Online ISSN 2424-6166. EKONOMIKA 2017 Vol. 96(1)
DOI: https://doi.org/10.15388/Ekon.2017.1.10668

LIMITATIONS AND APPLICATION POSSIBILITIES OF THE MONETORY UNIT AUDIT SAMPLING METHOD: THEORETICAL ASPECT

Vaclovas Lakis*
Vilnius University, Lithuania

Audrius Masiulevičius
UAB Novus Numerus, Lithuania

Abstract. *Sampling presents an auditor with a possibility to collect evidence and make a conclusion after having tested only a part of population. Having selected a concrete method of sampling, an auditor evaluates whether the activity of an entity under audition, the nature of accounting and audit data approve this method and whether the results would be reliable. If the selected sampling method is unsuitable or applied incorrectly, there is a greater risk that the conclusions made by an auditor can differ if the same audit procedures would be applied to the whole population.*

The most widely used method of statistical sampling is monetary unit sampling. This method can be applied by every auditor, since no special knowledge or technical means are required. However, in some cases, the results can be inaccurate. The aim of the article is to examine the limitations of the monetary unit sampling method and to suggest a more developed formula of this method. In the process of investigation, it was defined that application possibilities of the monetary unit method are limited by the necessity to determine whether all items in the population are suitable for selection; also, the application of this method is aggravated by an existence of zero or negative values in population. What is more, if an auditor would lack information about the population under audit, we would suggest to apply a correction factor. It allows for evaluating the size of expected misstatement more precisely.

Keywords*: monetary unit, sampling method, population, sample, expected misstatement.*

1. Introduction

In the process of audit, the number of transactions under audit is usually big and an auditor, in a purely physical sense, cannot check all of them. In seeking to perform audit during a reasonable period of time, an auditor must use sampling methods. For an auditor, sampling provides the possibility to collect and evaluate evidence about the characteristics of selected items, and on the basis of it, to make a conclusion about the population on which sampling was performed. The order of sampling application is regulated by

* *Corresponding author:*
Faculty of Economics, Vilnius University, Sauletekio al. 9-II, LT-10222 Vilnius, Lithuania
Email: vaclovas.lakis@ef.vu.lt

the International Standard on Auditing No. 530 (2009). The most reliable are methods of statistical sampling. However, in practice, they are used insufficiently. Investigations performed in different periods of time indicate that methods of statistical sampling in audit are applied insufficiently both in Lithuania and other countries. The data of audit surveys, which were performed in 2007, indicate that only 5.3% of Lithuanian auditors apply methods of statistical sampling (Mackevičius and Valkauskas, 2007). Very similar are the results of researches which were performed later. The experts at the European Court of Auditors, having performed a state control expert evaluation, stated that the auditors of the State Control of the Republic of Lithuania very seldom apply statistical sampling and indicated that sampling is applied depending on the professional decision of an auditors and the results of it are not always properly documented (2014 m. Lietuvos …). An investigation performed in 2015 by the Audit, Accounting, Asset Evaluation and Insolvency Assessment Office at the Ministry of Finance of the Republic of Lithuania also confirmed that the application of sampling methods is problematic (Report…, 2015). Non-statistical sampling methods are more often applied than statistical in foreign countries. (Hall et al., 2012). One of the most popular statistical sampling methods is the monetary unit sampling method (American, ..2001; Guidance…,2013; Higgins and Nandram, 2009). However, this method undergoes some limitations, too. Many studies, such as the ones by Gavenda (2001), Mackevičius and Valkauskas (2007), Tatum (1986), Elder et al. (2013) investigated the above mentioned method together with other methods of statistical sampling. The scientists Higgins and Nandram (2009), Anderson et al. (2015) suggested a way how the method of monetary unit sampling may be improved in order to facilitate the application of it and to achieve more reliable results. However, up to now, no extensive research exists on how to expand the application of the monetary unit sampling method.

The aim of our investigation is to examine the limitations of the monetary unit sampling method and suggest an upgraded formula of this method.

2. The Overview of Applied Sampling Methods in Audit

During the period of audit, two groups of sampling methods might be applied: statistical and non-statistical sampling. Statistical sampling is an approach to sampling that has the following characteristics: 1) The random selection of sample items; 2) Use of the probability theory to evaluate sample results, including the measurement of a sampling risk. A sampling approach that does not have the characteristics (1) and (2) is considered to be non-statistical sampling (530 ISA, 2009).

