

PAPER • OPEN ACCESS

Scenario Planning as a Tool for Managing Audit Risks

To cite this article: V A Yakimova and Y I Bevzyuk 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **272** 032207

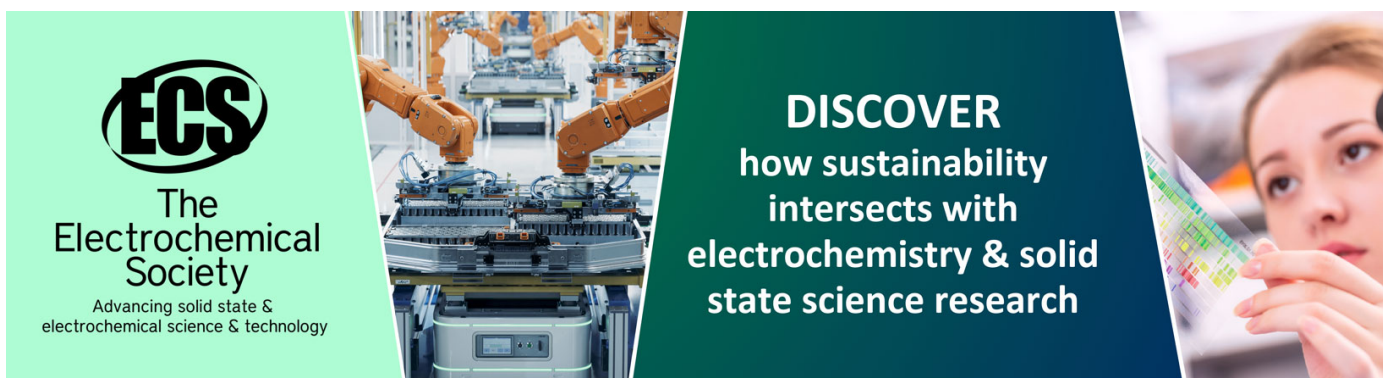
View the [article online](#) for updates and enhancements.

You may also like

- [RETRACTED: Advantages of Computer Aided Audit Technology in Enterprise Internal Audit](#)
Peibo Xie

- [Symbolic interaction of internal auditor in the implementation of consultation activities](#)
A A Nugraheni, I D A Nurhaeni and S Hastjarjo

- [Environmental sustainability: insight into paperless policy and integrated audit internal system](#)
M Khafid, D Suryandari, R Hidayah et al.



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Scenario Planning as a Tool for Managing Audit Risks

V A Yakimova¹, Y I Bevzyuk¹

¹Amur State University, Blagoveshchensk, Russia

Abstract. The article deals with scenario planning as a tool for managing audit risks in the planning and conducting of internal audit in order to minimize the risk of undetected errors, to obtain the reasonable assurance about the reliability of audit evidence. In the course of research the methods of logical analysis, synthesis, deduction, and observation were used. As a result the essence and methods of scenario planning were revealed to manage audit risk during internal audit, there was corrected the model to determine the sample size given the risky elements in the various scenarios, the use of scenario approach in conducting the audit of accounts receivable in «Blagoveshchensk cash-calculation center» Ltd. was considered. The obtained results can be used by auditors when choosing an approach to internal audit, methods of obtaining the audit evidence, determining the optimal sample quality in various scenarios of internal audit. Methodological aspects of scenario approach in the process of audit planning, adjustment of the sample volume model allow to substantiate the choice of a rational scenario that maximizes the economic benefits at the lowest cost for the audit, as well as to determine the risk management measures in the «narrow» areas where errors and distortions of financial indicators are possible.

1. Introduction

COSO's concept «Integrated concept of internal control» [1] pays great attention to the construction of a representative audit sample, which would allow to obtain sufficient audit evidence with minimal risk of errors. At the same time, it is desirable for the internal auditor to develop such an audit program, which would minimize both the audit risks and the costs of the audit.

