II

(Non-legislative acts)

REGULATIONS

COMMISSION DELEGATED REGULATION (EU) 2023/67

of 20 October 2022

supplementing Regulation (EU) 2021/1060 of the European Parliament and of the Council by establishing standardised off-the-shelf sampling methodologies and modalities to cover one or more programming periods

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2021/1060 of the European Parliament and of the Council of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Just Transition Fund and the European Maritime, Fisheries and Aquaculture Fund and financial rules for those and for the Asylum, Migration and Integration Fund, the Internal Security Fund and the Instrument for Financial Support for Border Management and Visa Policy ([1]), and in particular Article 79(4) thereof,

Whereas:

(1) Through the Guidance on sampling methods for audit authorities ([2]), the Commission services assisted Member States' authorities in building solid sampling methodologies for carrying out audits of operations to support their annual audit opinions for the implementation of the regulatory framework for the 2007-2013 and the 2014-2020 programming periods. Following the experience and knowledge acquired in that context, Article 79(4) of Regulation (EU) 2021/1060 envisages as a novelty for the 2021-2027 programming period the use of standardised off-the-shelf sampling methodologies embedded in a delegated act.

(2) This Delegated Regulation setting out off-the-shelf sampling methodologies supplements Article 79 of Regulation (EU) 2021/1060 and therefore should apply to audits of operations supported by all Funds covered by Regulation (EU) 2021/1060 for the programming period 2021-2027.

(3) Given that one statistical sample may cover one or more programmes receiving support from the European Regional Development Fund ('ERDF'), the European Social Fund Plus ('ESF+'), the Cohesion Fund and the Just Transition Fund ('JTF'), this Delegated Regulation should lay down modalities to cover a group of programmes by the use of a common sample for these Funds. In addition, for these Funds, the common sample may cover one or more programming periods.

(4) In accordance with Article 98(4) of Regulation (EU) 2021/1060, the assurance package does not concern the total amount of eligible expenditure incurred by beneficiaries and paid in implementing operations or the corresponding public contribution made or to be made linked to specific objectives for which enabling conditions are not fulfilled with the exception of operations that contribute to the fulfilment of enabling conditions. It is therefore appropriate to exclude from the sampling population such expenditure, until the accounting year where it will be included in payment applications for reimbursement.

([1]) OJ L 231, 30.6.2021, p. 159.

([2]) Guidance on sampling methods for audit authorities, Programming periods 2007-2013 and 2014-2020 (EGESIF_16-0014-01, 20.1.2017).

(5) Sampling units with negative values or null values should be part of a separate negative population for which an error rate should not be calculated. The audit authorities should be allowed to include the audit of negative units in the audit of accounts or to carry out separate sampling procedures for a negative population. Consequently, it should be clarified that only sampling units with positive values should be part of the audit population for which the total error rate is calculated.

(6) In accordance with Article 36(5) of Regulation (EU) 2021/1060, the Union contribution for technical assistance can be reimbursed in the form of flat-rate financing. The modalities for the treatment of such expenditure in the sampling methodologies should be laid down.

(7) Article 80 of Regulation (EU) 2021/1060 provides for single audit arrangements which can affect sampling procedures. The options available to the audit authorities to apply such single audit arrangements should be clarified as regards operations which cannot be audited in accordance with paragraph 3 of that Article. In particular, the decision to use either the exclusion or replacement of sampling units should be taken by the audit authorities based on their professional judgement. The same treatment can also be applied where supporting documentation of the sampled operations is not available.

(8) In accordance with the guidance and established practice in the 2007-2013 and 2014-2020 programming periods, different methodological options using equal probability selection and probability proportional to size selection have been offered to and applied by audit authorities. Based on that experience, sampling rules should be laid down to allow continuity of known methodological options. Audit authorities should be able to use any of the sampling designs including stratification options proposed under this Delegated Regulation for the selection of the main sample.

(9) The off-the-shelf sampling methodologies should include multi-period sampling to facilitate the organisation of audit work for the accounting year. Two different approaches for the recalculation of the sample size after the first sampling period should be offered to audit authorities to reflect the established practice and to offer flexibility to use the most advantageous statistical option.

(10) With a view to simplifying sampling procedures as well as reducing the administrative burden on beneficiaries and the administrative costs, the audit authorities, when applying the off-the-shelf sampling methodologies, should be able to cap the size of a statistical sample at the level of 50 sampling units. Such an option should be made available for all programmes assessed in category 1 and 2 in accordance with the classification of management and control systems with regard to their effective functioning, set out in Annex XI of Regulation (EU) 2021/1060, which are not covered by a sample size of 30 in the framework of enhanced proportionate arrangements pursuant to Article 83 of that Regulation.

(11) Where capped sample sizes are not used or where they are applied within multi-period sampling procedures and the audit authorities would like to maintain the capped sample size despite underestimated forecasts of population size or expenditure, information should be provided about how to determine technical sampling parameters. In particular, following established practice and the regulatory framework in the 2007-2013 and 2014-2020 programming periods, it is expected that for systems assessed as having high reliability the confidence level should not be less than 60 % whereas for systems assessed as having low reliability the confidence should not be less than 90 %. Following experience with unilateral testing in the 2014-2020 programming period, the audit authorities should have an option to use bilateral or unilateral testing in their sampling procedures. As the anticipated standard deviation and anticipated error reflect expected values for the population under audit, it is appropriate to clarify that such parameters can be established using a pilot sample, historical data derived from previous sampling procedures and professional judgement.

(12) In accordance with Article 79(2) of Regulation (EU) 2021/1060, it is possible to use non-statistical sampling methods for populations below 300 sampling units. This Delegated Regulation should set out also off-the-shelf non-statistical sampling methodologies. In that context, it is also appropriate to clarify that the sampling units of exhaustive strata can be included in the minimum coverage of the 10 % of the sampling units in the sampling population.

