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STATISTICAL MODEL FOR DETERMINING SAMPLE SIZE IN THE AUDIT OF BUDGETARY ORGANIZATIONS BASED ON AUDIT RISK, MATERIALITY, AND EXPECTED MISSTATEMENT

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Abstract. This article presents a statistical and mathematical model for determining sample size in audits of budgetary organizations by establishing the interrelationship among audit risk, materiality, and expected misstatement. The research problem is that, in practice, sample size is often determined using a fixed-percentage approach without adequately considering audit risk, materiality, and expected misstatement. The study employs monetary unit sampling methodology, the Poisson distribution, hypothetical modelling, and sensitivity analysis. As a result, a model was developed that systematically accounts for expected misstatement and applies differentiated parameters across risk zones. The author's scientific contribution lies in adapting the model to the specific characteristics of the budgetary sector and integrating it with a risk-based stratification methodology.

Keywords: sample size, statistical model, audit risk, materiality, expected misstatement, monetary unit sampling, Poisson distribution, confidence factor, budgetary organization, ISA 530.

Аннотация. В статье представлена статистико-математическая модель определения объёма выборки при аудите бюджетных организаций, основанная на установлении взаимосвязи между аудиторским риском, существенностью и ожидаемым искажением. Проблема исследования заключается в том, что на практике объём выборки нередко определяется с использованием метода фиксированной доли без достаточного учёта аудиторского риска, существенности и ожидаемого искажения. В исследовании применены методология выборки по денежной единице, распределение Пуассона, условное моделирование и анализ чувствительности. В результате разработана модель, которая системно учитывает ожидаемое искажение и предусматривает применение дифференцированных параметров по зонам риска. Научный вклад автора заключается в адаптации модели к специфическим особенностям бюджетного сектора и её интеграции с методологией стратификации, основанной на оценке рисков.

Ключевые слова: объём выборки, статистическая модель, аудиторский риск, существенность, ожидаемое искажение, выборка по денежной единице, распределение Пуассона, коэффициент доверия, бюджетная организация, МСА 530.

INTRODUCTION

Determining the sample size is one of the most important and complex issues in audit sampling. If the sample size is insufficient, certain errors may remain undetected; if it is excessive, audit resources may be wasted. Therefore, the sample size must be determined objectively and on a sound scientific basis.

However, in the practice of auditing budgetary organizations, the sample size is often determined using a fixed-percentage approach. Under this approach, a predetermined percentage of the population is selected without considering its risk level, variability, or the expected amount of misstatement. Such an approach may not fully reflect the relationship among audit risk, materiality, and expected misstatement and may therefore increase reliance on professional judgement when determining the sample size.

The relevance of the research topic is further strengthened by the ongoing reforms in the field of public financial control in Uzbekistan. The Decree of the President of the Republic of Uzbekistan No. PF-100 dated

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July 10, 2024, “On Additional Measures to Strengthen Financial Control over the Use of Budgetary Funds,” strengthened the risk-based approach to control activities and introduced the automated information system “Remote Audit” [1]. Moreover, the Decree of the President of the Republic of Uzbekistan No. PF-21 dated February 16, 2026, “On Additional Measures to Consistently Continue Reforms and Advance Them to a New Stage within the Priority Areas of the Country’s Development until 2030,” approved the updated “Uzbekistan–2030” Strategy and identified the efficient use of public resources as one of the country’s development priorities [2]. A risk-based approach requires control resources to be allocated in proportion to the assessed level of risk, which cannot be effectively achieved without linking the sample size to the assessed risk level through objective calculations.

International Standards on Auditing require the sample size to be determined on the basis of these factors. According to International Standard on Auditing ISA 530, the auditor must determine a sample size sufficient to reduce sampling risk to an acceptably low level, considering the required level of assurance, tolerable misstatement, and expected misstatement. However, the standard does not provide a specific calculation formula and leaves the development of appropriate methodologies adapted to national practice to researchers and practitioners. This situation indicates a methodological need to develop more consistent procedures that align the general requirements of the standard with national audit practice, thereby constituting the main scientific problem addressed in this study.

