic sampling is its ease of use. In most populations a
systematic sample can be drawn quickly, the approach automatically puts the numbers
in sequential order and documentation is easy.

A major problem with the use of systematic sampling is the possibility of bias. Because
of the way in which systematic samples are selected, once the first item in the sample is
selected, all other items are chosen automatically. This causes no problems if the
characteristics of interest, such as compliance exceptions, are distributed randomly
throughout the population; however, in many cases they are not. If all items of a
particular type are processed at a certain time of the month or with the use of certain
document numbers, a systematically drawn sample has a higher likelihood of failing to
obtain a representative sample. This shortcoming is sufficiently serious that some public
accounting firms do not permit the use of systematic sampling.

A block sample is the selection of several items in sequence. Once the first
item in the block is selected, the remainder of the block is chosen automatically. Thus,
to select 5 blocks of 20 sales invoices, one would select one invoice and the block
would be that invoice plus the next 19 entries. This procedure would be repeated 4
other times.

The sampling unit is the population item from which the auditor selects sample
items. The major consideration in defining the sampling unit is making it consistent with
the objectives of the audit tests. Thus, the definition of the population and the planned
audit procedures usually dictate the appropriate sampling unit.

The sampling unit for verifying the validity of recorded sales would be the entries in the
sales journal since this is the document the auditor wishes to validate. The sampling
unit for testing the possibility of omitted sales is the shipping document from which sales
are recorded because the failure to bill a shipment is the exception condition of interest
to the auditor.

Sampling error is an inherent part of sampling that results from testing less
than the entire population. Sampling error simply means that the sample is not
representative of the entire population.

Non-sampling error occurs when audit tests do not uncover errors which exist in the
sample. Non-sampling error can result from:

1. The auditor's failure to recognize exceptions, or
2. Inappropriate or ineffective audit procedures.

There are two ways to reduce the risk of sampling error:

1. Increase sample size.
2. Use an appropriate method of selecting sample items from the
   population.
Careful design of audit procedures and proper supervision and instruction are ways to reduce the risk of non-sampling error.

11-8 Tests of controls include looking for deviations from client’s established controls, and monetary errors or fraud and other irregularities in populations of accounting data. Attribute sampling works well for these types of tests because it is estimating the proportion of items that contain a certain characteristic. Test of balances require a dollar amount to determine if the difference is material.

11-9 An attribute is a statement of the condition when the control procedure is in effect. An exception is a departure from that control condition. The exception for the audit procedure, the duplicate sales invoice has been initialled indicating the performance of internal control, is the lack of the attribute in question.

11-10 Stratified sampling is the technique of dividing a population into uniform sub groups called strata. Then each of the strata can be sampled separately. This sampling is used when items of very high or low values or some other type of unusual characteristics exist. Accounts receivable could be stratified into 3 strata:

- All accounts over $25,000 - 5 accounts
- Accounts $10,000 to $25,000 - 15 accounts
- Accounts under $10,000 – 10 accounts

11-11 The true value of the misstatements can be determined by doing 100% testing. To calculate the point estimate of the total misstatements an inference is made that misstatements in the unaudited population are in proportion to those in the audited population. A weighted average is taken of the misstatement.

11-12 The relationship between sample size and the four factors determining sample size are as follows:

a. As the ARACR increases, the required sample size decreases.
b. As the population size increases, the required sample size increases but only slightly.
c. As the tolerable exception rate increases, the sample size decreases.
d. As the estimated population exception rate increases, the required sample size increases.
11-13 Sampling risk is the risk that the auditors’ conclusion based on a sample might be different from the conclusion they would reach if they examined every item in the population. Sampling risk applies to all sampling. Selecting an appropriate type of sampling provides a lower sampling risk. The only time you would avoid sampling risk is if you tested the entire population, but then you would no longer have a sample.

11-14 Analysis of exceptions is the investigation of individual exceptions to determine the cause of the breakdown in internal control. Such analysis is important because by discovering the nature and causes of individual exceptions, the auditor can more effectively evaluate the effectiveness of internal control. The analysis attempts to tell the "why" and "how" of exception occurrence after the auditor already knows how many and what types of exceptions have occurred.

11-15 A situation where an auditor would consider using discovery sampling is if they have reasons to suspect that fraudulent activity is taking place. For example if the suspicion is that someone is preparing fraudulent purchasing orders, receiving reports and purchase invoices in order to send cheques to cover the fabricated transaction.

11-16 Random (probabilistic) selection is a part of statistical sampling, but it is not, by itself, statistical measurement. To have statistical measurement, it is necessary to mathematically generalize from the sample to the population.

