USING SURVEY OF SERIES IN AUDIT

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Abstract
The efficiency of financial audit within an entity can be made by applying sampling statistical techniques. International auditing standards offer the possibility to test only part of financial information of an entity by means of different sampling techniques. The article is a rhetorical and practical speculation regarding the methodology and the possibility to apply a statistical survey of series in the research of documents and accounting records.

Keywords: *audit, sample, survey of series*

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1. Introduction

The utility of financial audit is highlighted by purpose fulfillment, by improving stakeholders' degree of confidence in financial information provided by the entity subject to audit [2].

In current economy, where the efficient use of resources is very important, the financial audit does not neglect this aspect either. Exhaustive auditing of accounting operations and transactions is almost impossible, mainly because of consumption of involved resources, which would make the auditors activity to be inefficient. Offering a reasonable assurance regarding the existence or inexistence of significant misstatements in financial situations, can be made by sampling.

The use of sampling in audit allows the auditor to obtain and to evaluate the audit evidence on certain characteristics of selected elements, to formulate and support the formulation of a conclusion regarding the sample population. The objective of the auditor is to ensure a reasonable basis in formulating conclusions regarding sample population (ISA 530). In order to reach this objective, the auditor seeks to find representative samples, which to limit the probability of error below the maximum accepted limit and in correlation with a satisfactory trust level, generally over 95% [3].

2. The survey of series

The survey series is used when the researched population consists of complex units that can't be considered as groups of uniform quality, because the simple units included have their own characteristics and differ from one another [5].

A characteristic of this survey is the fact that instead of using the characteristics of the surveys based on simple units, survey indicators calculated depending on the series will be used. The representativeness requirement is met when the averages of the series of units selected are close to averages of total population. Series averages $\left(\bar{x}_i\right)$ are calculated by using simple or weighted arithmetic average formula and are used to estimate the average survey $\left(\bar{x}_s\right)$. Deviations between the selected series averages and the survey average are synthetically measured by the dispersion between series $\left(\delta^2\right)$. So, in the survey of series, the dispersion between series $\left(\delta^2\right)$ replaces the general dispersion $\left(s^2\right)$ from simple survey or the partial dispersion average $\left(\bar{s}^2\right)$ from typical survey and the representativeness errors will be smaller or at most equal to errors from simple survey, because $s^2 = \bar{s}^2 + \delta^2$ [1].

The dispersion between series will be denoted by δ_x^2 for the undetermined characteristic and by δ_w^2 for the alternative characteristic. It reflects the variation between the averages of selected series and the average on the entire sample and it is calculated by one of the two formulas:

$\delta_x^2 = \frac{\sum(\bar{x}_i - \bar{x}_s)}{r}$ or $\delta_x^2 = \frac{\sum(\bar{x}_i - \bar{x}_s)^2 \cdot n_i}{\sum n_i}$, where:

r – the number of selected series;

n_i – the number of simple units in each series.

The dispersion between series has a small value in samples that contain series that have the same structure as the total population. Sampling is made based on series and their number will be denoted by „r" in selection collectivity and by „R" in total population. The survey indicators are calculated using the dispersion between series (δ^2) instead of using general dispersion (s^2), and the correction coefficient (in unrepeated survey) will be $\frac{R-r}{R-1}$ [1].

The survey of series is recommended where the dispersion of series is very small compared with general dispersion [4].

The series can be taken in several ways so that a series can represent: a place where the accounting is being made (when a entity has a accounting department); a number of records or documents from a certain period (a day, a week, a month, etc.); a number of records or documents between certain monetary values (for example the series of documents between 500 and 1000 lei) or a number of records or documents corresponding to certain accounting operations or which are part of the same category. Dividing the total population (documents and accounting records) into series can be made based on whatever criteria which assures the homogeneity of the population formed with series as complex units but, as much as possible, the number of simple units (documents and accounting records) from each series, has to be as close as possible.

3. Case study regarding the use of survey of series in audit

The survey of series (and, of course, the unrepeated one) has the most applicability and offers the most concluding results in the audit that measures the errors from documents and/or accounting records and in the audit of the number incorrect documents and/or accounting records.

Next, we will apply the unrepeated survey of series in the audit that measures the errors from the accounting records and incorrect documents at S.C. ABC S.A. Alba Iulia, in financial year 2013.