The purpose of the research is to develop a statistical and mathematical model for determining the audit sample size in budgetary organizations by establishing the relationship among audit risk, materiality, and expected misstatement.

To achieve this purpose, the following tasks were defined: to substantiate the theoretical foundations of the model based on the audit risk model, monetary unit sampling methodology, and the Poisson distribution; to justify the procedure for determining the model parameters; to develop a differentiated procedure for applying the model across different risk zones; to test the model using a hypothetical example; to conduct a sensitivity analysis; and to compare the proposed model with the fixed-percentage approach.

The object of the research is the practice of planning audit engagements in budgetary organizations of the Republic of Uzbekistan. The subject of the research is the quantitative relationship among audit risk, materiality, and expected misstatement in the process of determining the sample size. The subsequent sections of the article consistently present the literature review, research methodology, content of the proposed model, an example of its application, and a discussion of the results.

LITERATURE REVIEW

The theoretical foundations for determining the audit sample size have been extensively examined in international academic literature. The founders of monetary unit sampling developed a mechanism for determining the sample size based on the population value, confidence factor, and tolerable misstatement (Leslie et al., 1979).

J. Neter and J. Loebbecke experimentally examined the behaviour of statistical estimators in audit populations and demonstrated the effects of population structure and the distribution of misstatements on estimation results (Neter and Loebbecke, 1975).

A. A. Arens and co-authors systematized the main factors affecting the sample size, including the required level of assurance, tolerable misstatement, expected misstatement, and population variability (Arens et al., 2020). From a practical perspective, monetary unit sampling procedures and confidence factors are comprehensively explained in the AICPA Audit Sampling Guide (AICPA, 2017).

Empirical studies confirm the relevance of the problem of substantiating the audit sample size. R. J. Elder and co-authors systematized research on audit sampling and noted that sample-size determination methods are applied differently in practice, indicating the need for further research in this area (Elder et al., 2013).

B. E. Christensen and co-authors examined the sampling policies of large audit firms and identified considerable differences in sample-size determination, even among leading audit companies (Christensen et al., 2015).

A. V. Ganshin developed attributive, probability-based statistical, and monetary methods and corresponding algorithms for substantiating audit samples (Ganshin, 2019). However, these studies were conducted primarily within the context of commercial audits and did not fully consider the specific characteristics of the public sector.

In the literature of the Commonwealth of Independent States, the relationship among sample size, audit risk, and materiality has been examined from a theoretical perspective (Bychkova and Itygilova, 2009; Savin and Podolsky, 2018).

Uzbek scholars have also examined issues related to audit organization and public financial control (Dosmuratov, 2003). Nevertheless, the development and application of comprehensive statistical models for

determining sample size in audits of budgetary organizations remain insufficiently examined in the national literature.

From a regulatory and methodological perspective, ISA 530 requires the sample size to be determined by considering audit risk, materiality, and expected misstatement (IAASB, 2024), while ISSAI 2530 adapts these requirements to the public-sector environment (INTOSAI, 2020).

In Uzbekistan, audit activities are regulated by the Law of the Republic of Uzbekistan No. O‘RQ-677 dated February 25, 2021, “On Auditing Activities,” which establishes the legal framework governing audit activities and provides for the application of International Standards on Auditing in the country [3]. The risk-based approach to public financial control was further strengthened by the Decree of the President of the Republic of Uzbekistan No. PF-100 dated July 10, 2024, “On Additional Measures to Strengthen Financial Control over the Use of Budgetary Funds” [1].

The literature review leads to the following conclusion: although a general statistical framework for determining the audit sample size exists, the issues of differentiated application to populations stratified by the risk levels of budgetary organizations and the systematic consideration of expected misstatement have not been sufficiently addressed in national practice. This article is intended to fill this research gap.