Many authors agree that statistical sampling is based on scientific principles (Gavenda, 2001, Mackevičius and Valkauskas, 2007). The main features of statistical sampling are as follows: the calculation of sample size and the later evaluation of sampling results is based on statistical and mathematical calculations. Statistical sampling is recommend-

ed to be applied when a population is arranged well, when necessary data are obtained and all elements are possible to be selected into the sample. The main advantage of statistical sampling is that it is possible to ground the accuracy of statistical sampling on the basis of probability characteristics; this is done to define the qualitative reliability of presented conclusions. The characteristic of non-statistical sampling is the subjectivity when selecting the sample.

An auditor, while applying the non-statistical sampling method, makes a professional decision in selecting items for test. For investigation are sampled only those items, which, in an auditor's opinion, represent a population at its best. However, in such a case, there are no possibilities to give an objective evaluation of whether an auditor was impartial. One more very important difference between these sampling methods is that while applying statistical sampling methods, results can be extrapolated to all of the population. While applying the non-statistical sampling method, the final results cannot be extrapolated to the whole population as they reflect only tested items (Munteanu, 2014). An auditor, whether by applying statistical or non-statistical sampling, has to collect a sufficient amount of appropriate audit evidence. International Standards on Auditing allow an auditor to apply, in his opinion, the most suitable sampling method (530 ISA, 2009). The literature usually analyzes the following statistical sampling methods:

Random selection is the method of selection used when every item in a population has the same possibility to be selected by applying the table of random numbers, drawing lots or applying other means (Meng, 2013). If such a method is applied, all items in a population have an equal possibility to be selected. However, this method has some essential drawbacks. The most important disadvantage arises if some immaterial items get into a sample – then the sampling results can be non-presentable.

Systematic random selection is when every nth population item is checked, while the first items undergo random selection. In applying this method, an assumption is made that all selected items are uniformly distributed and cover all of the population (Barreiro and Albandoz, 2001; Guidance for Calculating …). Therefore, while applying this method, it is important to check whether the population is not deployed in a certain order.

Cluster selection is a selection when all the population is divided into groups according to certain characteristics or criteria. Then, the comparative share of every group is defined or every group is interpreted as a separate population and a sample is taken from every population separately. The application of this method is complicated due to the reason that population items belonging to a certain group can be very different (Barreiro and Albandoz, 2001). Also, the entire population must be divided into groups and the results of one group do not reflect other groups.

Stratified selection is when an entire population is divided into different substrata. The results are generalized according to the groups. While summarizing all population results, attention must be paid to the comparative share of different groups. The advantage of the

sampling method is that different strata can undergo different materiality (Kaplana, 2012); also, different sampling methods can be applied (Guidance for Calculating, …). However, the application of this method is limited by a complicated sample forming mechanism. In some cases, it is difficult to divide a population into strata (Barreiro and Albandoz, 2001).

Monetary unit sampling. This sampling method implies that every element has a proportional probability to their monetary value to be sampled. The peculiarity of this method is that while sampling is performed the focus is not paid to separate items, but on their total value. A population may cover many items, but if the total sum of them is very small, an auditor will select only some items. If the population has only a few items of great value, then all of them can get into a sample. This method is also named as the *Probability-Proportional-to-Size Sampling Method* (Christensen et al., 2015; Guidance…,2008).

3. The Advantages and Limitations of the Monetary Unit Sampling Method

The monetary unit sampling method is considered to be the most popular method of statistical sampling (American..., 2001; Guidance..., 2013; Higgins and Nandram, 2009; Hall et al., 2002). This method differs from other methods because it is based on the monetary sum of all population items. It is an aspect of great importance, because the users of financial statements are interested in the monetary evaluation of a company's assets. The risk of material items not being selected does not exist, which might happen if some other statistical sampling methods are applied. This method is orientated to big value items existing within a population. Every item in a population that exceeds set materiality will be selected into the sample (Moeller, 2016). In applying this method, it is possible to calculate the number of items in a population which must be checked and an auditor does not have to worry about it – the very opposite if some other sampling method is applied.

The probability of misstatements can also be evaluated. If no errors are expected, then the sample is smaller. Therefore, an auditor can easily apply this method in calculating the size of the sample (Sibelman, 2014). The monetary unit sampling method is not complicated. It can be applied even without using any special software. It can be applied in auditing different accounts of financial statements, e.g., accounts receivable, inventories etc. (Grimlund, 1990; Johnson and Mohsen, 2013). By applying the method of monetary unit sampling, sample size can be calculated according with the formula presented below:

$$Sample\ size = \frac{Population's\ recorded amount \times Reliability\ factor}{(Tolerable\ misstatement - (Expected\ misstatement \times Expansion\ factor)} \quad (1)$$

Population's recorded amount reflects the total monetary value of all items in a population. It can be the total value of account receivables, the total value of inventories etc.

