SAMPLING TECHNIQUES USED IN THE AUDIT MISSION

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Abstract: Achieving the audit mission needs to aim at reasonable costs and that is why, in collecting the audit samples, the exhaustive technique for verifying the events, transactions information in the financial situations was replaced by the sampling technique. The audit samples may be obtained through the sampling technique, the exhaustive technique, which thoroughly (100%) examines all the elements, the specific elements selection technique. The sampling technique reduces the time needed to draw conclusions or express opinions, reducing therefore the costs. The International Audit Standards defines the sampling technique as the method of applying the audit procedures to less than 100% of the elements that compose the balance of account, transaction classes, providing equal possibilities for all the elements to be selected for audit samples. In establishing the sample one will take into account the objectives of the audit and the total number of elements subject to auditing, out of which the elements composing the sample will be selected.

ESTABLISHING THE SAMPLES

The selection of the elements composing the sample may be:

- Random selection, which entails the equality of chances for each element to be selected;
- Systematic selection, which establishes a starting point, from which, taking fixed steps, the elements composing the sample are chosen;

Example: One may select always the 15^{th} employee on the pay list. Good results are obtained if the elements are dispersed at random.

- Arbitrary selection, through which the elements composing the sample are selected without a mathematical technique, being an accidental selection by certain criteria.

Examples: Choosing the employees on the pay list by their phone number, birthday, etc.

The main stages in establishing the samples needed to apply the audit procedures, both in the case of statistical methods, and in the case of non-statistical ones are the following:

4. Determining the size of the sample;
5. Selecting the elements in the sample and testing them;
6. Assessing the results.

1. Determining the size of the sample.

Choosing the correct size of the sample is important, because it will lead to conclusions valid for the entire set of elements. Establishing the size of the sample entails:

- Establishing the objectives of the audit tests;
- Establishing and assessing the possible errors;
- Identifying the entire set and the sampling units;
- Establishing the size of the sample.

- **Establishing the objectives of the audit tests**

The tests determined through sampling are control tests and substantial (detail) tests.

The objectives of the tests determined through sampling are as follows:

1. Assessing the effectiveness of the internal control system (through control tests).This imposes the existence of documents attesting the organization and functioning of the internal control system.
2. Obtaining the elements that show there are no significant errors in the balances of the accounts (the substantial tests);
3. Obtaining the elements (for the elements that cannot be verified through spotting with third factors) needed for an assessment independent from the leadership of the audited entity (through the substantial tests);

- **Establishing and assessing the possible errors**

Depending on the objective of the testing, one may determine a certain type and number of errors, many times some of which the financial auditor wouldn't have expected.

Example: Sampling the invoices to verify the registered quantities may lead to revealing wrong calculations of the VAT.

Control tests identify the deviation from de expected behaviour and substantial tests establish the registration errors.

- **Identifying the entire set and the sampling units**

In order to do this, the financial auditor needs to make sure that the elements in the sample are homogenous, as they have been selected by an established criterion.

Example: The set of bonds is heterogeneous, but referring them to a criterion (the value of 5,000 MU) classifies them into homogenous sets as follows:

- The set of customers that exceed 5,000 MU;
- The set of customers that are under 5,000 MU.

Usually, the greater the monetary unit, the larger the size of the sample.

The size criterion is the most used. Another criterion is the risk degree, depending on which assets are classified into:

- High embezzlement risk assets (cash in the cash desk);
- Low embezzlement risk assets (body immobilisations).

Irrespective of the criterion, the adequate attention will be paid to certain elements of the set.

Example: Out of the bonds set, irrespective of their size, the uncertain bonds whose cashing deadline is missed will be watched.

- **Establishing the size of the sample**

The sampling procedure is relevant only if the errors discovered in the sample are approximately similar to the errors in the entire set.

According to the probability theory [Cosserat G.W., 2000], the size of the sample is determined as follows:

- For sets under 5,000 UM, the entire set of elements is taken into consideration;
- For sets that exceed 5,000 MU, the size of the sample is established according to the following criteria:
  - The associated assurance level and the precision level;
  - The margin of error;
  - The standard deviation of sets, etc.

The associated **assurance level** refers to the possibility for the sample not to be representative.