3.1. The audit of the size of errors from accounting records

For the audit of the size of errors from the accounting records made at S.C. ABC S.A. Alba Iulia the following survey plan will be respected:

I. *Determining the population*: the 18.956 accounting records made at S.C. ABC S.A.

II. *Determining the place and controlled period*: the headquarters of S.C. ABC S.A. on X Street, number 99, Alba Iulia, accounting department, financial year 2013.

III. *Choosing the survey time*: based on what it was shown so far, we choose the unrepeated survey of series. A series will be constituted by the accounting records made in a week, in the financial year 2013. We will have 52 series, each of them having a number of accounting records.

IV. *Determining sample size*: because we don't know the size of error from previous accounting records, the volume of the sample will be established depending on the required promptness of the survey and the accuracy of results. Thus, analyzing the entity's activity, it is considered that a survey of 12% from total population (6 series) is enough to obtain relevant information regarding the size of error from accounting records.

V. *The sampling*: 6 series are extracted using the table of numbers procedures. The reading starts with line 10 and column 22 (numbers 10 and 22 corresponding to line and column from where we start the reading in the table, were randomly extracted). We read successively from top to bottom the definite numbers from each line starting with line 10 and the sequence of numbers from columns 22 and 23, keeping only the numbers smaller or equal to 52 (only once). We obtain numbers 38, 21, 28, 20, 15 and 27. So, we will observe the accounting records from weeks 15, 20, 21, 28 and 38 of 2013.

VI. *Sample observing*: we observe the samples in relation with the size of error from accounting records and we obtain: in week 15- two errors of 585 lei and 1.924,8 lei; in week 20- an error of 2.200 lei; in week 21- three errors of 788,3 lei, 246,6 lei and 1.113,5 lei; in week 27- an error of 2.056,3 lei; in week 28- tree errors of 1.561,2 lei, 125,5 lei and 321,2 lei; in week 38- an error of 1.846,9 lei.

VII. *Processing observation results*: we process the obtained data, calculating the average of each series, of sample and the dispersion between series. We have:

$$\bar{x}_1 = \frac{1.924{,}8 + 585}{412} = 6{,}0917,\ \bar{x}_2 = \frac{2.200}{386} = 5{,}6995,\ \bar{x}_3 = \frac{788{,}3 + 246{,}6 + 1.113{,}6}{360} = 5{,}9678$$

$$\bar{x}_4 = \frac{2.056{,}3}{339} = 6{,}0658,\ \bar{x}_5 = \frac{1.561{,}2 + 125{,}5 + 321{,}2}{341} = 5{,}8883,\ \bar{x}_6 = \frac{1.846{,}9}{327} = 5{,}648$$

In the above relation the denominator is the number of accounting records made that week (n_i).

The average of the sample will be: $\bar{x}_s = \frac{\sum_{i=1}^{6}\left(\bar{x}_i \cdot n_i\right)}{n} = \frac{12.769{,}3}{2.165} = 5{,}898$

The dispersion between series:

$$\delta_x^2 = \frac{\sum_{i=1}^{6}\left(\bar{x}_i - \bar{x}_s\right)^2 \cdot n_i}{\sum_{i=1}^{6} n_i} = \frac{\left(\bar{x}_1 - \bar{x}_s\right)^2 \cdot n_1 + \left(\bar{x}_2 - \bar{x}_s\right)^2 \cdot n_2 + \ldots + \left(\bar{x}_6 - \bar{x}_s\right)^2 \cdot n_6}{n_1 + n_2 + n_3 + n_4 + n_5 + n_6} = 0{,}10287$$

We determine the main indicators

– *the average error allowed*:

$$\sigma_{\bar{x}} = \sqrt{\frac{\delta_x^2}{r} \times \frac{R - r}{R - 1}} = \sqrt{\frac{0{,}10287}{6} \times \frac{52 - 6}{52 - 1}} = 0{,}124358$$

– *the limit error allowed*: $\boldsymbol{\Delta_{\bar{x}} = Z_\alpha \cdot \sigma_{\bar{x}}}$

where: Zα=1,96 from Laplace function table corresponding to a trust level of 95%.