Reliability factor is a statistical variable that can be calculated or selected by applying statistical tables (already calculated variables) on the basis of risk of incorrect acceptance. The reliability factor can vary widely from 4.61, when the risk of incorrect acceptance is 1%, to 0.7, when the risk of incorrect acceptance is 50% etc. (Technical..., 2012).

Tolerable misstatement is performance materiality calculated by an auditor, which is used in an audit process. This variable is used in order to find some misstatements which might be important and could make an impact on the economic decisions made by the users of financial statements.

Expected misstatement is an error which an auditor expects to find in the whole population. This value is selected by an auditor based on his professional decision and in compliance with the available information. An auditor can refer to earlier audits, changes in the structure of the company's employees, data presented by the company and other information, which might help to evaluate what misstatements can be expected in a population (Wampler and McEacham, 2005). However, an auditor does not always have enough information to evaluate the misstatement; therefore, to define an expected misstatement might be a very complicated task. The size of an expected misstatement has a direct impact on the size of the sample; therefore, if an expected misstatement is too small, the size of the sample will be smaller and an auditor will fail to collect the sufficient appropriate audit evidence. If the expected misstatement is too big, the size of the sample will be bigger than necessary and an auditor will not perform the audit effectively.

Expansion factor is a statistical variable that is defined based on the risk of incorrect acceptance. The expansion factor, like a reliability factor, is calculated and presented in different sources of literature; therefore, it is possible to select it from calculated variables (Technical..., 2012).

Risk of incorrect acceptance is a risk that occurs when a performed sample testing will substantiate a conclusion that the auditing balances are not materially distorted, but are in fact misstated (Aghili, 2011; Peek et al., 1991). The risk of incorrect acceptance depends on the audit risk, on the risk of material misstatement and on the effectiveness of analytical and other relevant tests of details. Audit risk is the combination of a company's inherent risk, control risk and detection risk (Waller, 1993). Usually, this risk is 5%. However, an auditor can make a decision if a bigger or smaller risk is acceptable for the audit. The risk of material misstatement is the combination of inherent and control risks. The 315th International Standard on Auditing regulates the determination and evaluation of this risk and the 330th International Standard on Auditing presents guidelines on how an auditor should respond to the assessed risks (315-asis TAS, 2009; 330-asis TAS, 2009). The effectiveness of analytical and other procedures indicates how

many sufficient and adequate audit evidence is collected by an auditor. Therefore, if an auditor defines the risks of material misstatement and the effectiveness of analytical and other procedures, he/she can calculate the risk of incorrect acceptance, which might be acceptable to him/her in order to sustain the audit risk at some defined level. Examples from literature present the formula of the risk of incorrect acceptance (39 Statement..., 2006; Technical..., 2012):

$$\frac{Risk\ of\ Incorrect}{Acceptance} = \frac{Audit\ risk}{\frac{Risk\ of\ material}{misstatement} \ x \ \frac{The\ effectiveness\ of\ substantive}{analytical\ procedures\ and\ other\ relevant\ tests\ of\ details}} \quad (2)$$

A more comprehensive analysis of the monetary unit sampling method indicates that this method has some limitations; therefore, the applicability of it is reduced. The analyses were done by reviewing and analyzing scientific literature related to statistical and non-statistical sampling and especially literature related with the monetary unit sampling audit method. The analysis indicated that this method is not intended for zero and negative values. If negative values do exist within a population, the result can be incorrect. Such values have to be eliminated from the total population and tested separately (Moeller, 2016; Felix et al., 1990), or an auditor must apply another method of sampling. Therefore, an auditor must check the entire population, but it is time consuming and makes the audit more expensive.

The other limitation implies the fact that if some misstatements are expected, the sample size can increase and become much bigger than by applying other sampling methods. Also, there might be a lack of information in determining the expected misstatement.

In applying this sampling method as well as other statistical sampling methods, the results reflect only those items which were included within a population. There is no easy way to determine whether all the elements were included in a population. In order to get such evidence, an auditor presents the enquiry to his management and performs analytical procedures which could help to determine the completeness of data.