Example: For an assurance level of 90%, a sample out of ten will not be representative, and the conclusions drawn based on that sample may be false.

The calculus relation for establishing the assurance level (IL) is:

$$AL=100 - SR \quad (1)$$

$$SR= \frac{AR}{CR \times IR \times NDR} \quad (2)$$

where:

AL	=	assurance level
SR	=	sample risk
AR	=	audit risk
CR	=	control risk
IR	=	inherent risk
NDR	=	non-detection risk

It is required that the audit risk estimated by the auditor be always lower than or equal to 5%, corresponding to a 95% reliability (assurance) level for which the financial auditor accepts a 40% sampling risk at the most, which corresponds to a 60% assurance level associated to the sample[Dănescu Tatiana, 2003].

Example:

AR = 5%
CR = 50%
IR = 50%
NDR = 50%

$$RE = \frac{RA}{RC \times RI \times RND} \times 100 \frac{5\%}{50\% \times 50\% \times 50\%} \times 100 = \frac{0,05}{0,125} \times 100 = 40\% \quad (3)$$

$$NA = 100 - RE = 100 - 40 = 60\% \quad (4)$$

The precision level refers to how exactly the size of the sample has to be established for the sample to be sufficiently representative. The precision level is related to the significance limit.

The margin of error is also related to the significance limit and is decisive in establishing the size of the sample. The literature reveals that the assurance level and the margin of error need to be established as exactly as possible.

The size of the sample varies:

- In inverse ratio to the margin of error;
- Directly proportionally to the associated assurance level.

Thus, if the assurance level established by the financial auditor is high, the costs of the audit will increase (using a larger sample), otherwise, the financial auditor could be accused of professional negligence.

The standard deviation represents the dispersion from an average in a graphic system with two axes of:

- the value of the elements and
- their frequency within the set.

The standard deviation is a value of the risk, a value of the distribution of the probability risk.

Example: Within the set of bonds with values between 1 MU and 10 MU, there are the elements 1, 2, 3, 10 for which one calculates the following:

- the average value (A), using the simple arithmetic mean:

$$A= \frac{1+2+3+10}{4} = 4 \text{ MU} \quad (5)$$

- the standard deviation (SD), extracting the root of the sum of each element's deviations from the average, individually squared:

$$DS = \sqrt{(1-4)^2 + (2-4)^2 + (3-4)^2 + (10-4)^2} = 7{,}07 \text{ UM} \quad (6)$$

According to the statistical theory, to a standard deviation correspond 67% of the elements of the set that have values belonging to the interval [4-7,07; 4+7,07], that is [-3,07; 11,07].

The greater the standard deviation, the greater the interval of values and, therefore the larger the size of the sample.

2. Selecting the elements in the sample and testing them

The financial auditors are responsible for selecting the number of elements in the sample, applying tests and assessing the results.

The selecting principle is: "*an equal chance for each element*". The selection may be achieved by using one or combining several sampling methods. No element will be excluded from the selection, even though it has been selected for other tests. Testing is done depending on the audit objectives. If for certain elements testing cannot be achieved for various reasons (such as: documents are missing, confirmations from customers are nor received), the financial auditor either will consider that those elements generate errors, or will eliminate them considering them irregular (unrepresentative) errors due to isolated events, depending on the case.

3. Assessing the results

Assessing the results consists of:

- determining the number of errors discovered after the testing;
- establishing the superior limit of the margin of error through the report:

$$\frac{\textbf{Reliability factor}}{\textbf{Discovered errors}}$$

If the superior limit of the margin of error is higher than the tolerable margin of error, it means that the size of the sample is too small, and the financial auditor has to

decide on the size of the sample. If the errors do not exceed the expected margin of error, the results are extended to the entire set.

When analysing the errors, the financial auditor has to take into account if they are valid for the entire set or are isolated. For generating results extrapolation may be used.

Example:

- the size of the sample chosen for bonds is 33% of the overall countable value of the bonds, 15,000 MU;
- by applying the background procedures, the financial auditor establishes the real value of the sample at 4,000 MU, while the countable value of the sample is 5,000 MU;
- establishing the error: $100 - \frac{4.000}{5.000} \times 100 = 20\%$ (7)
- the error at the level of the total set of bonds: $20\% \times 15.000 = 3.000\,\text{UM}$.
- It follows that the real audited value of the bonds is 12,000 MU (15,000 MU – 3,000 MU).

