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## AN APPLICATION OF STATISTICAL METHODS IN FINANCIAL STATEMENTS AUDITING

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**Summary:** Financial statements auditing plays an important role in ensuring high substantial quality of these statements. In most cases, auditors are not able to perform a full audit of a financial statement. In this case, they must choose a sampling method. One of these methods is the statistical method of financial statements. The article shows how to audit financial statements by means of applying statistical tools.

**Key words:** financial statement auditing, auditor, statistical tools.

### 1. Introduction

Financial statements auditing is conducive to reducing the risks associated with investing in a business by the authentication of the data contained in financial statements. The quality of services of auditors is a key factor in the efficiency of auditing. Efficiency is a measure of the achievement level of an assumed or recommended goal, as well as the assessment of the realization level of an assumed and recommended goal [Skorupko, Anderska, Łempicka (Eds.) 1999, p. 753]. The efficiency of financial statements auditing is the degree of users' trust in such statements.

There are many factors that determine the efficiency of financial statements auditing. The most important include auditors' competence and their independence and the methodology of an audit itself. Research methodology is an important factor in financial statements review process as any oversight restricts the right of an auditor to report on a statement.

Experts in financial statements auditing do not play the role of "the police officers" as it is often treated by many companies, and sometimes even expected. The purpose of an audit is variously defined. In International Standards on Auditing, an audit is defined as follows: "The purpose of the financial statements auditing is to enable the auditor to express an opinion about whether the financial

statements was, in all material respects, prepared in accordance with the required conceptual assumptions of financial reporting” [MSRF nr 200, par. 2].

The Accounting Act, however, states that a goal of financial statements auditing is to express a written opinion by an auditor, together with a report on whether financial statements comply with applied accounting principles (policy) and whether accounts truly and fairly present the financial position, as well as the financial result of a given company [Ustawa o rachunkowości, art. 65].

Nevertheless, determined and eliminated irregularities during financial statements auditing should help significantly improve the quality of financial statements. The revision of a financial statement fulfills certain functions:

- control function: it consists in finding the correctness, accuracy and clarity of the information presented in financial statements
- informative function: the auditor through audit documentation provides a number of information to the owners of a company,
- certified function: the auditor states the correctness of a financial statement or shows its incorrectness [Krzywda 2005, p. 18].

Thanks to these functions, financial statements auditing guarantees to owners that the information is correct and accurate.

This article aims to analyze one possible (it seems the most appropriate) method of examination of financial statements auditing. The method, which was analyzed, uses statistical tools for auditing.

## 2. The ways of financial statements auditing

One of the basic activities that the auditor performs during an audit is to check the reliability of accounting records on the basis of which a financial statement is prepared. The credibility check may rely on [KSRF, nr 1, par. 19]:

- a) analytical reviews,
- b) detailed studies of individual balances or groups of business operations.

Analytical surveys are used only for testing reliability and depend on an assessment of figures and trends. They allow determining significant changes, deviations from expected sizes and incompatibility with the data collected in the course of other checks. Their application is particularly useful:

- a) during planning of an audit for understanding the situation a company whose financial statements are examined, and checking the issues (areas) burdened with increased risk,
- b) during the detailed examination of reliability to assess the formation correctness of balances or business operations groups,
- c) at the end of a check in order to ensure that the conclusions drawn from a detailed audit are confirmed by the findings of audited financial statements.

The usefulness of analytical reviews for an audit stems from the fact that their application uses the repetition of the relations between specific figures. They allow obtaining evidence of the completeness, accuracy and validity of data resulting from records in books.

Performed by the auditor, detailed reliability checks can depend on the performance of the following actions:

- a) insight and reviewing of the documentation and accounting records of a company whose financial statements are examined,
- b) checking the inventory and the items of a material form (e.g., cash, stocks),
- c) observation of procedures, conditions or processes (e.g., inventory, control measures),
- d) oral and written inquiries addressed to the manager or the staff of a company or – in consultation with the head of a company – to third parties and obtaining a confirmation to the questions (e.g., confirmation of balances),
- e) making calculations.

Compliance tests rely primarily on the re-performance of internal control procedures. The selection of the types of actions listed above (which one is used), their scope (what and how much is included in them), deadliness (within a year, just before closing the books, after closing the books) specifies the procedures of an audit. That is why the term “audit range” refers to the possibility of using various application procedures which seem necessary in a given condition. If the auditor has no such a possibility, there is a limit in the scope of an audit.

The methods of testing the reliability of individual items, balances or groups of transactions can be divided into:

- full,
- sample.