This method is applied to determine whether the population has items which are increased. But in defining the items which are decreased, some other considerations might be needed (Moeller, 2016; Sibelman, 2014). This method is applied when auditing asset accounts; therefore, the application of it is not always suitable and it is not applied to audit liabilities, where the risk of non-completeness is great.

The scientists who investigated the application of the monetary units sampling method suggested some improvements. In 2009, Higgins and Nandram presented a model that is based on Zero-inflation Poisson Distribution and which can improve the calculation of misstatements (Higgins and Nandram, 2009). Anderson and other authors suggested adding a small constant to zero values so as to have positive values, which could

be then included in sampling (Anderson et al., 2015). However, the above mentioned suggestions do not solve all the problems that are related with the application of the monetary unit sampling method.

4. Applying the Monetary Unit Sampling Method – The Enhancement of Possibilities

One of the biggest problems that raise the difficulty of applying the monetary sampling method lies in the possibility to determine the size of an expected misstatement. An auditor, after investigating any available information, applies his professional experience. It is a rather complicated process that does not guarantee a reliable result. In order to minimize the risk an incorrect sample being selected because of the insufficient information about an expected misstatement, it is suggested to supplement the monetary unit sample formula and use a "correction factor". A correction factor is a coefficient that is applied instead of an expected misstatement when there is lack of information and it is difficult to determine the size of an expected misstatement. The suggested supplemented formula is presented below:

$$\frac{Sample}{size} = \frac{Population's\ recordedamount\ x\ Reliability\ factor}{\left[\left(Tolerable\ misstatement - \left(Expected\ misstatement\ x\ Expansion\ factor\right)\right]\ x\ Correction\ factor} \tag{3}$$

This correction factor should be applied when an auditor cannot reasonably assess the expected misstatement due to a lack of information or any other factors. If this formula is applied and the correction factor is entered, it is considered that an expected misstatement is 0. When the expected misstatement is 0, its own and the expansion factor's product will always be equal to 0. Therefore, in the formula's denominator, when zero is subtracted from a tolerant misstatement (the product of an expected misstatement and the expansion factor), the tolerable misstatement size remains unchanged and the denominator comprises only the product of a tolerable misstatement and correction factor. Then, we have the final formula number of 4. In this formula, the correction factor directly adjusts the tolerable misstatement. The tolerable misstatement makes a direct impact on defining the sample's size – if it decreases, the samples size increases as well.

$$\frac{Sample}{size} = \frac{Population's\ recordedamount\ x\ Reliability\ factor}{Tolerable\ misstatement\ x\ Correction\ factor} \tag{4}$$

On the basis of suggested criteria, it is recommended to apply one of the four suggested correction factors. Doctor of Sciences Thomas Nosberger has previously described some principles of audit. He indicates that the risk of material misstatement can be characterized by 4 different levels of materiality: minimal, low, average and high. Respectively, the scope of work ought to be expanded based on the level of risk of material

misstatement. He indicates that if risk is minimal, then the tolerable misstatement could not be changed for audit procedures, i.e., the 100% of a tolerable misstatement could be used. If the risk increases, then the tolerable misstatement could be reduced. If the risk is low, the scope could make 75% of the tolerable misstatement; if the risk is average – 50%, and if high – 25 % or even less (Nosberger, A short overview…). The suggested correction factor also depicts the level of risk; therefore, it is also suggested to apply one out of four correction factors which would reflect the risk from the lowest to the highest level, and it should also be 100%, 75%, 50% or 25%. The 315th International Standard on Auditing indicates that an auditor, in making a decision of which risks are material, has to evaluate the following information: 1) does the risk of fraud exist; 2) is the risk related with economic accounting or other factors; 3) the complexity of transactions; 4) is the risk related with the material transactions of related parties; 5) the subjectivity level of evaluation of financial information, i.e., evaluation that covers a high level of estimation uncertainty; 6) is the risk related with material transactions which are not specific to a company's usual performance.