The base of research were the works of the Russian scientists who have made significant contributions in theoretical aspects of applying audit sampling (A. V. Bakhteyev [2], M. A. Dobrunova [3], E. M. Gutzeit [4], etc.), methods of formation of audit sampling, introduced in practice of audit (A.V. Logvinenko [5], Yu. Yu. Kochenev [6], A. D. Sheremet, V. P. Sujc [7], R. I. Gizatullina [8], J. V. Danilevsky [9], Domracheva L. P. [10], M. Y. Neustroev [11][12], etc.). Significant contribution to the development of scientific bases of risk's research based on the method of scenario planning was made by foreign scientists-economists (Cannes, D. Lucy, G. Riff [13]), determining of the sample size during the audit (H. Arkin [14], S. A. Moyer Hiram T. Scovill [15], Y. Ijiri [16], R. S. Kaplan [17], K. W. Stringer [18], J. G. Ramage, A. M. Kreieger, L. L. Spero [19]).

In the works of the listed authors the separate methods of scenario planning in risk management and sample size determination are described, the algorithm of their application is offered. However, while appreciating the scientific contribution of these scientists, it should be noted that the issue of audit risk management on the basis of scenario planning has not yet been covered, and there is no clear answer to how scenario planning is related to the management of audit risks in internal audit and how it affects the definition of the audit sample.



The aim of the study is to adjust the model of sample size determination in order to select a rational scenario that maximizes economic benefits at the lowest expenses of internal audit.

The scientific novelty of the study is to develop an adjusted model for determining the sample size during the internal audit, which will allow auditors to justify the choice of a rational scenario with the lowest cost of its implementation, as well as to determine the risk management activities in the «narrow» areas of the audit space in different scenarios. The theoretical and practical significance of the study is to determine the essence of scenario planning in the process of managing audit risks in internal audit, adjusting the formula for determining the sample size taking into account the risk elements in various scenarios of internal audit.

Scenario planning in internal audit represents the method of management of auditor risks of the organization based on modeling of possible situations of carrying out internal audit, quantitative assessment of risks and the subsequent assessment of expenses on the basis of the conclusions drawn by results of modeling. The main purpose of scenario modeling in internal audit is to identify the audit risks of the audited entity, determine the consequences of the risks for the business entity, the formation of the audit sample of the optimal volume, which minimizes the risks and costs of the audit. Scenario planning uses the same apparatus as mathematical and financial planning, to answer the question: "what if?", creating the possibility of applying scenarios to the analysis of audit risks in the initial stages of management. The scenario for the real research is understood as the description of conditions of the checked object with different probability of existence and concentration of risks of errors of deliberate and unintentional character. The scenarios allow to reveal possible consequences of the made decisions in order to choose a suitable alternative at a stage of planning of the audit inspection. The scenario gives the chance to reveal cause-and-effect dependences of parameters which define probable changes of a condition of an object of a research, the operating factors and conditions in which these changes will happen.

To implement scenario planning in internal audit, the following stages are proposed:

Stage 1. Identification of risks and stratification of population on risk sign. During the first stage the auditor has to allocate «narrow» places and carry out search of risk elements.

Stage 2. Division of population into strata and initial assessment of possible scenarios. At this stage the auditor has to group on the basis of characteristics of population operations on the corresponding strata.

Stage 3. Determining of the sample size based on the level of trust and planning possible costs. After the second stage, the auditor needs to determine the optimal sample size for each stratum, depending on the level of confidence and the planned cost of the audit.

Stage 4. Development of scenarios and program of carrying out the audit inspection, budget of working hours and budget of direct expenses. Selecting the most representative sample at the lowest cost. Scenarios of internal audit can be constructed using the analysis «what if?» in Microsoft Excel, statistical programs, Statistics, SPSS-Statistics, etc. At this stage, the auditor chooses a scenario in which the conditions of a representative sample would be met, taking into account the minimum level of cost of audit procedures and compliance with the objectives of internal audit.

Stage 5. Evaluation of sample procedures and results of sample study. After implementing the previous steps, the auditor should compare the actual rate with the expected rate of errors determined during the planning. Thus, the auditor makes an assumption about the probability of errors, both in the sample and in the general population and adjusts the sample size.

When estimating the sample size, it is important to consider the distribution of the sample size.

The sufficiency of audit evidence and costs of carrying out the audit inspection depends on distribution of volume of selection between strata. Thus, the distribution should be optimal and guarantee a given level of accuracy, and on this basis it is possible to determine the required sample size for each stratum.