RESEARCH METHODOLOGY

The study is based on a positivist research philosophy and employs a theoretical and methodological research design. First, the statistical foundations of sample-size determination and the requirements of international auditing standards are summarized. On this basis, a model is then developed, tested using hypothetical data, and compared with the existing practical approach.

Three main requirements were established for the development of the model: scientific validity through reliance on statistical theory; practical applicability through clarity and simplicity for auditors; and compatibility with the specific characteristics of the public sector.

The following methods were used in the research:

Monetary unit sampling was used as the computational basis of the model. The Poisson distribution was applied to justify the confidence factors. A systematic approach was used to examine the sample size as a system interconnected with audit risk, materiality, and expected misstatement. Hypothetical modelling was employed to demonstrate the practical application of the model. Sensitivity analysis was conducted to assess how the model results respond to changes in its parameters. Comparative analysis was used to compare the proposed model with the fixed-percentage approach.

The information base of the research consists of International Standard on Auditing ISA 530, International Standards of Supreme Audit Institutions ISSAI 2530, the AICPA Audit Sampling Guide, regulatory legal documents of the Republic of Uzbekistan, academic studies by foreign and local scholars, and methodological materials related to treasury information systems.

The reliability of the research findings is ensured by the model’s foundation in tested statistical methods, while its validity is supported by its consistency with the requirements of international auditing standards and the principles of risk-based financial control.

The theoretical foundation of the proposed model is based on the relationship among audit risk, materiality, and expected misstatement. The audit risk model serves as the theoretical basis for determining the sample size. Audit risk is expressed as the combined effect of inherent risk, control risk, and detection risk. Based on the acceptable overall level of audit risk, the auditor determines the required level of detection risk, which directly affects the sample size.

The general relationship can be expressed as follows: the lower the acceptable audit risk and, consequently, the higher the required level of assurance, the larger the sample size. Similarly, the stricter the materiality threshold and the greater the expected misstatement, the larger the required sample size. Expressing these relationships mathematically makes it possible to determine the sample size objectively.

The model is based on the monetary unit sampling methodology. Its essence is that a monetary unit, rather than an individual document, is used as the sampling unit. The total value of the population is divided into equal sampling intervals, and one monetary unit and the corresponding transaction are selected from each interval.

This approach increases the probability that high-value transactions will be included in the sample. This is particularly important in public-sector audits because the greatest financial impact is often concentrated in large-value expenditures.

At the same time, the model combines the advantages of attribute sampling and monetary unit sampling. In public-sector audits, both the legality or compliance characteristics of a transaction and its monetary value are important. Therefore, the model operates on a monetary basis while also taking compliance-related aspects into account.

The main calculation formula of the model is expressed as follows:

$$n = (BV \times RF) / TM,$$

where:

n is the sample size, expressed as the number of monetary sampling units;

BV is the total book value of the population or stratum being audited;

RF is the confidence factor corresponding to the required confidence level and the expected number of misstatements;

TM is the tolerable misstatement or performance materiality.

The sampling interval is determined by dividing the book value of the population by the sample size:

$$J = BV / n.$$

Under the monetary unit sampling method, one monetary unit and the transaction associated with that unit are selected from each sampling interval.

The main variable in the model is the confidence factor, which is based on the Poisson distribution. This distribution is used to estimate the probability of rare events, such as infrequent misstatements within a population.

When the expected number of misstatements is zero, the confidence factor is at its lowest level. As the expected number of misstatements increases, the confidence factor and, consequently, the required sample size also increase. These confidence factors are obtained from standard statistical tables presented in Table 1 and ensure the statistical validity and accuracy of the proposed model.