The full method, by its nature, is a more detailed examination, and thus, from the perspective of risk minimization of financial statements, the right to apply. In practice, the possibility of its application is limited. It is very labor-consuming and expensive. According to the National Standards on Auditing, it is neither possible nor necessary in practice to examine all the elements of the items shown in financial statements. This allows limiting the scope of the study, however, increases the risk that financial statements auditing will contain not found (omitted or distorted) information and mistakes which may mislead the recipient of a report. The most popular method applied by auditors is the sampling method, which consists of taking only a sample of the population on the balance of the account or a group of transactions. Within the test a sample is subjected to a test, and the results of this test are extrapolated to entire population.

The achievement of the objectives of an audit does not require a detailed examination of all the components of balances or a group of business operations. This justifies the use of samplings which relies not only on a part of data (set)

making up the balance or a group of business operations. Depending on the selection of data for a detailed examination of a sample, contained in a test set one can distinguish [KSRF, nr 1, par. 22]:

a) deliberate selection (e.g., a survey covers all the unusual items, the items with an amount higher than specified, all operations from the turn of a year),

b) random selection, when the components of a tested set are selected into a sample in such a way that each of them has a different than zero probability (chances) of entering the sample and, simultaneously, for each sample it is impossible to determine the probability of its sampling,

c) incidental selection, made in a different way than the deliberate and random ones.

An objective, with a certain degree of reliability (precision), generalization of the findings of the tested sample for the whole set is possible in the case of the connection of the elements from random selection which are included in the sample with the methods of statistical inference.

### 3. Financial statements random survey

Sampling in financial statements auditing is based on auditor's analysis of only samples (parts) of a given population. The statistical population is a collection of individual statistical elements that have at least one thing in common, and differ with the variables surveyed. The statistical group, known as population or statistical weight, is the subject of a statistical survey. There are some examples of populations which are checked during financial statements auditing. They are:

- receivables,
- liabilities,
- documents (sales, purchase, internal invoices, etc.),
- account balances.

In the random sampling of a tested sample, every element of a population has an equal chance to be sampled. For this purpose, the statistical method of determining the sample size is applied to ensure the desired level of errors of inference, and in this case it is possible to determine the parameters defining the size of errors.

An essential role in the selection of the random sample methodology is played by the representative sampling method. It involves collecting a sample of a population, subjecting it to an analysis, the designation of appropriate levels of significance and the estimates that are an assessment of searched population parameters, and generalization of obtained results to an entire population. The main tool is a representative method of probability.

Random survey with an application of statistical procedures should consist of the following stages [Fedak 1998, p. 209]:

- determination of a goal,



- defining the studied population or an element,
- determination of parameters – risk, the level of materiality,
- determination of a sample size,
- choice of a sampling method,
- an analysis of sample content,
- choice of the generalization method of analysis results,
- evaluation of results.

An audit should begin by defining its object and scope. The scope may include testing for compliance and reliability, or one of those relationships.

As a key issue one should consider a proper definition of a population, sampling unit and sampling frame. The concept of population in financial statements auditing means any data from which the auditor draws a sample so that he or she could meet the established purpose of an audit. During the compliance check, populations may create accounting records, documents or individual elements of these documents. In the reliability study, populations make up balances, groups of operations or individual elements of financial statement [Krzywda 2005, p. 231].

The sampling element can be a particular element of a population – in the individual sampling or a group of elements – in the team or multi-team sampling.

In the next stage of an audit, the auditor must determine the risk associated with financial statement auditing. The risk is related to the possible existence of irregularities in a statement and not finding these irregularities during an audit. However, this type of failure should be eliminated while preparing a report by a responsible entity.

The basic risks rated among the general risk of financial statements auditing include:

- inherent risk,
- control risk,
- the risk of missing.

According to the ISA, inherent risk is a susceptibility to a potentially important irregularity, both the unit one as well as the one which occurs along other irregularities, assuming that there are adequate control systems [MSRF, nr 200, par. 29].

Control risk is a risk in a statement (e.g., in a balance account or group of transactions), a potentially significant irregularity, both the unit one and the one associated with other irregularities, which in a company internal control system may not be prevented or detected and corrected on time [MSRF, nr 200, par. 29].

International Standards on Auditing treat these two risks together, calling them “the risk of material misstatement”. These risks are presented in a company regardless of financial statements auditing.

Risk which is dependent on the actions of the auditor during an audit is a risk of missing. It is closely associated with test procedures and methods of their use by the auditor. This risk is associated not only with the choice of inappropriate

procedures or an improper application of appropriate procedures but also with an incorrect interpretation of obtained test results. The risk of sampling may be caused by choosing the wrong size of a sample for testing from a given position which was subjected to a test or inadequate methods of sample selection. The general risk of missing is connected with the causes which do not result from sampling. The causes of this risk may include a faulty test design, poor test realization, or faulty interpretation of test results. In any case, it is the experience of the auditor which counts. Thus, the stage of a proper audit is subjected to some kind of subjectivity so that even applying the full test method in financial statements auditing cannot assure the elimination of the risk of missing [Lew 2009].