(13) In principle, all the expenditure in the selected sample of operations should be audited. However, to allow for efficient audit procedures during audits of operations, the audit authorities should have the possibility to audit the sampling units of the selected sample using a subsampling methodology, provided it allows for the adequate extrapolation of errors.

(14) This Delegated Regulation should not apply to the specific rules on common samples of operations for Interreg programmes to be drawn by the Commission pursuant to Article 49(1) of Regulation (EU) 2021/1059 of the European Parliament and of the Council ([3]). However, statistical and non-statistical off-the-shelf methodologies could be used when audit authorities carry out a sampling exercise in accordance with Article 49(10) of that Regulation and Article 79 of Regulation (EU) 2021/1060.

(15) The off-the-shelf sampling methodologies laid down in this Delegated Regulation supplement Regulation (EU) 2021/1060 and do not limit the application of other sampling methodologies by the audit authorities under Article 79 of Regulation (EU) 2021/1060,

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter and scope

1. This Delegated Regulation lays down the provisions supplementing Article 79 of Regulation (EU) 2021/1060 by setting out, for audits of operations, standardised off-the-shelf sampling methodologies and modalities to cover one or more programming periods.

2. It lays down the statistical and non-statistical off-the-shelf sampling methodologies to be used by audit authorities for auditing the operations of the ERDF, the ESF+, the Cohesion Fund, the JTF, the European Maritime, Fisheries and Aquaculture Fund (EMFAF), the Asylum, Migration and Integration Fund (AMIF), the Internal Security Fund (ISF) and the Instrument for Financial Support for Border Management and Visa Policy (BMVI).

3. This Delegated Regulation shall not apply to:

(a) the Employment and Social Innovation strand of the ESF+;

(b) the direct or indirect management components of the EMFAF, the AMIF, the ISF and the BMVI;

(c) Interreg programmes subject to common samples pursuant to Article 49 of Regulation (EU) 2021/1059.

Article 2

Definitions

For the purpose of this Delegated Regulation, the definitions in Article 2 of Regulation (EU) 2021/1060 and the following definitions shall apply:

(1) 'sampling method' means a technical tool to select a sample and extrapolate results within a sampling methodology, which may be either statistical or non-statistical;

(2) 'statistical sampling method' is a sampling method which ensures a random selection of the sampling units and the use of probability theory to evaluate the sampling risk and precision;

(3) 'non-statistical sampling method' means a sampling method that does not involve the evaluation of the sampling risk and precision and is based on a random selection;

([3]) Regulation (EU) 2021/1059 of the European Parliament and of the Council of 24 June 2021 on specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments (OJ L 231, 30.6.2021, p. 94).

(4) 'sampling methodology' means a methodology describing the main elements and steps of a sampling procedure and which encompasses a sample selection stage including subsampling and extrapolation of results;

(5) 'Monetary Unit Sampling standard approach' or 'MUS standard approach' means a standardised statistical sampling method based on sample selection with 'probability proportional to size', compatible with different sampling designs, including stratification and multi-period sampling;

(6) 'Simple Random Sampling' or 'SRS' means a standardised statistical sampling method based on equal probability selection, compatible with different sampling designs, including stratification and 'multi-period sampling';

(7) 'random selection' means a probabilistic selection which refers either to probability proportional to size or equal probability selection ensured by using random number generating software, specialised or not, including MS Excel;

(8) 'equal probability' means one of the random selection methods in which random numbers are used in order to select randomly the units constituting the sample with equal probabilities;

(9) 'probability proportional to size' or 'PPS' means one of the random selection methods that uses the monetary unit as an auxiliary variable for sampling where the selection of the units constituting the sample is based on a probability proportional to the monetary value of the sampling unit (higher value units have higher probability of selection) and the selection is usually based on a systematic selection with a random starting point and application of a systematic rule to select the additional units;

(10) 'random stratum', also known as a sampling stratum, means a part of the positive population related to the accounting year or to a sampling period for which a random selection is used;

(11) 'exhaustive stratum' means a part of the positive population related to the accounting year or to a sampling period for which all sampling units are audited. It is typically composed of high value units, may also include other units based on the professional judgement of the audit authority and the audit of an exhaustive stratum may be combined with subsampling;

(12) 'subsampling' means a two-stage or multi-stage sampling where an error for a sampling unit is established on the basis of an extrapolation from a subsample of invoices or other subsampling units;

(13) 'subsampling unit' means a unit, which may be an invoice or other unit, into which a sampling unit is divided for the purpose of subsampling and which is audited exhaustively unless another level of subsampling for the subsampling unit is applied;

(14) 'multi-period sampling' means a sampling procedure where the audit population for an accounting year is divided into two or more sampling periods, which could be of the same or of a different length;

(15) 'negative population' means a sampling population composed of units with negative values or null values where expenditure is below or equal to 0;

(16) 'positive population' or 'audit population' means a sampling population composed of units with positive values where expenditure is above 0;

(17) 'bilateral testing' means an approach to statistical sampling allowing the calculation of both the upper error limit and the lower error limit;

(18) 'unilateral testing' means an approach to statistical sampling allowing the calculation of only one error limit, typically the upper error limit;

(19) 'extrapolated error' ('EE') or 'projected error' means the result of extrapolating the random errors found in the sample to the total population where the extrapolation/projection procedure depends on the sampling method used;

(20) 'upper error limit' means the sum of the 'sampling precision' and the 'extrapolated error' and, where applicable, delimited systemic errors and uncorrected anomalous errors;

(21) 'lower error limit' means an error limit calculated by deduction of the 'sampling precision' from the 'extrapolated error', adjusted, where applicable, by adding delimited systemic errors and uncorrected anomalous errors;

(22) 'sampling precision' means a sampling parameter measuring uncertainty in the extrapolation of sampling results to the population, and corresponding to the maximum expected deviation between the extrapolated error and the true population error which is achieved with a probability equal to the confidence level;

(23) 'confidence level' means a probability that a confidence interval includes the true value of the estimated parameter; it is used for the purpose of defining the sample size and for calculating sampling precision;

(24) 'confidence interval' means the interval that contains the true value of error in the population with a certain probability known as 'confidence level'; in bilateral testing, it is defined between a lower error limit and an upper error limit, and in unilateral testing, it is defined up to or down to a certain error limit which is typically an upper error limit.