Table 1

Confidence Factors (RF) Based on the Poisson Distribution[1]

Expected Number of Misstatements	90% Confidence Level	95% Confidence Level	99% Confidence Level
0	2.31	3.00	4.61
1	3.89	4.75	6.64
2	5.33	6.30	8.41
3	6.69	7.76	10.05

Systematically accounting for expected misstatement is an important feature of the model. If the auditor anticipates that misstatements may exist in the population, the confidence factor increases, resulting in a larger sample size. This is logical because, in a population with a higher probability of misstatement, more items must be examined to obtain a reliable audit conclusion.

This relationship can be illustrated through a specific example. Assume that the population value is 10,000 conventional units, the confidence level is 95 percent, and the tolerable misstatement is 200 units, or 2 percent of the population value. If the expected number of misstatements is assumed to be zero, then RF = 3.00, and the sample size is calculated as follows:

$$n = 10{,}000 \times 3.00 / 200 = 150.$$

If, based on the results of previous audits, the auditor expects at least one misstatement in the population, Table 1 indicates that RF = 4.75. Accordingly, the sample size increases to:

$$n = 10{,}000 \times 4.75 / 200 \approx 238.$$

If two misstatements are expected and RF = 6.30, the sample size is:

$$n = 10{,}000 \times 6.30 / 200 = 315.$$

Thus, accounting for expected misstatements substantially increases the sample size from 150 to 238 and then to 315, even when the confidence level and materiality threshold remain unchanged. Since this factor may not always be considered systematically in practice, the proposed model provides a structured approach to incorporating expected misstatement.

1 Source: Compiled by the author based on AICPA (2017).

The accuracy of the model depends on the correct specification of its parameters, as presented in Table 2. The confidence level is determined on the basis of the acceptable audit risk. For example, if the acceptable audit risk is 5 percent, the corresponding confidence level is set at 95 percent. In public-sector audits, the confidence level is generally set at 95 percent or higher because of the significance of the public interest involved. In high-risk areas, it may be increased to 99 percent.

The tolerable misstatement is determined on the basis of the established materiality level. Overall materiality is set for the budget execution as a whole, while performance materiality is determined for individual transaction classes, account balances, or audit areas. Performance materiality is generally set at 50–75 percent of overall materiality and is used in calculating the sample size.

The expected misstatement is estimated on the basis of the results of previous audits, the effectiveness of internal controls, and the specific characteristics of the audited sector. The total population value is obtained from treasury data and, following stratification, is determined separately for each risk zone.

Table 2
Model Parameters and the Procedure for Determining Them[2]

Parameter	Source	Explanation
Confidence Level	Acceptable audit risk	In public-sector audits, the confidence level is generally set at 95% (corresponding to a 5% acceptable audit risk) and may be increased to 99% for high-risk zones.
Tolerable Misstatement (TM)	Materiality level	Performance materiality is generally set at 50–75% of overall materiality and is used to calculate the sample size
Expected Misstatement	Risk assessment and results of previous audits	A higher expected misstatement increases the confidence factor and, consequently, the required sample size
Population Value (BV)	Treasury data	Determined separately for each risk zone after stratification

The specific characteristics of public-sector auditing are taken into account when determining the model parameters. Unlike in commercial auditing, materiality in public-sector auditing is assessed not only quantitatively but also qualitatively. Certain matters, including instances of non-compliance with legislation or indications of less efficient use of public funds, may be considered material regardless of their monetary value. In such cases, the model is supplemented by applying a stricter materiality threshold, or the relevant audit areas are subject to full examination.

The interrelationship among the parameters is also important. If an excessively high confidence level and an excessively low materiality threshold are established simultaneously, the resulting sample size may become impractically large. Therefore, the auditor should determine the parameters in proportion to the actual level of risk and the resources available for the audit. All parameters and the rationale for their selection must be documented in the audit working papers. This is consistent with the requirements of ISA 530 and ensures the validity, transparency, and reproducibility of the sample-size calculation.