Fraud risk is a very important factor. A separate 240th International Standard on Auditing is intended to define the responsibility of an auditor regarding fraud; thus, it indicates that fraud is a very important matter. Therefore, if an auditor suspects fraud, the correction factor should be 25-50%. The economic, accounting and other factors that are closely related to or influence the population are also of great importance and they must also undergo necessary processing. If the risk occurs, the population can be affected or distorted due to these factors; the correction factor should then be applied. Very often these factors are not directly related to a population under audit; therefore, the correction factor only of 57-75% should be applied. If an audited population is related with very complicated transactions, the usage of correction factor should be considered. Difficult transactions require considerable experience and a high level of competence of the client's personnel; thus, if complex transactions are determined, it is recommended to consider applying the 25-50% correction factor. Also, the level of competence of the client's personnel should be considered as well. And if it is determined to be not sufficient, a 25-50% correction factor should be considered. If the audited population is related with a high estimation of uncertainty, a 25-50% correction factor should be considered as such complex estimations require a high level of competence and experience from the clients' personnel. New transactions, which are not usual for the company, are related with higher risk, so it is recommended to consider applying a 50-75% correction factor. The number of transactions is also important. The higher the number, the higher the risk as well; thus, a correction factor of 50-75% should be considered as well. If an audit is performed for the first time, or an audit is performed not for the first time, but the previous experience indicated the probability of misstatement on the basis of a number of errors, the application of a correction factor of 25-50% should be evaluated. The generalized level of importance of suggested criteria is depicted in Figure No. 4. If risk does

not exist because of certain criteria then 100 % correction factor should be applied. An auditor has to rely on his professional decision in selecting the final correction factor, but the consideration of different criteria and the determination of a correction factor, having a limited amount of information, is a more simple way as compared with the determination of a specific estimated misstatement.

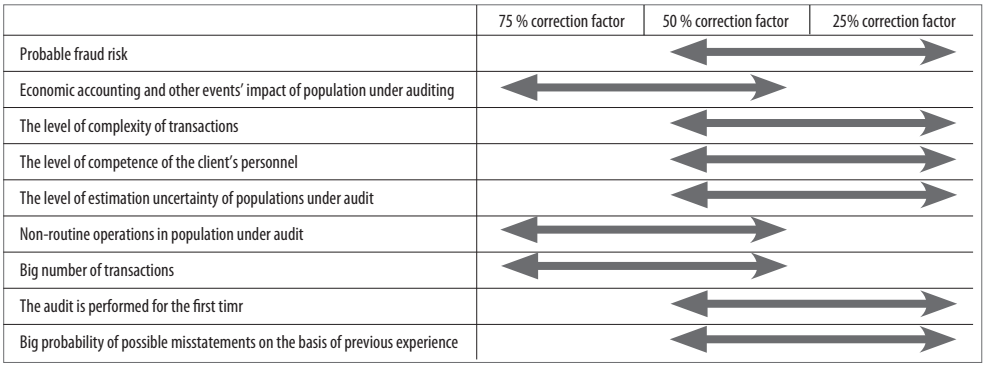

FIG. No. 1. **Suggested criteria for determining correction factors and their significance**
Source: estimated by the authors.

A smaller correction factor indicates a higher risk for possible misstatement. In other words, a 25% (or 0.25) correction factor has to be applied when an auditor expects many errors that may occur within a population and vice versa – 100% (or 1) has to be applied when an auditor does not identify the risk for possible misstatements. The changes in sample size, while applying a different correction factor, are presented in Figure No. 2. The sample size when applying a 100% correction factor indicates a situation when the sample size is not adjusted because a misstatement is not expected.

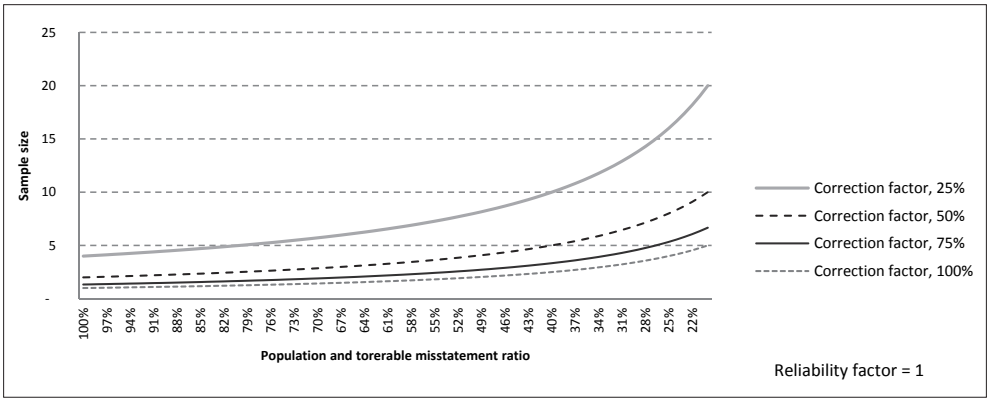

FIG. No. 2. **Sample size dependency on population and tolerable misstatement ratio if the correction factor is different**
Source: estimated by the authors.