If the risks are assessed at a lower level, then the real margin of error is higher than the expected margin of error, which requires:

- Diminishing the audit risk by diminishing the control risk and the non-detection risk;
- More detailed background procedures;
- Changes in the audit program.

If the real margin of error is lower than the expected margin of error, an increase of the non-detection risk follows within audit activities that could be conducted with less effort.

SAMPLING METHODS

Financial auditors use the random sampling method both for auditing internal control mechanisms, and for auditing operations and balances of accounts.

The differences among testing internal control mechanisms, testing operations and balances of accounts refer to quantification. Testing internal control mechanisms aims at determining whether the ration of the deviations in the audited set is sufficiently small to justify the reduction of the estimated control risk, with a view to reduce the quantity of audit samples.

When testing operations, the financial auditor takes into considerations both the effectiveness of internal control and the significant monetary errors within the balances of accounts testing operations. The objective of the audit is to identify the significant monetary errors within the balance of the audited account. That is why financial auditors use testing methods [Loebbecke Arens, 2003] whose results are expressed as monetary terms, i.e. sampling methods that may be:

- **statistical methods** use the probability theory;

These methods provide a scientific base for using the financial auditor's professional judgement and taking into consideration the entire set of elements.

Example: for selection, the set of the transactions in a year is used, as opposed to non-statistical methods, which choose for the sample elements from the set of transactions in a month, without extending the selection to the entire year.

- **non-statistical methods** (of relational sampling, non-probabilistic).

These methods imply a higher degree of subjectivity and, as they don't use the probability theory, are based on chance and professional judgement, both for determining the size of the sample, and for interpreting the results.

Example: When verifying the bonds, there are 10 customers whose bond value exceeds 5,000 MU and 50 customers whose bond value is under 5,000 MU. The financial auditor chooses to verify the 10 customers whose value exceeds 5,000 MU and selects 30% of the customers whose value is under 5,000 MU, either through statistical methods, or through non-statistical methods.

Depending on the selection techniques applied, there are several types of statistical sampling:

- simple random sampling;
- systematic (mechanical) sampling;
- sampling through probability proportional to the size;
- stratified sampling.

Although when it comes to statistical methods (of probabilistic sampling) the financial auditor does not resort to judgement to determine the elements in the sample, he resorts to judgement to choose one of the four statistical methods to use during the audit mission.

- **Simple random sampling;**

According to this method, each element of the set faces the same probability to enter the sample, and this represents the basic condition.

Audit procedures will be applied to all the selected elements, and the conclusions will be associated to all the elements in the audited set. This method is used for the sets that have not been segmented for auditing.

Example: auditing all the cashing operations in the registers, irrespective of the activity that generates them.

This method uses random number tables containing numbers for which there is no identifiable model of occurrence, but only an equal chance to be selected from within the set.

Usually, financial auditors use IT means when creating random numbers tables:

- calculation computer programs;
- random numbers generators;
- audit applications.

Random numbers may be obtained with replacement (repeated, by introducing the element extracted from the set, offering to it once again the chance to be selected) or without replacement (not repeated, when the element is selected only once without being reintroduced in the set). If the random number is selected several times – during the replacement selection – it will be included in the sample only once. Usually, financial auditors use no replacement selection.

Example: The financial auditor wants to select 30 random elements out of the set of cashing operations contained in the cashing register. The financial auditor introduces in the computer program the parameters that define the set of cashing operations, i.e. the total number of cashing operations (let us suppose 300) out of which the computer program will randomly select the number associated to the operations that will form the sample.

Using computer programs when randomly selecting elements has the following advantages:

- time saving;
- reducing the number of errors made by financial auditors during the selection.

- **Systematic (mechanical) sampling** is the method by which the financial auditor calculates a counting step, and afterwards methodically selects elements in the sample. The counting step is obtained by dividing the size of the set by the size of the wanted sample.