The principal feature of the proposed model is its differentiated application to a population stratified by risk zones. Expenditures are first allocated among the respective risk zones, after which the model is applied separately to each stratum using different parameters. In the high-risk zone, a higher confidence level, for example 99 percent with RF = 4.6, and a stricter tolerable misstatement threshold are applied, resulting in a larger sample size. In the low-risk zone, a relatively lower confidence level, such as 90 percent with RF = 2.3, and a less stringent tolerable misstatement threshold may be considered sufficient.

This differentiation enables audit resources to be allocated in proportion to the assessed risk and closely integrates the model with the stratification methodology. Stratification determines where the audit sample should be concentrated, while the proposed model determines how many monetary units or transactions should be examined within each risk zone. Together, these two components form a comprehensive audit sampling plan and supplement professional judgement with a statistically grounded calculation.

2 Source: Developed by the author.

ANALYSIS AND RESULTS

The practical application of the model can be illustrated using a hypothetical example presented in Table 3. Assume that a population with a total value of 10,000 conventional units is divided into three risk zones.

For the high-risk zone, with a population value of 3,000 units, a confidence level of 99 percent, RF = 4.6, and a tolerable misstatement of 60 units, the sample size is calculated as follows:

n = 3,000 × 4.6 / 60 = 230 monetary units.

For the medium-risk zone, with a population value of 4,000 units, a confidence level of 95 percent, RF = 3.0, and a tolerable misstatement of 160 units, the sample size is:

n = 4,000 × 3.0 / 160 = 75 monetary units.

For the low-risk zone, with a population value of 3,000 units, a confidence level of 90 percent, RF = 2.3, and a tolerable misstatement of 200 units, the sample size is:

n = 3,000 × 2.3 / 200 ≈ 35 monetary units.

Table 3
An Example of Applying the Statistical Model to Risk Zones (Hypothetical Data)[3]

Risk Zone ((Confidence Level	Population Value ((BV	RF	Tolerable Misstatement ((TM	Sample Size ((n
(High (99%	3,000	4.6	60	230
(Medium (95%	4,000	3.0	160	75
(Low (90%	3,000	2.3	200	35
Total	10,000	—	—	340

The example demonstrates that the model determines a sample size for each risk zone in accordance with its assessed risk level. In the high-risk zone, 230 monetary units are selected from a population valued at 3,000 units, whereas only 35 monetary units are considered sufficient for the low-risk zone with the same population value. This difference results from the application of different confidence levels and tolerable misstatement thresholds. The total sample size is therefore 340 monetary units.

The sampling interval can also be calculated separately for each risk zone. In the high-risk zone, the interval is:

J = 3,000 / 230 ≈ 13 units.

This means that one monetary unit is selected for approximately every 13 units of population value. The relatively small interval indicates a high sampling density. In the low-risk zone, the sampling interval is:

J = 3,000 / 35 ≈ 86 units.

The larger interval indicates a lower sampling density, which is consistent with the lower assessed level of risk.

A comparison with the fixed-percentage approach illustrates the potential advantages of the proposed model. If a fixed rate of 5 percent were applied uniformly to the entire population of 10,000 units, the resulting sample size would be 500 units. When allocated proportionally across the three zones, this approach would result in 150 units being selected from the high-risk zone, 200 units from the medium-risk zone, and 150 units from the low-risk zone. Such an allocation would result in lower coverage than indicated by the model in the high-risk zone, where 230 units are required, and higher coverage than necessary in the low-risk zone, where 35 units are considered sufficient.

By contrast, the proposed model provides more intensive coverage in the high-risk zone and more targeted coverage in the low-risk zone, with a total sample size of 340 units. Thus, the model reduces the overall sample

3 Source: Author's calculations based on hypothetical data.

size by 160 units compared with the fixed 5 percent approach while directing audit resources specifically toward the areas in which risk is concentrated. Therefore, the model not only provides coverage proportional to the assessed risk but also optimizes the overall sample size. This enables auditors to achieve greater effectiveness with the same audit workload or to maintain the same level of effectiveness while using fewer resources.