Ordinarily, the auditor should not use random selection without drawing a statistical conclusion because of the inconclusiveness of using such results. There is a statistical inference inherent in random selection; therefore, the auditor should compute it to consider the implications of the statistical results. It would always be inappropriate to use statistical measurement to evaluate results when a sample is not randomly selected.

One case when a statistical inference should not be made is when the random sample size is too small to do so. Conversely, it would be inappropriate to ever draw a statistical conclusion unless the sample is randomly selected.

Multiple Choice Questions

11-17 a. (1) b. (3) c. (3) d. (3) e. (2)
11-18 a. (3) b. (1)
11-19 a. (4) b. (2) c. (4) d. (4) e. (3) f. (1)
**Discussion Questions and Problems**

### 11-20

<table>
<thead>
<tr>
<th>Sampling Unit</th>
<th>Numbering System for the Population</th>
<th>Correspondence Between Random Number Tables and Population</th>
<th>First 5 Sample Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sale invoice</td>
<td>All invoices numbered 0001 to 6211</td>
<td>The four left-most digits of the random number correspond to the invoice number</td>
<td>5018 5001 0445 5751 4337</td>
</tr>
<tr>
<td>2. Bill of lading</td>
<td>All bills of lading numbered 1926 through 8511 (drop the left-most digit &quot;2&quot;)</td>
<td>The fourth left-most digits of the random number correspond to the bill of lading number.</td>
<td>5018 5001 6602 5751 4337</td>
</tr>
</tbody>
</table>

### 11-21

a. The following shows which are exceptions and why:

<table>
<thead>
<tr>
<th>Invoice Number</th>
<th>Exception ?</th>
<th>Type of Exception</th>
</tr>
</thead>
<tbody>
<tr>
<td>5028</td>
<td>No</td>
<td>Error was detected and corrected by client.</td>
</tr>
<tr>
<td>6791</td>
<td>No</td>
<td>Sales invoice was voided.</td>
</tr>
<tr>
<td>6810</td>
<td>Yes</td>
<td>Proof of shipment not presented.</td>
</tr>
<tr>
<td>7364</td>
<td>No</td>
<td>Credit collection problem; should be noted for review of allowance for doubtful accounts.</td>
</tr>
<tr>
<td>7625</td>
<td>Yes</td>
<td>Duplicate sales invoice not properly filed</td>
</tr>
<tr>
<td>8431</td>
<td>Yes</td>
<td>Invoices not recorded by proper date; represents potential cutoff problem.</td>
</tr>
<tr>
<td>8528</td>
<td>Yes</td>
<td>Customer orders not included in invoice package to verify compliance with the order.</td>
</tr>
<tr>
<td>8566</td>
<td>Yes</td>
<td>Error in pricing. No internal verification.</td>
</tr>
<tr>
<td>8780</td>
<td>Yes</td>
<td>Duplicate sales invoice not properly filed.</td>
</tr>
<tr>
<td>9169</td>
<td>Yes</td>
<td>Credit not authorized.</td>
</tr>
<tr>
<td>9974</td>
<td>Yes</td>
<td>Internal verification of price extensions and postings of sales invoices was not included.</td>
</tr>
</tbody>
</table>

b. It is inappropriate to set a single acceptable tolerable exception rate and estimated population exception rate for the combined errors because each attribute has a different significance to the auditor and should be considered separately in analyzing the results of the test.
c. For each exception, the auditor should check with the controller to determine his explanation for the cause. In addition, the appropriate analysis for each type of exception is as follows:

<table>
<thead>
<tr>
<th>Invoice No.</th>
<th>Deviation Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>6810</td>
<td>Confirm the account balances to the customer; examine the reduction in the perpetual inventory records.</td>
</tr>
<tr>
<td>7625</td>
<td>Trace the amount to the sales journal and subsidiary ledger; examine the shipping document and recompute the sale amount.</td>
</tr>
<tr>
<td>8431</td>
<td>Determine who recorded the invoice and check several others prepared by him or her to determine if the error consistently occurs.</td>
</tr>
<tr>
<td>8528</td>
<td>Examine subsidiary ledger of subsequent cash receipt; examine sales invoices for other invoices to the same customer to determine if customer orders were attached.</td>
</tr>
<tr>
<td>8566</td>
<td>Check the price on other invoices to the same customer. Check the price on other invoices which have the same product.</td>
</tr>
<tr>
<td>8780</td>
<td>See 7625</td>
</tr>
<tr>
<td>9169</td>
<td>Check credit history of customer and evaluate collectibility of the customer’s account.</td>
</tr>
<tr>
<td>9974</td>
<td>Recheck actual price, extensions and postings; determine who the clerk was and check several other invoices for proper indication of performance.</td>
</tr>
</tbody>
</table>

11-22  
1. (a)  
2. (d)  
3. (d)  
4. (c)  
5. (a)  

11-23  
a. This nonstatistical (ie. judgmental) sample is a stratified sample. All 23 items over $10,000 were examined 100%. The remaining 7,297 items were tested with a sample of 77 items. Although this was not a probabilistic sample, GAAS require that in the auditor’s judgment, it be a representative one. Accordingly the results must be projected to the population and a judgment made about sampling risk, although sampling risk and precision cannot be measured.