Article 3

Audit population

1. The audit authority shall establish the audit population on the basis of expenditure included in the payment applications submitted to the Commission for a given accounting year. That population shall comprise the expenditure of a programme or a group of programmes, subject to the modalities laid down in this Article and in Article 4.

2. The statistical sample may cover one or more programmes receiving support from the ERDF, the ESF+, the Cohesion Fund and the JTF in one or more programming periods.

3. The expenditure linked to specific objectives for which enabling conditions are not fulfilled as referred to in Article 15(5) of Regulation (EU) 2021/1060, shall be excluded from the audit population.

4. Only sampling units with positive values shall be part of the audit population.

5. The audit population established in accordance with paragraphs 1 to 4 shall be used for the calculation of the total error rate.

6. Where relevant, the audit authority shall also establish an adjusted audit population for the purpose of sample selection by:

(a) excluding flat-rate financing for technical assistance in accordance with Article 36(5) of Regulation (EU) 2021/1060;

(b) removing sampling units which cannot be audited in accordance with Article 80(3) of Regulation (EU) 2021/1060, in the framework of single audit arrangements in case the audit authority adopts an approach based on exclusion for such sampling units.

All expenditure of the adjusted audit population established in accordance with points (a) and (b) shall be used for the sample selection except where supporting documentation of the sampled operations is not available.

In exceptional cases where the supporting documentation for some sampling units is not available, the audit authority may decide either to replace the sampling units or to exclude such units, as set out for single audit arrangements referred to in point (b).

Article 4

Multi-period sampling and stratification

1. The audit authority may divide the audit population of an accounting year into two or more sampling periods.

2. The audit authority may stratify the population of a programme or a group of programmes by dividing it into sub-populations. The audit authority may use criteria for stratifying such as programmes, Funds, regions, intermediate bodies, programming periods, values of operations, values of sampling units, types of operations and risks of operations.

3. Each sampling period and each stratum of a population or of a sampling period, as relevant, shall be subject to exhaustive verification or verifications based on a random selection. Where the PPS or the MUS standard approach are used, high value sampling units above the interval of selection shall be audited except for the cases provided for in Article 3(6), first subparagraph, points (a) and (b), and third subparagraph.

Article 5

Selection of a random statistical sample

1. The audit authority shall select a random statistical sample, from the population established in accordance with Articles 3 and 4, using one of the following methods:

(a) the MUS standard approach;

(b) Simple Random Sampling ('SRS').

2. Where the audit authority uses the MUS standard approach, it shall select a sample using PPS.

The low value units shall be selected on the basis of an interval of selection calculated using the expenditure of a low value stratum after determining an exhaustive high value stratum. All high value units above the interval of selection shall be audited, subject to exceptions provided in Article 3(6), first subparagraph, points (a) and (b), and third subparagraph.

3. Where the audit authority uses SRS, it shall select a sample using equal probability selection, with the optional use of an exhaustive stratum.

4. Annexes I and II set out sampling parameters and formulas to calculate the sample size for the methods referred to in paragraph 1, points (a) and (b), except where the capped sample size referred to in paragraph 7 is applied. Those formulas may be used with different sampling designs covering stratification or multi-period sampling or a combination of both.

5. The sample shall have at least 30 units and at least 3 units in each random stratum of a sampling period.

6. In the case of multi-period sampling, the audit authority shall apply one of the following approaches to recalculate the sample size in order to adjust to updated sampling parameters:

(a) standard recalculation of the sample size;

(b) global recalculation of the sample size.

Where the audit authority uses the approach of the standard recalculation of the sample size as referred to in point (a), the sample size of subsequent sampling period or periods shall be recalculated while maintaining the sample sizes of previous sampling periods of the accounting year.

Where the audit authority uses the approach of the global recalculation of the sample size as referred to in point (b), both the total sample size and the sample size per sampling period shall be recalculated.

7. As regards programmes assessed in category 1 or 2 as set out in Table 2 of Annex XI to Regulation (EU) 2021/1060, which are not subject to enhanced proportionate arrangements pursuant to Article 83 of that Regulation, the audit authority may cap the sample size at 50 sampling units.

Where the capped sample size referred to in the first subparagraph is used, it shall be applied to a sample for the whole population comprising, where applicable, more than one programme and programming periods.

All units in random strata and only high value units in exhaustive strata shall count for the capped sample size.

Multi-period sampling procedures may be applied with the capped sample size. In case of underestimated forecasts of population size or expenditure for the second or subsequent sampling periods, the audit authority shall take one of the following actions:

(a) increase the sample size to take into consideration the underestimated values of the forecasts;

(b) calculate the sample size in accordance with the formulas set out in Annex II.

Article 6

Selection of a random non-statistical sample

1. Where the population consists of less than 300 sampling units and the audit authority applies random non-statistical sampling, such a random non-statistical sample shall be selected from the population established in accordance with Articles 3 and 4 using one of the following methods:

(a) PPS which shall use the selection approach set out in Article 5(2);

(b) equal probability which shall use the selection approach set out in Article 5(3).

Both methods may be combined with stratification and multi-period sampling. Where using stratification, the sample shall include sampling units from every stratum of the population.

Units in individual strata shall either be selected randomly or be subject to the exhaustive verification of a stratum.

2. The units of exhaustive strata in both methods shall be included in the calculation of the 10 % minimum coverage of the sampling units in the population of the accounting year.