Sensitivity analysis provides a deeper understanding of the model's response to changes in its parameters. If the confidence level in the high-risk zone is reduced from 99 percent to 95 percent, the confidence factor decreases from 4.6 to 3.0, and the sample size decreases from 230 to 150 units:

n = 3,000 × 3.0 / 60 = 150.

Conversely, if the materiality threshold is tightened by reducing the tolerable misstatement, the required sample size increases. Similarly, an increase in the expected number of misstatements results in a higher confidence factor and, consequently, a larger sample size. This effect becomes particularly significant when the expected misstatement is substantial relative to the tolerable misstatement.

These results encourage auditors to estimate expected misstatement carefully, as an inaccurate estimate may significantly distort the calculated sample size. Sensitivity analysis allows auditors to assess alternative scenarios and make informed decisions regarding the model parameters, thereby providing an objective basis for audit planning.

One of the principal practical advantages of the model is the simplicity and transparency of its calculation formula. Rather than relying on an unnecessarily complex mathematical framework, the model is based on clear and understandable relationships. This enables auditors to apply the model easily, verify the calculations, and justify the resulting sample size.

At the same time, the model's simplicity does not compromise its scientific validity because the formula is based on monetary unit sampling methodology and the Poisson distribution, both of which have been tested extensively in international auditing practice. The model also combines statistical methods with professional judgement in a rational manner. The statistical framework provides an objective calculation of the sample size, while professional judgement is applied when determining the model parameters. Thus, statistical calculation and professional judgement do not contradict each other but instead perform complementary functions.

The use of digital technologies is particularly important for the practical implementation of the model. Treasury information systems make it possible to determine the population value accurately and comprehensively, while the "Remote Audit" automated information system enables the centralized collection of data relating to budgetary organizations. Therefore, the necessary digital infrastructure for automating the model calculations already exists.

Incorporating the model formula, the table of confidence factors, and the parameter-setting procedure into the information system as separate modules would allow auditors to calculate the sample size in real time, document the calculations consistently, and reduce the likelihood of human error. The implementation process may be carried out in stages. First, the model should be formalized in the form of methodological guidelines for auditors. Second, the relevant calculations should be automated. At the final stage, the model should be fully integrated into the existing information system.

The operating mechanism of the model can be summarized as a three-stage process. At the first stage, the input parameters are determined, including the population value, confidence level, tolerable misstatement, and expected misstatement. The appropriate confidence factor is then selected. At the second stage, the sample size is calculated using the proposed formula. At the third stage, the sampling interval is determined and the relevant monetary units and associated transactions are selected.

This step-by-step structure ensures that the model is applied clearly and consistently. A coherent approach is also used when determining the parameters for different risk zones. In the high-risk zone, the confidence level is increased because of the greater probability of errors, irregularities, or violations. In the medium-risk zone, moderate parameters are applied. In the low-risk zone, relatively less stringent parameters may be used. This approach ensures that the sample size corresponds logically to the assessed level of risk and that the auditor's decisions are properly justified.

The model may also be adapted to different types of public-sector audits. In financial audits, it can be used to verify the accuracy of reported monetary amounts. In compliance audits, it can be adapted to assess compliance with legislation, regulations, and established procedures. In performance audits, the model may support the selection of transactions, programmes, or activities for examining economy, efficiency, and effectiveness.

For each type of audit, the risk zones and model parameters must be determined in accordance with the relevant audit objectives and criteria. This adaptability enables the model to be applied across different areas of public-sector auditing, subject to appropriate methodological adjustments. The model may also be adjusted

according to the size and structure of the audited organization. In large and complex organizations, broader and more detailed stratification may be used, whereas in smaller organizations, the model may be applied in a simplified form.