Thus, H. Arkin [14] proposed a formula (1) for determining the sample size based on the optimal distribution between the strata:

$$n_i = \frac{N_i \sigma_i \sum N_i \sigma_i}{(A/U_R)^2 + (N_i \sigma_i^2)} \quad (1)$$

n_i – is the sample size of the i -th stratum; N_i – the population size of the i -th stratum; σ_i – is the population standard deviation of the i -th stratum, A – is the tolerable error (acceptable precision); U_R – reliability factor.

H. Arkin [14] has transformed equation (1) for a confidence level of 95%:

$$n_i = \frac{N_i \sigma_i \sum N_i \sigma_i}{N^2 (0,51SE)^2 + (N_i \sigma_i^2)} \quad (2)$$

SE – is the expected deviation from the average value (average sampling error); and for the level of confidence 99%:

$$n_i = \frac{N_i \sigma_i \sum N_i \sigma_i}{N^2 (0,3876SE)^2 + (N_i \sigma_i^2)} \quad (3)$$

However, the task of constructing an optimal sample is the formation of a representative sample with a given level of accuracy and at minimal cost. To do this, at the planning stage, the auditor develops the budget of working time for the audit inspection and the budget of direct costs. The planned cost of the audit inspection is divided on direct and indirect. The direct costs include the cost of labor, which directly depends on the amount of work, i.e. the number of documents checked by the auditor. Indirect costs can include the cost of sending employees on a business trip to the branches and internal divisions of the organization.

On this basis, S. A. Meyer Hiram T. Scovill [15] adjusted the H. Arkin model [14] at the probability level of 95 % ($t_{\alpha} = 1.96$; $1/1, 96 = 0.51$) at the cost level.

The cost per unit of the document to be checked (piece rate) is defined as the ratio of the hourly tariff rate (l) and the rate of production (v), determined by the number of documents to be checked for 1 hour of working time:

$$c_i = l / v \quad (4)$$

where l – hour tariff rate, v – the rate of production (the number of documents to be checked for 1 hour). Considering the cost of conducting the audit, the optimal size of the audit sample of the i -th stratum can be represented by the formula 5:

$$n = \frac{N_i \sigma_i \times \sum_1^k N_i \sigma_i \sqrt{c_i}}{\sqrt{c_i} \times \sigma \sqrt{(N x_{st}) + \sum_1^k N_i \sigma_i^2}} \quad (5)$$

where c_i – is the piece rate for checking the i -th stratum.

According to the formula (4): the larger the stratum, the larger the sample size; the greater the variability (variation) of the elements within stratum, the larger the sample size should be; the smaller the confidence interval, the more reliable the sample and its volume. However, the sample may contain risk elements that require the most thorough inspection, time - consuming and more qualified specialists, which accordingly requires an increased rate of labor.

$$C = C_i + C_j = \sum_1^m n_i \times c_i + \sum_1^r n_i^p \times (c_i + f) \rightarrow \text{in} \quad (6)$$

where C_i – is the cost of checking the i -th stratum, C_j – is the cost of checking the strata with an increased level of risk, n_i – is the volume of the sample population of the i – th stratum, $(c_i + f)$ – is the increased piece rate for checking the i – th stratum containing risk elements, n_i^p – the volume of the sample stratum containing risk elements.

Due to the fact that the non-detection of elements with an increased level of risk deprives the auditor of the opportunity to obtain reliable audit evidence and to extend the findings to the general population, the auditor needs to approach the sample more closely, taking into account professional knowledge and skills, paying more time to risk areas for verification. This requires higher piece-rate

wages due to higher requirements for quality and thoroughness of inspection, as well as an increase in the number of documents to be checked by the value of f .

Then we propose to adjust the formula (5) to determine the optimal sample size, taking into account the risk nature of the elements with the planned degree of accuracy. Therefore, the formula will look like this:

$$n = \frac{N_i \sigma_i^2 \times \sum_{i=1}^k N_i \sigma_i^2 \sqrt{c_i + \bar{f}}}{\sqrt{c_i + \bar{f}} \times 0,51^2 \times \sum_{i=1}^k p_{np}^p \times N x_{st}^p)^2 + \sum_{i=1}^k N_i \sigma_i^2} \quad (7)$$

$N_i x_{st}^p$ - the volume of the general population in the value terms of risk strata.

We will calculate the volume of the sample for the purpose of audit of accounts receivable of «Blag-RKTs» Ltd. The number of houses included in the act on the provision of services for which receivables were formed was chosen as a unit of selective observation.