3. In multi-period sampling, where the audit authority selects a sample for the first sampling period using a statistical method forecasting a population of 300 or more sampling units, it may change the sampling method to non-statistical after the second sampling period where the final population size falls below 300.

In the cases referred to in the first subparagraph, the minimum coverage of sampling units shall be established on the basis of the number of sampling units selected from the audit population for the whole accounting year.

Article 7

Subsampling

All the sampling units selected in accordance with Articles 5 and 6 shall be audited either exhaustively or by the application of a subsampling methodology, which shall allow the extrapolation of errors at the level of the sampling unit.

The subsampling methodology shall be based on random selection and may be combined with stratification. In the case of stratification, the audit authority shall randomly select subsampling units from each stratum not exhaustively verified. In the case of PPS and MUS standard approaches, high value subsampling units above the interval of selection shall be audited.

The subsampling method may differ from the method applied for the selection of the main sample.

Article 8

Calculation of the total error rate

1. On the basis of the results of the audits of operations for the purpose of the audit opinion and control report referred to in Article 77(3) of Regulation (EU) 2021/1060, the audit authority shall calculate the total error rate, which shall be the sum of the extrapolated random errors, including errors established in the exhaustive strata, and, where applicable, delimited systemic errors and uncorrected anomalous errors, divided by the expenditure of the audit population.

2. Extrapolation in the framework of the off-the-shelf methodologies set out in this Delegated Regulation shall depend on the selection methods set out in Articles 5 and 6 and shall be carried out in accordance with the formulas set out in Annex II. For non-statistical sampling, the sampling precision and upper error limit shall not be calculated.

3. In the case of subsampling, the error of the sampling unit used for the calculation of the total error rate shall be the error extrapolated from subsampling units to the sampling unit of the main sample. Where the subsample is selected in accordance with the methods set out in Articles 5 and 6, the audit authority shall use the relevant extrapolation formulas set out in Annex II.

4. Where the operations cannot be audited in accordance with Article 80(3) of Regulation (EU) 2021/1060 or, exceptionally, where the supporting documentation for the sampling units is not available, extrapolation shall be adjusted and carried out in accordance with Annex III of this Delegated Regulation.

5. In the case of flat-rate financing for technical assistance, extrapolation shall be carried out on the basis of expenditure of the population excluding technical assistance. The total error rate obtained for such a population shall be considered also as the total error rate for the population including the amount based on a flat-rate for technical assistance.

Article 9

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 20 October 2022.

For the Commission
The President
Ursula VON DER LEYEN

ANNEX I

SAMPLING PARAMETERS

This Annex lays down a methodology for establishing sampling parameters applicable in the following cases:

(a) the audit authority does not apply a capped sample size of 50 sampling units based on Article 5(7) of this Delegated Regulation or a size of 30 sampling units based on Article 83 of Regulation (EU) 2021/1060.

(b) the capped sample size is applied in the framework of two-period or multi-period sampling procedures and the audit authority uses the re-calculation formulas for sample size, set out in Annex II, to verify the possibility of maintaining the capped size in spite of underestimated population size or expenditure for the second or subsequent sampling periods.

1. Materiality threshold

The maximum materiality threshold must be set at the level of 2 % in accordance with point 5.9 of Annex XX to Regulation (EU) 2021/1060.

2. Confidence level

The audit authority must evaluate the reliability of the system as high, average or low, taking into account the results of system audits to determine the technical parameters of sampling in such a way that the combined level of assurance obtained from the system audits and audits of operations is high. The confidence level used for sampling of operations of a system assessed as having high reliability must not be less than 60 %. The confidence level used for sampling of operations of a system assessed as having low reliability must not be less than 90 %.

3. Parameter *z*

To determine the parameter *z* based on the confidence level, the audit authority may use either bilateral or unilateral testing.

The following table presents *z* values using bilateral and unilateral testing:

Confidence level	90 %	80 %	70 %	60 %
z value (bilateral)	1,645	1,282	1,036	0,842
z' value (unilateral)	1,282	0,842	0,524	0,253

4. Anticipated standard deviation of errors or error rates and anticipated error

Anticipated standard deviation of errors or error rates and anticipated error are parameters that are expected to characterise the population under audit. They may be established using a pilot sample, historical data derived from previous sampling procedures and professional judgement.

ANNEX II

FORMULAS FOR SAMPLE SIZE CALCULATION AND EXTRAPOLATION OF ERRORS

1. MUS STANDARD APPROACH

1.1. **MUS standard approach – one period**

NON-STRATIFIED	STRATIFIED
Sample size calculation	
$n = \left(\frac{z \times BV \times \sigma_r}{TE - AE}\right)^2$	$n = \left(\frac{z \times BV \times \sigma_{rw}}{TE - AE}\right)^2$ $n_h = \frac{BV_h}{BV} n$ where σ_{rw}^2 - weighted mean of the variances of the error rates for the whole set of strata, with the weight for each stratum equal to the ratio between the stratum book value (BV_h) and the book value for the whole population (BV) $\sigma_{rw}^2 = \sum_{i=1}^{H} \frac{BV_h}{BV} \sigma_{rh}^2, h = 1,2,\ldots,H;$ and σ_{rh}^2 is the variance of error rates in each stratum

where

BV - population book value (total declared expenditure)

z - coefficient z from a normal distribution

TE - tolerable error (maximum 2 % of the total expenditure)