The integration of the model with risk-based stratification improves the quality of audit planning. The auditor designs the sample in advance according to the assessed risks, objectively calculates the required sample size for each zone, and allocates audit resources appropriately. As a result, audit planning is transformed from a largely subjective estimate into a precise and statistically grounded calculation, making the audit process more consistent, transparent, and manageable.

The model is also compatible with the audit quality management system. Since the model parameters, calculations, and the rationale underlying them are documented, they can be reviewed, verified, and defended during internal or external quality control procedures. Such transparency is particularly important in public-sector auditing because audit findings and conclusions may need to be substantiated for relevant oversight bodies and other stakeholders.

The discussion of the results indicates that the proposed model does not contradict existing scientific approaches but instead further develops them. The computational basis of the model is derived from the monetary unit sampling methodology tested in international practice (Leslie et al., 1979; AICPA, 2017). However, the model has been adapted to national conditions in several important respects.

First, the model is applied to a population stratified by risk zones using differentiated parameters. This approach directly corresponds to the principle of risk-based control established by Decree No. PF-100. Second, unlike the approaches currently applied in practice, the model systematically accounts for expected misstatement. Third, the qualitative criteria of public-sector auditing, including legality and the intended use of public funds, are considered when determining materiality.

Therefore, the proposed model is not merely a replication of an existing international method but an adapted methodological solution. It ensures both compliance with international auditing standards (IAASB, 2024; INTOSAI, 2020) and applicability to national public-sector audit practice.

The model is applied after risk-based stratification as an integral component of the overall audit sampling system. It also provides a methodological basis for subsequent stages, including the selection of items through monetary unit sampling and the evaluation and extrapolation of sample results to the audited population. The development of detailed methodologies for these subsequent stages represents an area for future research.

CONCLUSION AND SUGGESTIONS

The study resulted in the following conclusions. First, it was established that the fixed-percentage approach used in the auditing of budgetary organizations may not fully incorporate the relationships among audit risk, materiality, and expected misstatement. Consequently, sample-size determination under this approach may rely more heavily on professional judgement.

Second, a statistical and mathematical model was developed to overcome this limitation. Under the proposed model, the sample size is calculated by multiplying the population value by a confidence factor based on the Poisson distribution and dividing the result by the tolerable misstatement:

$$n = BV \times RF / TM.$$

The confidence factor is systematically increased according to the expected number of misstatements.

Third, a procedure was developed for applying the model differentially across risk zones. A high confidence level of up to 99 percent and a strict tolerable misstatement threshold are applied in the high-risk zone, while relatively less stringent parameters are used in the low-risk zone. In the hypothetical case study, the model produced a total sample size of 340 units for a population valued at 10,000 units, compared with 500 units under the fixed 5 percent approach. At the same time, the model substantially increased sampling coverage in the high-risk zone.

Fourth, the sensitivity analysis confirmed that the model responds logically and consistently to changes in the confidence level, tolerable misstatement, and expected misstatement. The analysis also demonstrated the importance of estimating expected misstatement carefully because an inaccurate estimate can significantly affect the required sample size.

Based on the research findings, it is recommended that the proposed sample-size determination model, the table of confidence factors, and the parameter-setting procedure be formalized in the methodological documents of public financial control bodies and audit organizations.

It is also recommended that the model calculations be integrated into the “Remote Audit” automated information system as a separate functional module. Auditors should receive appropriate training in determining,

substantiating, and documenting model parameters, including the confidence level, tolerable misstatement, and expected misstatement.

The expected misstatement should be reassessed during each audit period based on the results of previous audits, changes in internal control systems, and updated information about the audited organization. In addition, the statistical model for determining audit sample size should be incorporated into the curricula of the subjects “Audit” and “Public-Sector Audit” at higher education institutions.

Future research should focus on adapting monetary unit sampling procedures specifically to budget expenditure transactions. Further studies should also develop a methodology for evaluating and extrapolating sample results to the audited population and integrating these procedures with digital public financial control information systems.

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