We have: $\Delta_{\bar{x}} = 1{,}96 \cdot 0{,}124358 = 0{,}24374$

In order to establish if the survey is representative we will calculate the representativeness coefficient. The survey will be representative if the calculated representativeness coefficient won't exceed 5%. We have:

$C_R = \frac{\Delta_{\bar{x}}}{\bar{x}_s} \times 100 = \frac{0{,}24374}{5{,}898} \times 100 = 4{,}13\%\ (< 5\%)$, so the survey is representative

– *the trust range*:

$$\boldsymbol{P\left(\bar{x}_s - \Delta_{\bar{x}} < m < \bar{x}_s + \Delta_{\bar{x}}\right) = 95\%}$$

$$P(5{,}898 - 0{,}24374 < m < 5{,}898 + 0{,}24374) = 95\%$$

$$P(5{,}65426 < m < 6{,}14174) = 95\%$$

VIII. *Results Evaluation*: prior to extrapolate the size of error resulted from total population survey, each error will be examined carefully. It was considered that the errors found are based on the training level of the staff, the errors not having a common feature so that there is no need to examine a larger population in order to identify all elements possessing such a feature. There aren't any elements to lead to the conclusion that these errors are evidence of fraud, due also to the low level of errors (maximum 2.200 lei). Thus, after evaluating each error, it is considered that they can be extended to the entire population.

IX. *Survey conclusions*: We extrapolate the results to the level of all accounting operations made in 2013 and the result is that the medium error level from accounting records is between (5,65426; 6,14174) lei. Multiplying by 18.956 we can see that the total error level from accounting records at S.C. ABC S.A. Alba Iulia in 2013 is between (107.182,15; 116.422,82) lei. Because it hasn't been established an overall materiality, we can't tell if the errors exceed the expected error rate.

3.2. The audit of the number of incorrect documents

For the control of incorrect documents at S.C. ABC S.A. Alba Iulia we will follow the survey plan below:

I. *Determining the population*: the 31.166 primary documents from S.C. ABC S.A.

II. *Determining the place and the accounting period*: the headquarters of S.C. ABC S.A. from X Street, nr. 99, Alba Iulia, accounting department, financial year 2013.

III. *Choosing the type of survey*: the same as for the control of accounting records, the survey used will be the survey of series, unrepeated, the series being the documents drawn in a week of 2013.

IV. *Determining sample size*: the same as in the case of the control of the size of error from accounting records, a survey of 12% is considered to be representative.

V. *The sampling*: 6 series are extracted using the table of numbers procedures. We start the reading with line 8 and column 30 (numbers 8 and 30 corresponding to line and column from where we start the reading in the table, were randomly extracted). We read successively from top to bottom the definite numbers from each line starting with line 8 and the sequence of numbers from columns 30 and 31, keeping only the numbers smaller or equal to 52 (only once). We obtain the numbers: 39, 51, 26, 11, 01 and 10. So, we will observe the accounting records from weeks 1, 10, 11, 26, 39 and 51 of 2013.

VI. *Sample observing*: we observe them as it follows:

$$x = \begin{cases} 1, \text{ if the document is correctly drawn} \\ 0, \text{ if the document is incorrecty drawn} \end{cases}$$

And we have: in week 1, from 593 documents, 4 were incorrect; in week 10, from 608 documents, 5 were incorrect; in week 11, from 601 documents, 3 were incorrect; in week 26, from 526 documents, 2 were incorrect.

VII. *Processing observation results*: we process the obtained data, calculating the average of each series, sample average and the dispersion between series. We have:

$$w_1 = \frac{589}{593} = 0{,}993254637,\ w_2 = \frac{603}{608} = 0{,}991776315,\ w_3 = \frac{598}{601} = 0{,}99508319$$

$$w_4 = \frac{524}{526} = 0{,}996197718,\ w_5 = \frac{670}{673} = 0{,}995542347,\ w_6 = \frac{583}{585} = 0{,}996581196$$

The sample average will be: $w_s = \frac{3.567}{3.586} = 0{,}994701617$

The dispersion between series:

$$\delta_w^2 = \frac{\sum_{i=1}^{6} (w_i - w_s)^2 \cdot n_i}{\sum_{i=1}^{6} n_i} = \frac{(w_1 - w_s)^2 \cdot n_1 + ... + (w_6 - w_s)^2 \cdot n_6}{n_1 + n_2 + n_3 + n_4 + n_5 + n_6} = 0{,}00000285$$

We determine the main indicators:

– *the average survey error*:

$$\hat{\sigma} = \sqrt{\frac{\delta_w^2}{r} \times \frac{R-r}{R-1}} = \sqrt{\frac{0{,}00000285}{6} \times \frac{52-6}{52-1}} = 0{,}000654546$$

– *limit error allowed*: $\Delta_w = Z_\alpha \cdot \hat{\sigma}_w$

where: Zα=1,96 from Laplace function table corresponding to a trust level of 95%.