Projection of the total population misstatement would be as follows;

- Items over $10,000  
  Projected Misstatement = Audited value - Recorded value  
  = 432,000 - 465,000  
  = (33,000) overstatement.

- Items under $10,000
Projected Misstatement = Average sample misstatement X population size
= (4,350 / 77) X (7,320 - 23)
= 56.49 X 7,297
= (412,207) overstatement.

Items under $10,000 -- proportional amount method

Projected Misstatement = Sample misstatement ratio X population book value
= (4,350 / 19,285) X (2,760,000 - 465,000)
= .226 X 2,295,000
= (518,670) overstatement.

Where sample misstatements are:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>AUDITED VALUE</th>
<th>RECORDED VALUE</th>
<th>MISSTATEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>4,820</td>
<td>5,120</td>
<td>(300)</td>
</tr>
<tr>
<td>19</td>
<td>385</td>
<td>485</td>
<td>(100)</td>
</tr>
<tr>
<td>33</td>
<td>250</td>
<td>1,250</td>
<td>(1,000)</td>
</tr>
<tr>
<td>35</td>
<td>3,875</td>
<td>3,975</td>
<td>(100)</td>
</tr>
<tr>
<td>51</td>
<td>1,875</td>
<td>1,850</td>
<td>(25)</td>
</tr>
<tr>
<td>59</td>
<td>3,780</td>
<td>4,200</td>
<td>(420)</td>
</tr>
<tr>
<td>74</td>
<td>0</td>
<td>2,405</td>
<td>(2,405)</td>
</tr>
<tr>
<td>TOTALS</td>
<td>14,935</td>
<td>19,285</td>
<td>(4,350)</td>
</tr>
</tbody>
</table>

Total misstatement is either:

\[(33,000) + (412,207) = 445,207\) overstatement
\[\text{or}\]
\[(33,000) + (518,670) = 551,670\) overstatement

In either case, the following can be said: There is a significant number of misstated items in the sample, and the amount is quite large. Since the sample is representative, it is clear that there is a material misstatement of the population. The amount of misstatement is not estimable from the sample. At this point, the best course of action would be to ask the client to make a study of their records for all population items to identify more accurately the misstatements that exist and correct them.

11-24

Decision to Use Sampling

- Generally accepted auditing standards do not require a 100% examination to express an opinion. The standard audit report explicitly refers to “such tests and other procedures as were considered necessary in the circumstances.”
• Sampling allows the auditor to obtain sufficient confidence in the financial information without examining all the underlying evidence. This reduces cost and improves timeliness without sacrificing quality.

• Planning is necessary to ensure that, within the confidence limits desired, the sample is representative of the population and that the conclusion drawn from the sample can be properly applied to the entire population.

• The auditor would choose to sample a large sized database but may decide it is more efficient to examine the entire population of a small number of large dollar value transactions.

• When some items in the population are high risk, or if the auditor believes they require special attention because of a particular attribute (for example, seriously overdue accounts receivable, slow moving inventory items or related party transactions), those items should be specifically identified for testing.

• The auditor must consider inherent risk at the time of each examination and determine the extent of testing necessary to satisfy himself or herself that this risk has not actually resulted in errors that would cause difficulties in the expression of the audit opinion.

• 100% examination may not necessarily give complete assurance because there is always the possibility that the assumptions were faulty or that inaccurate observations were made.

• Nonsampling risk stems from factors unrelated to the sampling process. The auditor must recognize the possibility that the results obtained may be inaccurate because of mistakes made in inspecting or examining the items in the sample. The risk of nonsampling error generally is not subject to measurement, but this same risk would exist even if the data of the entire population were to be examined 100%.

• Nonsampling risk can be reduced by appropriate professional competence, objectivity, due care and judgement. The use of sampling can actually lessen the nonsampling risk because it reduces the repetitiveness of a 100% examination.

• Because a sample is only part of the entire population, there is a possibility that the conclusion the auditor draws from the sample will not be representative of the population. This sampling risk can take two forms: the sample may be incorrectly accepted as representative or it may be incorrectly rejected as unrepresentative.
Application of Sampling Techniques

Sample Size

- Sample size is affected by the level of assurance desired and the level of error the auditor can tolerate (precision). Sample size varies directly with the level of assurance and inversely with precision. If a higher confidence level and/or smaller precision interval is required, a larger sample is necessary.