The most commonly used in practice method of risk assessment is the multiples method, which assumes that risk is the product of inherent risk, control and oversight. The auditing risk is defined as:

$$R_B = R_N \times R_K \times R_P,$$

where:  $R_B$  – auditing risk,  
 $R_N$  – inherent risk,  
 $R_K$  – control risk,  
 $R_P$  – risk of missing.

Each audit of financial statements will be accompanied by various types of risk. The risk of error exists in the process of creating financial statements, i.e. at the stage of collecting, recording and processing of accounting data for the whole year. This type of failure should be eliminated during a preparation process, or, if it has not been removed at this stage, then during an audit. Unfortunately, finding these failures is time-consuming and sometimes quite unnecessary, since some of them may be irrelevant to assess the credibility of financial statements. The auditor applies the materiality in order to define a border to which the distortions due to errors and possible fraud can remain undetected or detected but not corrected because of their small effect on the existence of errors [Folcik 2009].

The given information is significant if its omission or distortion could influence economic decisions taken by users based on financial statements. The significance of information depends on the amount of items or errors, assessed under the circumstances in which this position is omitted or distorted. Thus, what is of great significance is a threshold or limit, not the essential feature that information must have to be useful [MSRF, nr 320, par. 3].

Determination of materiality, which is the limit of omitting minor deficiencies, establishes a certain level of acceptable risk of an audit. Reducing the risks of an audit is important for the auditor. This is due to the importance of the opinion and report on the financial statements of a company for the potential recipients of such information. The auditor is accompanied by risk during each phase of an audit and this stems from a large range of test procedures, as well as the probability of accidental or intentional irregularities in investigated company books.

Because one cannot completely eliminate the risk of overlooking, the auditor should first of all, within the planning of an audit determine the level of acceptable risk, by determining the overall significance level which relates to financial statements as a whole and partial significance for individual test items, such as a balance or group operations. The significance level for various subitems can be estimated using the equation, which, thanks to the used coefficient can be adapted to the specific requirements of various inspected items:

$$I_C = I_O \times w,$$

where:  $I_C$  – partial materiality,  
 $I_O$  – general materiality,  
 $w$  – coefficient taking into account the different risk of errors in individual items.

The level of partial materiality can be also defined on the basis of dependencies proposed by various authors [Hołda 2000, p. 20, Helin 1997, p. 58]:

$$I_C = I_O \times \frac{Z_P}{W},$$

where:  $I_C$  – partial materiality,  
 $I_O$  – general materiality,  
 $Z_P$  – set value covered by sampling,  
 $W$  – value of assets or revenues from sales.

$$I_C = I_O \times \sqrt{\frac{Z_P}{W}},$$

where:  $I_C$  – partial materiality,  
 $I_O$  – general materiality,  
 $Z_P$  – set value covered by sampling,  
 $W$  – value of assets or revenues from sales.

The next step is to determine the sample size of a tested population. The sample size depends on many factors. The most important ones include the required level of materiality. The smaller the deviation and the materiality level is assumed, the greater the sample. In the case of conformity test, the sample size ( $n$ ) is defined as:

$$n = \frac{W_n}{b_d},$$

where:  $n$  – sample size,  
 $W_n$  – reliability coefficient (in practice, it is read from prepared tables based on the Poisson distribution),  
 $b_d$  – permissible error.

While determining sample quality, one can also use more accurate methods based on precision expanding coefficient ( $W_p$ ), which is the difference between the current and the previous value of the reliability coefficient ( $W_n$ ). In this case, the formula which determines a sample size has the following form:

$$n = \frac{W_n}{b_d - b_o \times W_p},$$

where:  $n$  – simple size,

$W_n$  – reliability coefficient (in practice, it is read from prepared tables based on the Poisson distribution),

$b_d$  – permissible error,

$b_o$  – expected error,

$W_p$  – precision expanding coefficient.

In the case of reliability testing, one can apply the same formulas after their multiplying by the book value of a given population.

An appropriate sampling scheme is an important element of the reliability of statistical tools. A sampling scheme is a way of taking samples from a population. There are many sampling schemes. The auditor can use the following sampling schemes, among which, depending on a classification, one can distinguish [Krzywda 2005, pp. 241ff]:

- 1) depending on the stability of probability:
  - independent (with replacement),
  - dependent (without replacement),
- 2) depending on the complexity of sampling:
  - individual,
  - team (group),
- 3) depending on the divisibility of a population:
  - unlimited,
  - limited:
    - a) stratified:
      - proportional,
      - variational (Neyman),
      - optimum,
    - b) systematic – the probability of proportionate sizes.
- 3) depending on the number of phases:
  - one-phase,
  - multi-phase.