AE - anticipated error

σ_r - the standard deviation of the error rates

Extrapolation of errors	
Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive stratum, the projected error is the sum of the errors found in the units belonging to the stratum: $$EE_e = \sum_{i=1}^{n_e} E_i$$	Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive groups, the projected error is the sum of the errors found in the units belonging to those groups: $$EE_e = \sum_{h=1}^{H} \sum_{i=1}^{n_h} E_{hi}$$
For the non-exhaustive stratum, i.e. the stratum containing the sampling units with book value smaller than the interval, $BV_i < \frac{BV}{n}$ the projected error is $$EE_s = SI \sum_{i=1}^{n_s} \frac{E_i}{BV_i}$$	For the non-exhaustive groups, i.e. the groups containing the sampling units with book value smaller than the interval, $BV_{hi} < \frac{BV_h}{n_h}$, the projected error is $$EE_s = \sum_{h=1}^{H} \frac{BV_{hs}}{n_{hs}} \sum_{i=1}^{n_{hs}} \frac{E_{hi}}{BV_{hi}}$$
The projected error at the level of population is the sum of the two components above: $$EE = EE_e + EE_s$$	The projected error at the level of population is just the sum of these two components above: $$EE = EE_e + EE_s$$
Sampling precision: $$SE = z \times \frac{BV_s}{\sqrt{n_s}} \times s_r$$ where s_r is the standard-deviation of error rates in the sample of the non-exhaustive stratum (calculated from the same sample used to extrapolate the errors to the population)	Sampling precision: $$SE = z \times \sqrt{\sum_{h=1}^{H} \frac{BV_{hs}^2}{n_{hs}} . s_{rhs}^2}$$ where s_{rhs} is the standard-deviation of error rates in the sample of the non-exhaustive group of stratum h (calculated from the same sample used to extrapolate the errors to the population)

1.2. **MUS standard approach – two periods**

NON-STRATIFIED	STRATIFIED
Sample size calculation	
First period where $n_{1+2} = \frac{(z \times BV_{1+2} \times \sigma_{rw1+2})^2}{(TE - AE)^2}$ $\sigma^2_{rw1+2} = \frac{BV_1}{BV_{1+2}}\sigma^2_{r1} + \frac{BV_2}{BV_{1+2}}\sigma^2_{r2}$ $BV_{1+2} = BV_1 + BV_2$ $n_t = \frac{BV_t}{BV_{1+2}} n_{1+2}$	**First period** where $n_{1+2} = \frac{(z \times BV_{1+2} \times \sigma_{rw1+2})^2}{(TE - AE)^2}$ $\sigma^2_{rw1+2} = \sigma^2_{rw1} + \sigma^2_{rw2}$ $\sigma^2_{rwt} = \sum_{i=1}^{H_t} \frac{BV_{ht}}{BV}\sigma^2_{rht}, h = 1,2,\ldots,H_t;$ $BV_{1+2} = BV_1 + BV_2$ $n_{ht} = \frac{BV_{ht}}{BV} n$
Second period $n_2 = \frac{(z \times BV_2 \times \sigma_{r2})^2}{(TE - AE)^2 - z^2 \times \frac{BV_1^2}{n_1} \times s^2_{r1}}$	**Second period** where $n_2 = \frac{z^2 \times BV_2 \times \sum_{h=1}^{H_2}(BV_{h2}.\sigma^2_{rh2})}{(TE - AE)^2 - z^2 \times \sum_{h=1}^{H_1}\left(\frac{BV_{h1}^2}{n_{h1}}.s^2_{rh1}\right)}$ $n_{h2} = \frac{BV_{h2}}{BV_2} n_2$

Notes:

Whenever different approximations for the standard-deviations of each period cannot be obtained/are not applicable, the same value of standard deviation may be applied to all periods. In such a case σ_{rw1+2} is just equal to the single standard-deviation of error rates σ_r.

The parameter σ refers to the standard-deviation obtained from auxiliary data (e.g. historical data) and s refers to the standard-deviation obtained from the audited sample. In the formulas, whenever s is not available, it may be substituted by σ.

Formulas under the heading "First period" are used to calculate the sample size after the first sampling period of the accounting year in the case of a standard recalculation of the sample size referred to in Article 5(6), point (a). In the case of the global recalculation of the sample size referred to in Article 5(6), point (b), these formulas are used after the first sampling period and if needed also after the second sampling period in order to adjust to updated sampling parameters.

Formulas under the heading "Second period" are applicable only in the case of a standard recalculation of the sample size referred to in Article 5(6), point (a). They are used to recalculate the sample size of the second period in order to adjust to updated sampling parameters. If the formula results in a negative number, the formula and consequently the standard approach to recalculation of the sample size cannot be applied based on the established set of the updated parameters.

Extrapolation of errors	
Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $$EE_e = \sum_{i=1}^{n_1} E_{1i} + \sum_{i=1}^{n_2} E_{2i}$$	Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $$EE_e = \sum_{h=1}^{H_1} \sum_{i=1}^{n_{h1}} E_{h1i} + \sum_{h=1}^{H_2} \sum_{i=1}^{n_{h2}} E_{h2i}$$
For the non-exhaustive strata, i.e. the strata containing the sampling units with book value smaller than the interval, $BV_i < \frac{BV}{n}$ the projected error is $$EE_s = \frac{BV_{1s}}{n_{1s}} \times \sum_{i=1}^{n_{1s}} \frac{E_{1i}}{BV_{1i}} + \frac{BV_{2s}}{n_{2s}} \times \sum_{i=1}^{n_{2s}} \frac{E_{2i}}{BV_{2i}}$$	For the non-exhaustive strata, i.e. the strata containing the sampling units with book value smaller than the interval, $BV_i < \frac{BV}{n}$ the projected error is $$EE_s = \sum_{h=1}^{H_1} \left(\frac{BV_{h1s}}{n_{h1s}} . \sum_{i=1}^{n_{h1s}} \frac{E_{h1i}}{BV_{h1i}} \right) + \sum_{h=1}^{H_2} \left(\frac{BV_{h2s}}{n_{h2s}} . \sum_{i=1}^{n_{h2s}} \frac{E_{h2i}}{BV_{h2i}} \right)$$
The projected error at the level of population is the sum of the two components above: $$EE = EE_e + EE_s$$	The projected error at the level of population is the sum of the two components above: $$EE = EE_e + EE_s$$
Sampling precision: $$SE = z \times \sqrt{\frac{BV_{1s}^2}{n_{1s}} \times s_{r1s}^2 + \frac{BV_{2s}^2}{n_{2s}} \times s_{r2s}^2}$$	Sampling precision: $$SE = z \times \sqrt{\sum_{h=1}^{H_1} \left(\frac{BV_{h1s}^2}{n_{h1s}} . s_{rh1s}^2 \right) + \sum_{h=1}^{H_2} \left(\frac{BV_{h2s}^2}{n_{h2s}} . s_{rh2s}^2 \right)}$$
where s_{rt} is the standard-deviation of error rates in the sample of the non-exhaustive strata of period t (calculated from the same sample used to extrapolate the errors to the population)	where s_{rhts} is the standard-deviation of error rates in the sample of the non-exhaustive group of stratum h in period t (calculated from the same sample used to extrapolate the errors to the population)