Example: In the cashing register there are 300 operations, the size of the selected sample is established at 30 elements. It follows that the dimension of the next step is 10. The financial auditor also needs to determine the starting point in forming the sample. If the randomly selected starting number is 2, the operation occupying the 2nd position in the register will be the first element selected for the sample, and the following selected elements will be from 10 to 10 (12, 22, etc.).

The advantage of the systematic selection is the easiness in forming the sample, but there is an objectivity-related risk because of the way in which the elements of the sample are selected, especially when the visual features of the elements are not distributed at random.

Example: The absence of the internal number of the selling invoice during a certain period of the year (the period subsequent to the introduction of the legislative rule).

In consequence, a systematic sample poses a higher risk not to be representative than a random sample. What is important is the fact that, when choosing systematic sampling one should analyse the possible distributions of the deviations within the set, in order to obtain an objective representative sample depending on the audited feature of the elements of the set.

- **Sampling through probability proportional** to the size seeks to form the sample out of those elements that have the highest values, offering the possibility to an element to be selected proportionally to the registered value of the element.
- **Stratified sampling,** also seeks the elements in the set that have the highest values. When selecting them the set is divided into subsets depending on dimensions, forming larger samples for larger subsets. Through stratifying into subsets, the financial auditor attaches greater importance to certain elements (in the subset containing elements with higher values) and lesser importance to other elements, which belong to other subsets.

Example: The financial auditor groups the buying invoices into 2 subsets depending on their value. The stratification criterion is 1,000 MU. The resulting subsets are:

- Those containing elements > 1,000 MU, from which he selects 20 elements;
- Those containing elements < 1,000 MU, from which he selects 10 elements.

Depending on the objectives and the way errors are quantified there are:

- Variable sampling;
- Monetary units sampling.

Between statistical and non-statistical methods there are both similarities – as regards the application of the same stages in establishing the samples (determining the size of the sample, selecting the elements in the sample and testing them, assessing the results), and differences that refer to quantifying the sampling risk. In the case of the statistical method, let us consider the use of a statistical series for a 95% reliability level, which leads to a 5% sampling risk, as opposed to non-statistical methods that do not quantify a sampling risk, but chose elements of the sample via a subjective

judgement. That is why the non-statistical method is called relational sampling. Through the statistical (probabilistic) method, the sample is formed in a random process in which each element of the set faces a stable probability to be included in the sample, as opposed to the non-statistical (non-probabilistic, relational) method, in which, when forming the sample, one's own judgement is used.

Financial auditors may use both statistical and non-statistical sampling. In the case of the statistical sampling, the sampling has to be probabilistic, and the sampling risk will be calculated through statistical assessment methods. Non-statistical samplings may be achieved, by using probabilistic methods, but the results cannot be assessed, like in the case of a statistical sample.

DRAWBACKS OF THE SAMPLING TECHNIQUE

Selecting a sample out of a population aims at its being representative, i.e. the features of the sample should be identical to those of the population (set). The sample not being representative may be caused by:

- Sampling errors;
- Observation errors.

The sampling error emerges when elements with features that are different from those of the population are selected.

Example: 5% of the invoices issued by the entity don't contain the personal number of the individual that draws them. In the selected sample of 50 invoices, all the invoices contain the personal number of the individual that has drawn them.

In order to eliminate the sampling risk one can:

- Increase the size of the sample;

Establishing the size of the sample so that the sampling risk be reduced represents an important problem of the sampling technique.

- Choose an adequate method of selecting the elements in the sample.

Using the adequate sampling method allows the financial auditor to reasonably quantify the sampling risk.

The observation error emerges when the financial auditor does not observe the deviations in the chosen sample because of:

- The financial auditor's incompetence in recognising the errors, his tiredness or boredom;
- The use of inadequate and ineffective audit procedures.

Example: The financial auditor verifies whether each buying invoice has attached to it the entry-reception note. The chosen method is examining a sample of entry-reception notes and not a sample of buying invoices, the financial auditor applying the testing wrongly. He / she should have chosen a sample of buying invoices, in order to identify whether each buying invoice has attached to it the entry-reception note.

Choosing the adequate audit procedures, training financial auditors, supervising their activity represent ways to reduce the observation risk.

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