The above divisions may overlap. In particular, one can distinguish conceptually the easiest case of simple selection, which is independent, individual, unrestricted and one-phase. It is purely a model and serves as a starting point in theoretical mathematical statistics. What is the most extensive is the schemes of limited

sampling in which one can distinguish the systematic and stratified sampling [Krzywda 2005, p. 241].

For the analysis of the results obtained from a test sample one apply:

- estimation, i.e. verifying the parameters of an analyzed variable,
- verification, or testing of statistical hypotheses concerning the characteristics and distribution of the variable in a population, more broadly [Nowak 2001; Zeliaś (Ed.) 1996].

The auditor during financial statements auditing should pay attention mainly to the estimation of parameters and not to the verification of hypotheses. In practice, the auditor focuses on estimating the average for quantitative traits and the size of the index structure for qualitative characteristics.

Use of statistical methods is the most optimum solution for the application of the random methods of financial statements auditing in practice. It results from the fact that, unlike the full method, it allows the auditor to limit the time of an audit, but also enables to stretch the results of the test from a sample to entire data or items covered by a test. The errors extrapolation to the whole data population may be done by applying the proportional estimation method according to the following formula [Owczarek 1997, p. 441]:

$$B_O = \frac{B_P}{Z_P} \times Z_Z,$$

where:  $B_O$  – general error,

$B_P$  – error found in a given sample,

$Z_P$  – set value covered by sampling,

$Z_Z$  – total value of a given set.

Another way is to apply the relative error method:

$$B_O = \frac{\sum_{j=1}^k b_j \times Z_Z}{n}, \quad b_j = \frac{wk_j - wb_j}{wk_j},$$

where:  $B_O$  – general error,

$b_j$  – relative error,

$Z_Z$  – total value of a given set,

$n$  – sample size,

$wk_j$  – book value of  $j$ -th position,

$wb_j$  – value estimated by the auditor of  $j$ -th position.

The size of errors in the entire group can also be determined by the mean difference method:

$$B_O = \frac{B_P}{n} \times N,$$

where:  $B_O$  – general error,  
 $B_P$  – error found in a given sample,  
 $n$  – sample size,  
 $N$  – number of sets covered by sampling.

The choice of the projection results method for an entire set depends on many variables, in particular, the size of errors and their distribution in a sample. The results on identified, estimated errors should be compared with established levels of materiality relating to different tested items, i.e. the size of allowable errors.

#### 4. Conclusions

The choice of a method of financial statements auditing is critical to the effectiveness of this auditing. In the absence of substantial reasons, in order to conduct a full test, the most appropriate method to use is the application of statistical tools. This provides a basis for the auditor to express an objective opinion on the throughout financial statement audit. Another aspect of the application of statistical methods is to reduce the risk born by the auditor during a test. Reducing the risks of test is of significant importance for the auditor. This is due to the importance of an opinion and a report on company's financial statement auditing for potential recipients of such information. The auditor is accompanied by a risk during each phase of an audit and this stems from a large range of test procedures, as well as the probability of accidental or intentional irregularities in the books of controlled companies.

For the purposes of risk mitigation of an audit, the auditor can make it in a randomly-deliberate way. The deliberate choice should include those items that have a significant value, and for the rest the statistical methods should be applied, i.e. the random sampling. As the application of random methods (statistical ones) allows for a simple extrapolation of test results to an entire population, one should not exclude within this method those items which were subjected to the random sampling, in spite of an earlier application of the deliberate method for more significant items. This should ensure the quality improvement of audit results.

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## WYKORZYSTANIE METOD STATYSTYCZNYCH W BADANIU SPRAWOZDAŃ FINANSOWYCH

**Streszczenie:** Badanie sprawozdań finansowych odgrywa istotną rolę w zapewnieniu wysokiej jakości merytorycznej tych sprawozdań. W większości przypadków biegli rewidentzi nie mają możliwości dokonania pełnego badania sprawozdania finansowego. W takim przypadku muszą wybrać wrywkową metodę przeprowadzenia badania sprawozdania finansowego. Jedną z tych metod jest metoda statystyczna badania sprawozdania finansowego. Artykuł ten przedstawia procedurę przeprowadzenia takiego badania z wykorzystaniem narzędzi statystycznych.

**Słowa kluczowe:** badanie sprawozdań finansowych, biegły rewident, narzędzia statystyczne.