We have: $\Delta_w = 1{,}96 \cdot 0{,}000654546 = 0{,}001282911$

In order to establish if the survey is representative we will calculate the representativeness coefficient:

$C_R = \frac{\Delta_w}{w_s} \times 100 = \frac{0{,}001282911}{0{,}994701617} \times 100 = 0{,}13\%\ (< 5\%)$, so the survey is representative

– *the trust range*:

$$P(w_s - \Delta_w < p < w_s + \Delta_w) = 95\%$$

$$P(0{,}994701617 - 0{,}001282911 < p < 0{,}994701617 + 0{,}001282911) = 95\%$$

$$P(0{,}9934 < p < 0{,}9960) = 95\%$$

VIII. *Elaborating the results*: examining each document, it was found that the incorrectly drawn documents have strayed from the requirements of form and content that all accounting documents must meet. There weren't found any serious misconducts and there is no need to extend the population subject to survey.

IX. *Survey conclusions*: We extrapolate the results to the level of all primary documents drawn in 2001 and we obtain the following result: the average share of correctly drawn documents is of (99,34% - 99,60%) and the one of the incorrect documents is (0,40% - 0,66%). We multiply by 31.166 and we obtain the total number of primary correctly drawn documents at S.C. ABC S.A. are in the range of (30.960 – 31.041), and the ones that were incorrectly drawn, in the range of (125 – 206).

3.3. The test of significance

The test of significance is the process by which a hypothesis is accepted, if the observed sample is not significantly different from the expected results, or it is rejected if the difference is a significant one. We check if the share of incorrect documents significantly differs from 1% with a risk of 5% (a trust probability of 95%). We will have hypothesis H_0 and H_1 as it follows:

H_0: p = 0,01 (does not significantly differ from 1%)

H_1: p ≠ 0,01 (significantly differs from 1%)

Because the risk is of 5% $\Rightarrow P(-Z_\alpha < Z_{cal.} < Z_\alpha) = 1-0,05 = \alpha = 0,95$

$\frac{1+\alpha}{2} = \frac{1+0,95}{2} = 0,975 \Rightarrow$ from Laplace function table $Z_\alpha = 1,96$.

So if $Z_{cal.} \in (-1,96; 1,96)$ hypothesis H_0 will be accepted. If not, hypothesis H_1 will be accepted.

We calculate the average share of errors from documents:

$$W_s = \frac{19}{3.586} = 0,005298382$$

We will have: $$Z_{cal.} = \frac{W_s - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0,005298382 - 0,01}{\sqrt{\frac{0,01 \cdot (1-0,01)}{3.586}}} = -2,83$$

Due to the fact that $Z_{cal} = 2,83 \notin (-1,96; 1,96)$, results that hypothesis H_0 is rejected and it is accepted hypothesis H_1, so the average share of incorrect documents significantly differs from 1%.

Let's check now if the share of incorrect documents significantly differs from 0,5%, with a risk of 1% (so a probability of 99%). We have: ***H_0: p = 0,005*** şi ***H_1: p ≠ 0,005***

To a risk of 1%, we have $\alpha = 0,99$ and from Laplace function table $Z_{cal.} = 2,58$.

We will have: $$Z_{cal.} = \frac{0,005298382 - 0,005}{\sqrt{\frac{0,005 \cdot (1-0,005)}{3.586}}} = \frac{0,000298382}{0,001177853} = 0,2533$$

Due to the fact that $Z_{cal.} = 0,2533 \in (-2,58; 2,58)$, results that hypothesis H_0 is accepted so the average share of error does not significantly differ from 0,5%.

4. Conclusions

In the audit of the size of errors from documents and accounting records, the survey of series is the most indicated, and its use will provide the most accurate results because, due to the heterogeneity of error size, the dispersion between series will be very small.

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