As Figure No. 2 indicates, the bigger the sample size, the smaller is the correction factor that should applied. In applying 25% of a correction factor, the sample size increases 4 times. In applying 50% of a correction factor, the sample size increases 2 times, and if 75% of a correction factor are applied the sample size is increased by 33%.

The application of a correction factor instead of an expected misstatement has one more advantage. While applying an expected misstatement, the sample size can become negative. On the basis of formula no. 1, which is not enhanced, the denominator is calculated in the following way: the product of an expected misstatement and an expansion factor are deducted from a tolerable misstatement. Therefore, if the product is greater than the tolerable misstatement, the dominator becomes negative and the total sample size would then become negative, too. The final result can mislead an auditor and some supplementary processing can be needed. While applying a correction factor, the tolerable misstatement is decreased by a certain degree, though it always remains positive. Consequently, if the denominator is of positive size, the sample size will always be positive. An example is presented in Figure No. 3 where it is showed that the sample size, while having a 25% correction factor (on the basis of formula no. 4) and sample size when the applied expected misstatement makes up the 75% of a population (on the basis of formula no. 1).

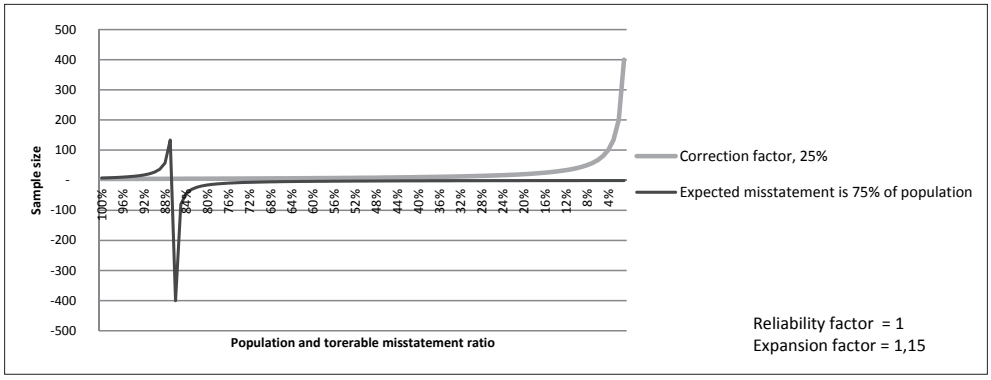

FIG. No. 3. **Tendencies in changes of sample size when a correction factor or an expected misstatement are applied**

Source: estimated by the authors.

The application of a correction factor will facilitate an auditor's work if there is no information about an expected misstatement or it is not accurate enough, as the determination of a correction factor is much easier, which enables an audit to be performed faster. Also, if a correction factor is used, the credibility of an expected misstatement (which is expressed through a correction factor) increases as the concrete criteria are set for the determination of a correction factor. What is more, when an auditor can determine the sample size more precisely (which could be either bigger or smaller as compared to

the standard formula), audit quality and assurance level, in general, increase as well. Finally, the application of this factor would help an auditor not only to define the risk of an expected misstatement, but the results gained in applying formula no. 4 will always be positive.

5. Conclusions

In the process of auditing legal entities, statistical and non-statistical sampling methods are applied. This statistical sampling is based on the scientific methods, whereas the non-statistical sampling method is based on an auditor's professional competence and experience. In practice, both methods are used. Non-statistical sampling is applied to audit and evaluates internal control and other data where the population is not big and when it is inexpedient to apply statistical sampling. While auditing big amounts of data, it is recommended to apply statistical sampling. Thus, an auditor's subjective opinion is avoided and there is no doubt about the reliability of an auditor's conclusions.

Some statistical sampling methods are known. The selection of a concrete method depends on population characteristics, an auditor's readiness and the technical possibilities. The most popular statistical sampling method is monetary unit sampling. The application of this method is not complicated in practice, as there is no need to use special software. The advantage of monetary unit sampling over other statistical methods of samplings lies in that all items above the materiality level would be selected into the sample. In applying other methods of statistical sampling, the sample covers only some items that do not necessarily depend on materiality.

The main characteristic of monetary unit sampling, which, to some extent, limit the application of this method, is that it is not assigned to audit zero and negative values; therefore, an auditor has to check the entire population in order to be sure that all items are suitable for sampling. Also, sometimes it is very difficult to determine an expected misstatement if the available information about population is limited.