1.3. **MUS standard approach – three periods** ([1])

NON-STRATIFIED	STRATIFIED
Sample size calculation	
First period $$n_{1+2+3} = \frac{(z \times BV_{1+2+3} \times \sigma_{rw1+2+3})^2}{(TE - AE)^2}$$ where $$\sigma^2_{rw1+2+3} = \frac{BV_1}{BV_{1+2+3}}\sigma^2_{r1} + \frac{BV_2}{BV_{1+2+3}}\sigma^2_{r2} + \frac{BV_3}{BV_{1+2+3}}\sigma^2_{r3}$$ $$BV_{1+2+3} = BV_1 + BV_2 + BV_3$$ $$n_t = \frac{BV_t}{BV_{1+2+3}} n_{1+2+3}$$	**First period** $$n_{1+2+3} = \frac{(z \times BV_{1+2+3} \times \sigma_{rw1+2+3})^2}{(TE - AE)^2}$$ where $$\sigma^2_{rw1+2+3} = \sigma^2_{rw1} + \sigma^2_{rw2} + \sigma^2_{rw3}$$ $$\sigma^2_{rwt} = \sum_{i=1}^{H_t} \frac{BV_{ht}}{BV}\sigma^2_{rht}, h = 1,2,\ldots,H_t;$$ $$BV_{1+2+3} = BV_1 + BV_2 + BV_3$$ $$n_{ht} = \frac{BV_{ht}}{BV} n$$
Second period $$n_{2+3} = \frac{(z \times BV_{2+3} \times \sigma_{rw2+3})^2}{(TE - AE)^2 - z^2 \times \frac{BV_1^2}{n_1} \times s^2_{r1}}$$ where $$\sigma^2_{rw2+3} = \frac{BV_2}{BV_{2+3}}\sigma^2_{r2} + \frac{BV_3}{BV_{2+3}}\sigma^2_{r3}$$ $$BV_{2+3} = BV_2 + BV_3$$ $$n_t = \frac{BV_t}{BV_{2+3}} n_{2+3}$$	**Second period** $$n_{2+3} = \frac{z^2 \times BV_{2+3} \times \left(\sum_{h=1}^{H_2}(BV_{h2}.\sigma^2_{rh2}) + \sum_{h=1}^{H_3}(BV_{h3}.\sigma^2_{rh3})\right)}{(TE - AE)^2 - z^2 \times \sum_{h=1}^{H_1}\left(\frac{BV_{h1}^2}{n_{h1}}.s^2_{rh1}\right)}$$ where $$BV_{2+3} = BV_2 + BV_3$$ $$n_{ht} = \frac{BV_{ht}}{BV_{2+3}} n_{2+3}$$

([1]) MUS standard approach may be applied with more than three sampling periods by relevant adjustments of the formulas.

Third period	**Third period**
$n_3 = \frac{(z \times BV_3 \times \sigma_{r3})^2}{(TE-AE)^2 - z^2 \times \frac{BV_1^2}{n_1} \times s_{r1}^2 - z^2 \times \frac{BV_2^2}{n_2} \times s_{r2}^2}$	$n_3 = \frac{z^2 \times BV_3 \times \left(\sum_{h=1}^{H_3} (BV_{h3}.\sigma_{rh3}^2)\right)}{(TE-AE)^2 - z^2 \times \sum_{h=1}^{H_1} \left(\frac{BV_{h1}^2}{n_{h1}}.s_{rh1}^2\right) - z^2 \times \sum_{h=1}^{H_2} \left(\frac{BV_{h2}^2}{n_{h2}}.s_{rh2}^2\right)}$ $n_{h3} = \frac{BV_{h3}}{BV_3} n_3$

Notes:

Whenever different approximations for the standard-deviations of each period cannot be obtained/are not applicable, the same value of standard deviation may be applied to all periods. In such a case $\sigma_{rw1+2+3}$ is just equal to the single standard-deviation of error rates σ_r.

The parameter σ refers to the standard-deviation obtained from auxiliary data (e.g. historical data) and s refers to the standard-deviation obtained from the audited sample. In the formulas, whenever s is not available, it may be substituted by σ.

See also notes above for the two-period MUS standard approach as regards the use of the standard approach to the recalculation of the sample size and the global approach referred to in Article 5(6).