Table 1. Stratification of debtors (management companies) on the example of «Blagoveshchensk cash processing center» Ltd.

The name of the strata	the Number of houses	Sum, rub.	specific weight, %	Sum of debt on default term, rub.	
				up to 1 year	over 1 year
Receivables from management companies, including:	1138	24 014,97	538 100	24 167 183,78	370 831,19
Management companies with a minimum level of risk					
<i>(Ltd. «Amur», Ltd. «Amurstroy Housing», Ltd. «Euroservice», PJSC16 «DEK», FKR):</i>					
from 1000 to 10000 rub.	5	13 536,39	0,06	13 536,39	-
from 10001 to 28000 rub.	5	102 786,02	0,42	102 786,02	-
from 28001 to 73000 rub.	6	92 821,01	0,38	92 821,01	-
Management companies with a medium level of risk					
<i>(JSC «AKS», Ltd. «Amurblagupravlenie», Ltd. «GUK-1», Ltd. «GUK-2», Ltd. «UZHB»):</i>					
from 200 to 50000 rub.	123	759 211,26	3,09	759 211,26	-
from 50001 to 199400 rub.	243	4 490 783,46	18,30	4 490 783,46	-
from 199401 to 2988200 rub.	265	18 275 737,57	74,48	18 275 737,57	-
Management companies with the maximum level of risk					
<i>(Ltd. «Gil-Comfort 4», Ltd. «Housing Management», Ltd. «Guk», Ltd. «GUK»):</i>					
from 100 to 7000 rub.	144	37 441,71	0,15	5 598,17	31 843,54
from 7001 to 27700 rub.	226	310 133,77	1,26	134 583,35	175 550,42
from 27701 to 76000 rub.	121	455 563,78	1,86	292 126,55	163 437,23

So, we will determine the sample size for each stratum of management companies. For strata "Management companies with a minimum level of risk" it is recommended to form a sample size

based on the selection of the elements of the greatest value, as a continuous method will lead to unnecessary costs. The maximum risk level stratum should be subjected to a continuous review to eliminate the risk of the auditor not detecting distortion in the documents.

For a medium-risk stratum, we quantify the sample size based on the scenario approach of formula 7. It is expected that the cost of debt audit for organizations with unstable solvency is 10 rubles higher than for organizations with a high level of solvency. We will take $f=10$.

Planning the sample size for each stratum is produced on the basis of tables of substitutions when you change the two unknown parameters of the sample: the level of costs (ci) and the expected sampling errors (p). The results of the calculations are presented in table 2 and 3.

Table 2. The calculation of parameters of optimal stratified sample distribution.

Management companies:	The number of elements in each strata (N_i)	σ	$N_i \sigma$	$N_i \sigma^2$	$\overline{x}_{st}$	$N \overline{x}_{st}$
With a medium level of risk						
from 200 to 50000 rub.	123	8095,0	995694,5	8060224304	14324,7	1761943,2
from 50001 to 199400 rub.	243	19698,9	4786848,4	94295959736	102063,2	24801372,8
from 199401 to 2988200 rub.	265	246065,6	65207406,2	16045305040	1075043,9	284886498,4
Subtotal	631	273859,7	70989949,2	161476612245		311449813,6
With a maximum level of risk						
от 100 до 7000 rub.	144	685,1	98657,2	67592076	3120,14	449300,1
от 7001 до 27700 rub.	226	758,2	171359,9	129930278	15506,6	3504511,4
от 27701 до 76000 rub.	121	771,3	93332,1	71990813	41414,8	5011200,8
Resume	491	2214,6	363349,4	269513166	3120,14	8965012,5

Because the risk nature requires more thorough testing and acceptable errors can have a significant impact, the confidence range should be reduced and the sample size in these strata increased. By establishing an acceptable range of confidence, the auditor is able to increase the volume of risk and material transactions. For example, in the analysis of the sample size of strata 1 and 3, it appears that, although strata 1 contains the largest number of elements, the percentage of the sample from strata 3 is higher, because this strata has the highest degree of variability and risk.

To increase the sampling percentage of the aggregate 2 compared to 1 had the effect of factor variation and the risk factor. Stratum 2 is risky and has a greater degree of variability. Stratum 3 has a higher value range and a higher standard deviation than 1 and 3, so the sample rate is higher. An assessment of the scenarios is presented in table 4.