The improved formula of this method is simpler. Because of indetermination in defining an expected misstatement, a correction factor can be applied. It is easier to select this factor than an expected misstatement when information is limited. Four different correction factors are recommended: 100%, 75%, 50% and 25%. The main risk factors that an auditor must consider before selecting a correction factor are as follows: 1) the risk of possible fraud; 2) economic, accounting and impact of other events on the population under audit; 3) the complexity level of transactions; 4) the level of competence of a client's personnel; 5) the level of estimation uncertainty under auditing; 6) the number of transactions; 7) audit that is performed for the first time; 8) a great probability of possible misstatements on the basis of former experience.

If the information about population under audit is limited, it is complicated and sometimes impossible to define the size of an expected misstatement; therefore, there is a risk

that the expected misstatement will not be acknowledged at all. In applying a correction factor, such risk is minimized. Therefore, the risk that material distortions might not be observed decreases as well. Also, if a correction factor is used, the credibility of an expected misstatement (which is expressed through a correction factor), audit quality and the level of assurance all increase.

REFERENCES

2014 m. Lietuvos Respublikos valstybės kontrolės Veiklos Ekspertinio Vertinimo Ataskaita, available at: https://www.vkontrole.lt/aktualiju_failai /files/NAOL_peer_reviewLT.pdf, referred on 16/12/2016.

Aghili, S. (2011). Sampling Techniques //*Internal Auditor*. Vol. 68 Issue 6, p. 19-21.

American Institute of Certified Public Accountants (AICPA) (2001).*Audit Sampling, New Edition as of April 1, 2001*. Digital Publisher: University of Mississippi Library. 104 p.

Andersen, I. T., Hahn, U., Vedel, J. E. (2015). Optimal PPS Sampling with Vanishing Auxiliary Variables - with Applications in Microscopy //*Scandinavian Journal of Statistics*, Vol. 42 Issue 4, p. 1136-1148.

Ataskaita dėl auditorių ir audito įmonių audito kokybės užtikrinimo 2015 m., available at: http://www.aat.lt/get.php?f.3689, referred on 16/12/2016.

Barreiro, P. L., Albandoz J. P. (2001). Population and sample. Sampling techniques, available at: http://optimierung.mathematik.uni-kl.de/mamaeusch/veroeffentlichungen/ver_texte/sampling_en.pdf, referred on 22/01/2017.

Christensen, B. E., Elder, R. J., Glover, S. M. (2015). Insights into Large Audit Firm Sampling Policies // *Current Issues in Auditing*, Vol. 9 Issue 2, p. 7-18.

Elder, R., J., Akresh, A., D., Glover, S. M., Higgs, J. L., Liljegren, J. (2013) Audit Sampling Research: A Synthesis and Implications for Future Research // *Auditing: A Journalof Practice & Theory American Accounting Association*, Vol. 32, Supplement 1, p. 99-129.

Felix, W. L., Jr., Grimlund, R. A., Koster, F. J., Roussey, R. S. (1990). Arthur Andersen's New Monetary Unit Sampling Approach // *Auditing: A Journal of Practice & Theory*, Vol. 9 Issue 3, p. 1-16.

Nosberger, T. A short overview, available at: http://www.unifr.ch/ses/pdf/cours/Audit_methodology_FS_10.pdf, referred on 18/02/2017.

Gavenda, M. (2001).Statistical Versus Non-Statistical Sampling in Sales & Use Tax Audits // *Journal of State Taxation*, Vol. 20 Issue 1, p. 65-74.

Grimlund, R. A. (1990). Combined monetary unit sampling from several independent populations: Sample size planning and sample evaluation with the moment method // *Contemporary Accounting Research*. Part 1, Vol. 6 Issue 2, p. 446-484.

Guidance for Calculating Scope 3 Emissions. Calculation Guidance for Implementing the 17 GHG Protocol Corporate Value Chain (Scope 3) 18 Accounting & Reporting Standard, available at: https://www.google.lt/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKEwiR4J7q29XRAhUL7RQKHVQ3DqAQFggeMAE&url=http%3A%2F%2Fwww.ghgprotocol.org%2Ffiles%2Fghgp%2Fpublic%2Fghg-protocol-scope-3-standard-draft-november 20101.pdf&usg=AFQjCNE5rNpweeLd1XSW4r1EpySXST6jBg&sig2=jixA2rXcER9VD7RtDe7SwQ&bvm=bv.144224172,d.d24, referred on 22/01/2017.

Guidance note on sampling methods for Audit Authorities (under Article 62 of regulation (ec) no 1083/2006 and Article 16 of Commission Regulation (ec) n° 1028/2006), available at: http://www.aeuf.minfin.bg/document/152, referred on 18/12/2016.