Extrapolation of errors	
Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $EE_e = \sum_{i=1}^{n_1} E_{1i} + \sum_{i=1}^{n_2} E_{2i} + \sum_{i=1}^{n_3} E_{3i}$	Projected/extrapolated error (MUS standard approach/PPS): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $EE_e = \sum_{h=1}^{H_1} \sum_{i=1}^{n_{h1}} E_{h1i} + \sum_{h=1}^{H_2} \sum_{i=1}^{n_{h2}} E_{h2i} + \sum_{h=1}^{H_3} \sum_{i=1}^{n_{h3}} E_{h3i}$
For the non-exhaustive strata, i.e. the strata containing the sampling units with book value smaller than the interval, $BV_i < \frac{BV}{n}$ the projected error is $EE_s = \frac{BV_{1s}}{n_{1s}} \times \sum_{i=1}^{n_{1s}} \frac{E_{1i}}{BV_{1i}} + \frac{BV_{2s}}{n_{2s}} \times \sum_{i=1}^{n_{2s}} \frac{E_{2i}}{BV_{2i}} + \frac{BV_{3s}}{n_{3s}} \times \sum_{i=1}^{n_{3s}} \frac{E_{3i}}{BV_{3i}}$	For the non-exhaustive strata, i.e. the strata containing the sampling units with book value smaller than the interval, $BV_i < \frac{BV}{n}$ the projected error is $EE_s = \sum_{h=1}^{H_1} \left(\frac{BV_{h1s}}{n_{h1s}} . \sum_{i=1}^{n_{h1s}} \frac{E_{h1i}}{BV_{h1i}}\right) + \sum_{h=1}^{H_2} \left(\frac{BV_{h2s}}{n_{h2s}} . \sum_{i=1}^{n_{h2s}} \frac{E_{h2i}}{BV_{h2i}}\right) + \sum_{h=1}^{H_3} \left(\frac{BV_{h3s}}{n_{h3s}} . \sum_{i=1}^{n_{h1s}} \frac{E_{h3i}}{BV_{h3i}}\right)$
The projected error at the level of population is the sum of the two components above: $EE = EE_e + EE_s$	The projected error at the level of population is the sum of the two components above: $EE = EE_e + EE_s$

Sampling precision: $SE = z \times \sqrt{\frac{BV_{1s}^2}{n_{1s}} \times s_{r1s}^2 + \frac{BV_{2s}^2}{n_{2s}} \times s_{r2s}^2 + \frac{BV_{3s}^2}{n_{3s}} \times s_{r3s}^2}$ where s_{rts} is the standard-deviation of error rates in the sample of the non-exhaustive strata of period t (calculated from the same sample used to extrapolate the errors to the population)	Sampling precision: $SE = z \times \sqrt{\sum_{h=1}^{H_1} \left(\frac{BV_{h1s}^2}{n_{h1s}} . s_{rh1s}^2 \right) + \sum_{h=1}^{H_2} \left(\frac{BV_{h2s}^2}{n_{h2s}} . s_{rh2s}^2 \right) + \sum_{h=1}^{H_3} \left(\frac{BV_{h3s}^2}{n_{h3s}} . s_{rh3s}^2 \right)}$ where s_{rhts} is the standard-deviation of error rates in the sample of the non-exhaustive group of stratum h in period t (calculated from the same sample used to extrapolate the errors to the population)

2. SIMPLE RANDOM SAMPLING

2.1. **Simple random sampling – one period**

NON-STRATIFIED	STRATIFIED
Sample size calculation	
$n = \left(\frac{N \times z \times \sigma_e}{TE - AE} \right)^2$ where σ_e is the standard-deviation of errors in the population	$n = \left(\frac{N \times z \times \sigma_w}{TE - AE} \right)^2$ $n_h = \frac{N_h}{N} \times n.$ where σ_w^2 - the weighted mean of the variances of the errors for the whole set of strata: $\sigma_w^2 = \sum_{i=1}^{H} \frac{N_h}{N} \sigma_{eh}^2, h = 1,2,\ldots,H;$ and σ_{eh}^2 is the variance of errors in each stratum

where

N - population size

z - coefficient z from a normal distribution

TE - tolerable error (maximum 2 % of the total expenditure)

AE - anticipated error

σ_e - the standard deviation of the errors

Extrapolation of errors

In the framework of application of the off-the-shelf methodologies laid down in this Delegated Regulation, a single extrapolation method, ratio estimation, applies for SRS referred to in Article 5(1), point (b), and equal probability selection referred to in Article 6(1), point (b), for the purpose of simplification and legal certainty. This does not limit the application of other extrapolation methods by the audit authorities under Article 79 of Regulation (EU) 2021/1060.

Projected/extrapolated error (SRS/equal probability selection): If an exhaustive stratum is used, the projected error in this group is the sum of the errors found in the units belonging to the stratum: $$EE_e = \sum_{i=1}^{n_e} E_i$$ For the random stratum the projected error is $$EE_s = BV \times \frac{\sum_{i=1}^{n} E_i}{\sum_{i=1}^{n} BV_i}$$ The projected error at the level of population is the sum of the two components above: $$EE = EE_e + EE_s$$	Projected/extrapolated error (SRS/equal probability selection): If an exhaustive stratum is used, the projected error in this group is the sum of the errors found in the units belonging to those groups: $$EE_e = \sum_{h=1}^{H} \sum_{i=1}^{n_h} E_{hi}$$ For the random strata the projected error is $$EE_s = \sum_{h=1}^{H} BV_h \times \frac{\sum_{i=1}^{n_h} E_i}{\sum_{i=1}^{n_h} BV_i}$$ The projected error at the level of population is just the sum of these two components above: $$EE = EE_e + EE_s$$
Sampling precision: $$SE = N \times z \times \frac{s_q}{\sqrt{n}}$$ where s_q is the sample standard deviation of the variable q: $$q_i = E_i - \frac{\sum_{i=1}^{n} E_i}{\sum_{i=1}^{n} BV_i} \times BV_i.$$ Precision is exclusively calculated with data pertaining to the non-exhaustive strata.	Sampling precision: $$SE = N \times z \times \frac{s_{qw}}{\sqrt{n}}$$ where $$s_{qw}^2 = \sum_{h=1}^{H} \frac{N_h}{N} s_{qh}^2$$ is a weighted mean of the sample variances of the variable q_h, with $$q_{ih} = E_{ih} - \frac{\sum_{i=1}^{n_h} E_{ih}}{\sum_{i=1}^{n_h} BV_{ih}} \times BV_{ih}.$$ Precision is exclusively calculated with data pertaining to the non-exhaustive strata.