Table 3. The planning of the sample size at a given average value of expected error and unit costs of the document to be checked ($ci+f$).

With a medium level of risk									
The sample size of stratum «1»									
Costs per unit of the document to be checked ($ci+f$), RUB.									
p_{np}	26	28	30	32	34	40	50	60	70
0,006	6	6	6	6	6	6	6	6	6
0,007	6	6	6	6	6	6	6	6	6
0,01	5	5	5	5	5	5	5	5	5
0,02	3	3	3	3	3	3	3	3	3
0,03	2	2	2	2	2	2	2	2	2
The sample size of stratum «2»									
0,006	31	31	31	31	31	31	31	31	31
0,007	30	30	30	30	30	30	30	30	30
0,01	26	26	26	26	26	26	26	26	26
0,02	15	15	15	15	15	15	15	15	15
0,03	9	9	9	9	9	9	9	9	9
The sample size of stratum «3»									
0,006	265	265	265	265	265	265	265	265	265
0,007	257	257	257	257	257	257	257	257	257
0,01	225	225	225	225	225	225	225	225	225
0,02	130	130	130	130	130	130	130	130	130
0,03	76	76	76	76	76	76	76	76	76
With a maximum level of risk									
The sample size of stratum «4»									
0,006	58	58	58	58	58	58	58	58	58
0,007	48	48	48	48	48	48	48	48	48
0,01	29	29	29	29	29	29	29	29	29
0,02	9	9	9	9	9	9	9	9	9
0,03	4	4	4	4	4	4	4	4	4
The sample size of stratum «5»									
0,006	100	100	100	100	100	100	100	100	100
0,007	83	83	83	83	83	83	83	83	83
0,01	50	50	50	50	50	50	50	50	50
0,02	15	15	15	15	15	15	15	15	15
0,03	7	7	7	7	7	7	7	7	7
The sample size of stratum «6»									
0,006	55	55	55	55	55	55	55	55	55
0,007	45	45	45	45	45	45	45	45	45
0,01	27	27	27	27	27	27	27	27	27
0,02	8	8	8	8	8	8	8	8	8
0,03	4	4	4	4	4	4	4	4	4

The borders of the confidential interval can guarantee the reliability of the results of the sample study. If you select scenario 3, the auditor will check 9,1 % of the population, which is 102 elements and will ensure that the error of the population will deviate from the average value of 9612444,78 rubles. Scenario 1 gives a higher accuracy of $\pm 1922488,96$ rubles. in this case, when checking scenario 1, the expected planned amount of costs will be higher than in scenario 3 and will be 15080 rubles.

Table 4. Planned scenarios of optimal sample distribution at $ci = 20, f = 10$.

Scenario	Indicator for the comparative evaluation of scenarios				
	Borders of a confidential interval, rub.	p_{np1-6} %	n	The proportion of the sample size in the general population, % (w)	The planned costs of testing (C), formula 6
Scenario 1	±1922488,96	0,006	546	48,66	15080
Scenario 2	±3204148,26	0,01	394	35,12	10550
Scenario 3	±9612444,78	0,03	102	9,1	2950

2. Conclusion

Thus, the use of scenario planning in the internal audit allows to determine the different states of the object of inspection in the "narrow" areas of audit with equal probability of their occurrence, to determine specific measures to minimize the risks in this area under different scenarios and the costs of their implementation.

The adjusted model of sample size determination during internal audit enables the auditor to determine the most optimal scenario for the audit, which will comply with the desired accuracy of the auditor's evidence, as with greater accuracy requires a larger sample size for verification, and therefore the cost of verification will be higher. At the same time, this model provides an opportunity to consider various options for the cost of internal audit with different accuracy and to choose an option that meets the objectives of the audit and the professional knowledge of the auditor.