Level of Assurance (confidence)

- The confidence level is the probability that the sample results will be sufficiently representative of the population to give the auditor the assurance he or she requires that the population does not contain more than the specified amount of errors or deviations.
- The level of assurance required is a matter of professional judgement for the auditor.

Precision

- Precision refers to the degree of accuracy in the results of a sampling application to the indicated value of the characteristic being measured in the entire population from which the sample is taken.
- The goal is to obtain reasonable assurance that errors in the financial statements do not exceed materiality limits. Precision limits should be set so that, at the upper level of confidence, the upper limit of possible errors will not be material.

Sample Selection

- The sample selected must be representative of the population being tested. Otherwise, it is not possible to project conclusions from the sample to the entire population.
- Samples can be selected using manual or computerized techniques using, random selection, systematic selection or block testing.

Sample Examination

- Care must be taken to ensure audit control to avoid the possibility that, because of client manipulation, the sample items examined are not truly representative of the population.

Sample Evaluation

- Errors discovered in the sample should be considered representative of others in the population, and these should be projected over the entire population. The auditor must then decide whether the achieved precision and confidence are acceptable,

Statistical versus Judgemental Sampling

- Statistical sampling offers a number of advantages over nonstatistical methods. Conclusions drawn from a statistical sample are more objective and defensible because they are based on mathematical principles. This enables the auditor to measure and control the risks of making incorrect projections that are inherent in all
sampling approaches; possible increase in accuracy due to a reduction in
nenonsampling risk; time and cost saving; and more consistent extent of testing
decisions with respect to a client from year to year and between clients in an audit
practice.

If statistical sampling is selected, a number of sampling plans are available, such as
attribute and variables techniques. Statistical sampling requires trained and
knowledgeable personnel and costs will be incurred in development and training to
implement the statistical methods.

Cases
11-25

Points to be included in the memorandum:

1. Audit objectives of the physical count
   a. to verify physical existence of the stated amount or number of securities;
   b. to verify that title to the securities is correct;
   c. to verify the existence of all outstanding coupons, options, etc.;
   d. to verify that Bank holdings are separated from Trust holdings;
   e. to verify that all securities on hand are recorded;
   f. to verify that the securities are bonafide;
   g. to help form an opinion on the adequacy of the system of controls by means of a
cut off check, etc.

2. Description and assessment of various statistical sampling techniques

   The techniques to be assessed are as follows:

   • Monetary unit sampling, which allows for projection of $ amount of errors
     (misstatements);

   • discovery sampling, which is equivalent to a 0 acceptance number in acceptance
     sampling. The objective is the detection of at least one error should error exist at
     some assumed level of occurrence;

   • attributes estimation sampling, which is used to estimate the number or percentage
     of errors in a population and the related precision and reliability of the estimates.
     The auditor can conclude that he is X% confident that the actual number of errors is
     between Y and Z;

   • variables estimation sampling, which is used to estimate a variable characteristic of
     an accounting population. The most important application for auditors is the
     estimation of the dollar value of the population. The auditor can conclude that he is
     X% confident that the total population estimated lies between Y and Z.
**Assessment of alternatives:**

In achieving objectives (a), (c) and (f), identified in part (i), it is likely that no errors would be acceptable, accordingly:

- discovery sampling is a possibility, since it places an acceptable error rate at 0. It has the disadvantage of not enabling a quantification of the total probable dollar value of errors if there are any;

- monetary (dollar) unit sampling and attributes estimation sampling allow for a quantification of total probable errors, but always with workable sampling sizes allows for some errors;

- variables estimation sampling is not really appropriate because the size of the population is already known, so there is no need to estimate it.

In achieving objectives (b), (d) and (e), what is involved is primarily a test of the system, so some errors might be acceptable. The auditor must decide how many or what dollar value of errors is acceptable.

- discovery sampling is not appropriate because some errors can be accepted;

- monetary (dollar) unit sampling and attributes estimation sampling provide a quantification of the number of probable errors, but is costly in terms of sample sizes;

- variables estimation sampling is also costly in terms of sample sizes.

3. **Recommendations**

For objectives (a), (c) and (f), discovery sampling appears to be the best technique because:

- it allows 0 errors

- quantification of errors that exist is probably not worth the extra work required since, if errors are found, a 100% test could be required.

Attribute sampling could also be used to identify potential control system deviations for objectives (b), (d) and (e).
Other considerations:

- there should be a contingency plan in case a 100% count becomes necessary;
- the other audit firm must agree to this use of statistical sampling;
- to make proper use of statistical sampling, “discrepancies” have to be clarified immediately, requiring fairly senior audit personnel to be readily available.