Guidance on sampling methods for audit authorities (Under Article 62 of Council Regulation (EC) N 1083/2006, Article 16, including Annex IV, of Commission Regulation (EC) N 1828/2006 and Articles 61 of Council Regulation (EC) N 1198/2006, Article 42, including Annex IV, of Commission Regulation (EC) N 498/2007), available at: http://www.esfondi.lv/upload/revizijas_iestade/1.2.5._sampling_eng_04.04.2013.pdf, referred on 19/12/2016.

Hall, T. W., Hunton, J. E., Pierce, B. J. (2002). Sampling Practices of Auditors in Public Accounting, Industry, and Government // *Accounting Horizons*. Vol. 16 No. 2. p. 125–136.

Higgins, H. N., Nandram, B. (2009). Monetary unit sampling: Improving estimation of the total audit error // Advances in Accounting, incorporating Advances in International Accounting. 9 p., available at: https://web.wpi.edu/Images/CMS/MGT/ADIAC_48.pdf, referredon 19/02/2017.

ISA 315 (Revised). Identifying and Assessing the Risksof Material Misstatement through Understanding the Entityand Its Environment. 2016-2017. IAASB Handbook – Volume 1, p. 280-337.

ISA 330 The Auditor"s Responses to Assessed Risk, available at: http://www.ifac.org/system/files/downloads/a019-2010-iaasb-handbook-isa-330.pdf, referred on 19/02/2017.

ISA530 Audit Sampling, available at: http://www.ifac.org/system/files/downloads/a027-2010-iaasb-handbook-isa-530.pdf, referred on 19/02/2017.

Johnson, G. G., Mohsen, A. A. (2013). Monetary unit sampling: combining accounts for sampling to increase audit efficiency and effectiveness - when and how // *International Journal of Business, Accounting, & Finance*. Vol. 7 Issue 1, p. 152-165.

Kalpana V. J. (2012). Methods of Sampling Design in the Legal Research: Advantages and Disadvantages // *Online International Interdisciplinary Research Journal*, Volume-II, Issue-VI, p. 183-190.

Mackevičius, J., Valkauskas, R. (2007). Statistinio Atrankos Būdo Metodika Atliekant Auditą // *Ekonomika*, Vol. 78, p. 84-97.

Meng, X. (2013).Scalable Simple Random Sampling and Stratified Sampling // *Proceedings of the 30th International Conference on Machine Learning (ICML-13)*, p. 531–539, available at: http://jmlr.org/proceedings/papers/v28/meng13a.pdf, referred on 22/01/2017.

Moeller, R., R. (2016). *Brink's Modern Internal Auditing: A Common Body of Knowledge, 8th Edition*. New Jersey: John Wiley & Sons. 832 p.

Munteanu, C. C. (2014). Aspects of Statistical Sampling as Selection Technique in Financial Auditing // *Valahian Journal of Economic Studies*, Vol. 5 Issue 3, p. 93-98.

Peek, L. E., Neter, J, Warren, C. (1991). Nonstatistical Audit Sampling Guidelines: A Simulation // *Auditing: A Journal of Practice & Theory*. Vol. 10 Issue 2, p 33-48.

SAS 39 Audit Sampling, available at: http://www.aicpa.org/Research/Standards/AuditAttest/Pages/SAS.aspx, referred on 17/12/2016.

Sibelman, H. (2014).Myths and Inconvenient Truths about Audit Sampling // *CPA Journal*. Vol. 84 Issue 4, p. 6-10.

Tatum, K., W. (1986) An empirical study of audit sampling problems // Dissertation in business administration. Submitted to the Graduate Faculty of Texas Tech University, availabe at: https://ttu-ir.tdl.org/ttu-ir/bitstream/handle/2346/9482/31295005008775.pdf; sequence=1, referred on 04/02/2017.

Technical Notes on the AICPA Audit Guide Audit Sampling, available at: https://www.aicpa.org/

Publications/AccountingAuditing/KeyTopics/DownloadableDocuments/Sampling_Guide_Technical_Notes.pdf, referred on 18/12/2016.

Waller, W. S. (1993). Auditors' Assessments of Inherent and Control Risk in Field Settings // *Theaccountingreview*, Vol. 68 Issue 4, p 783-803.

Wampler, B., McEacharn, M. (2005).Monetary-Unit Sampling Using Microsoft Excel // *CPA Journal*. Vol. 75 Issue 5, p. 36-40.