3. References

- [1] COSO concept «Risk management of the organization: an integrated model». Access mode : https://www.coso.org/documents/COSO_ERM_Executive_Summary_Russian.pdf
- [2] Bakhteyev A V 2014 Methodological aspects of the study of the risk assessment process in the context of risk-based audit *Terra Economicus* **2-3** 114-117
- [3] Dobrunova M A 2016 Application of a sampling method in auditor's activity.: author. dis. ... candidate of Econ. Sciences: 08.00.12 Financial University under the Government of the Russian Federation (Moscow) 26
- [4] Gutzeit E M 2015 Professional judgment of the auditor and the method of expert evaluations *Audit* **10-11** 23-29
- [5] Loginenkov A V 2016 The application of statistical methods with random checks in the audit: author's abstract of dis. cand. of Econ. Sciences: 08.00.12 Saint-Petersburg state University of Economics (St. Petersburg) 22
- [6] Kochenev Y Y 2014 Peculiarities of application of statistical and non-statistical sampling procedures in the audit *Auditor* **5** 24-31
- [7] Sheremet A D, Audit A D, Sheremet V P 2014 M.: *Research Center INFRA-M* 352
- [8] Gizatullina R I 2008 The use of selective methods in the audit of accounting (financial) statements: Diss ... for the degree of cand. *Econ. Sciences* (Kazan)
- [9] Danilevsky Y A, Shapiguzov S M, Remizov H A, Starovoitova E V 1999 Audit: textbook Moscow *ID FBK-PRESS* 544 p
- [10] Domracheva L P 2015 Comparison of Russian and Western approaches to selective IP-adherence to audit check. In the book: Society, science and innovation (TS - 2015) the annual all-Russian scientific-practical conference: Collection of materials: the University section, BF, ChF, FSA, FAME, FEE, FACE, FEM, FHSS, LF Federal State-Funded Educational Institution of Higher Professional Education "Vyatka State University" 1651-1656

- [11] Neustroev M Y 2010 Identification and evaluation of significant risks during audit *Izvestia of ISEA* **6**. 41-44
- [12] Neustroev M J 2010 The selective formation of the risk and its evaluation in non-statistical method of research in audit *Izvestia of ISEA* **4** (72)53-56
- [13] Cherkasova V A 2006 Management of business risks on the basis of the method of scenario planning: abstract. dis. ... candidate of Econ. Sciences 08.00.05 Immanuel Kant Russian State University (Kaliningrad) 24
- [14] Arkin H 1963 Handbook of Sampling for Auditing and Accounting pp 350, 351 McGraw-Hill Book Company (New York)
- [15] Moyer S A, Hiram T 1965 Scovill. Statistical sampling for auditors and accountants *John Wiley&Sons, Inc.* (New York)
- [16] Ijiri Y, Kaplan R S 1971 A model for Integrating Sampling objectives in Auditing In: *Journal of Accounting Research* vol **9** pp 73-87
- [17] Kaplan R S 1973 Statistical Sampling in Auditing with Auxiliary Information Estimators. In: *Journal of Accounting Research* vol **11** pp 238-258
- [18] Stringer K W 1963 Practical Aspects of Statistical Auditing In: *Preceeding of Business and Economic Statistics Section of the American Statistical Association* pp 405-411
- [19] Ramage J G, Kreieger A M, Spero L L 1979 An Empirical Study of Error Characteristics in Audit Populations In: *Journal of Accounting Research* vol **17** pp 72-10 Supplement
- [20] Voropaev Yu N 1996 Evaluation of internal control Accounting **8** 17-23
- [21] Makalskaya A K 2001 Internal audit Moscow *Business and Service* 112
- [22] Skala V I, Skala N V, Nam G M 2010 National accounting system in the Republic of Kazakhstan. Almaty: *LEM Publishing house* 545
- [23] Alborov R A 2016 Audit in organizations of industry, trade and agriculture Izhevsk: *Izhevsk state agricultural Academy* 284
- [24] Sotnikova L V 2001 Internal control and audit M.: *Finstatinform* 239
- [25] Isayeva I E 2013 The Essence, goals and objectives of internal control in the enterprise. Economics and modern management: theory and practice: collection of articles XXXII international. scientific.- pract. Conf. **12** (32) 20-26
- [26] International standards for the professional practice of internal auditing. Access mode : <http://www.theiia.org/guidance>
- [27] Novoselov I V 2008 Goals, functions and tasks of internal audit of Russian companies *Izvestia of Baikal state University* **6** 19-21
- [28] Arens E A, Lobbying J K 2001 Audit. M.: *Finance and statistics* 560
- [29] Yakimova V A, Radomskiy V S 2017 Identification and risk assessment in the process of audit sample planning International accounting vol **20** **2** (416) 70-87
- [30] Maksimova G V, Yakimova V A 2013 Audit risk and the sufficiency of the evidence International accounting **28** 22-34