2.2. **Simple random sampling – two periods**

NON-STRATIFIED	STRATIFIED
Sample size calculation	
First period $n_{1+2} = \frac{(z \times N_{1+2} \times \sigma_{ew1+2})^2}{(TE - AE)^2}$ where $\sigma^2_{ew1+2} = \frac{N_1}{N_{1+2}}\sigma^2_{e1} + \frac{N_2}{N_{1+2}}\sigma^2_{e2}$ $N_{1+2} = N_1 + N_2$ $n_t = \frac{N_t}{N_{1+2}} n_{1+2}$	**First period** $n_{1+2} = \frac{(z \times N_{1+2} \times \sigma_{ew1+2})^2}{(TE - AE)^2}$ where $\sigma^2_{ew1+2} = \sum_{i=1}^{H_1} \frac{N_{h1}}{N}\sigma^2_{h1} + \sum_{i=1}^{H_2} \frac{N_{h2}}{N}\sigma^2_{h2},$ $N_{1+2} = N_1 + N_2$ $n_{ht} = \frac{N_{ht}}{N_{1+2}} n_{1+2}$
Second period $n_2 = \frac{(z \times N_2 \times \sigma_{e2})^2}{(TE - AE)^2 - z^2 \times \frac{N_1^2}{n_1} \times s^2_{e1}}$	**Second period** $n_2 = \frac{z^2 \times N_2 \times \sum_{h=1}^{H_2} (N_{h2} . \sigma^2_{eh2})}{(TE - AE)^2 - z^2 \times \sum_{h=1}^{H_1} \left(\frac{N_{h1}^2}{n_{h1}} . s^2_{eh1} \right)}$

Notes:
Whenever different approximations for the standard-deviations of each period cannot be obtained/are not applicable, the same value of standard deviation may be applied to all periods. In such a case σ_{ew1+2} is just equal to the single standard-deviation of errors σ_e.
The parameter σ refers to the standard-deviation obtained from auxiliary data (e.g. historical data) and s refers to the standard-deviation obtained from the audited sample. In the formulas, whenever s is not available, it may be substituted by σ.
Formulas under the heading "First period" are used to calculate the sample size after the first sampling period of the accounting year in the case of a standard recalculation of the sample size referred to in Article 5(6), point (a). In the case of the global recalculation of the sample size referred to in Article 5(6), point (b), these formulas are used after the first sampling period and if needed also after the second sampling period in order to adjust to updated sampling parameters.
Formulas under the heading "Second period" are applicable only in the case of a standard recalculation of the sample size referred to in Article 5(6), point (a). They are used to recalculate the sample size of the second period in order to adjust to updated sampling parameters. If the formula results in a negative number, the formula and consequently the standard approach to re-calculation of the sample size cannot be applied based on the established set of the updated parameters.

Extrapolation of errors

In the framework of application of the off-the-shelf methodologies laid down in this Delegated Regulation, a single extrapolation method, ratio estimation, applies for SRS referred to in Article 5(1), point (b) and equal probability selection referred to in Article 6(1), point (b), for the purpose of simplification and legal certainty. This does not limit the application of other extrapolation methods by the audit authorities under Article 79 of Regulation (EU) 2021/1060.

Projected/extrapolated error (SRS/equal probability selection):
If an exhaustive stratum is used, the projected error in this group is the sum of the errors found in the units belonging to the strata:

$$EE_e = \sum_{i=1}^{n_1} E_{1i} + \sum_{i=1}^{n_2} E_{2i}$$

For the non-exhaustive strata, the projected error is:

$$EE_s = BV_1 \times \frac{\sum_{i=1}^{n_1} E_{1i}}{\sum_{i=1}^{n_1} BV_{1i}} + BV_2 \times \frac{\sum_{i=1}^{n_2} E_{2i}}{\sum_{i=1}^{n_2} BV_{2i}}$$

The projected error at the level of population is the sum of the two components above.

Projected/extrapolated error (SRS/equal probability selection):
If an exhaustive stratum is used, the projected error is the sum of the errors found in the units belonging to the strata:

$$EE_e = \sum_{h=1}^{H_1} \sum_{i=1}^{n_{h1}} E_{h1i} + \sum_{h=1}^{H_2} \sum_{i=1}^{n_{h2}} E_{h2i}$$

For the non-exhaustive strata, the projected error is:

$$EE_s = \sum_{h=1}^{H_1} BV_{h1} \times \frac{\sum_{i=1}^{n_{h1}} E_i}{\sum_{i=1}^{n_{h1}} BV_i} + \sum_{h=1}^{H_2} BV_{h2} \times \frac{\sum_{i=1}^{n_{h2}} E_i}{\sum_{i=1}^{n_{h2}} BV_i} 1$$

The projected error at the level of population is the sum of the two components above.

Sampling precision:

$$SE = z \times \sqrt{\left(N_1^2 \times \frac{s_{q1}^2}{n_1} + N_2^2 \times \frac{s_{q2}^2}{n_2} \right)}$$

$$q_{ti} = E_{ti} - \frac{\sum_{i=1}^{n_t} E_{ti}}{\sum_{i=1}^{n_t} BV_{ti}} \times BV_{ti}$$

Precision is exclusively calculated with data pertaining to the non-exhaustive strata.

Sampling precision:

$$SE = z \times \sqrt{\sum_{h=1}^{H_1} \left(\frac{N_{h1}^2}{n_{h1}} . s_{qh1}^2 \right) + \sum_{h=1}^{H_2} \left(\frac{N_{h2}^2}{n_{h2}} . s_{qh2}^2 \right)}$$

$$q_{iht} = E_{iht} - \frac{\sum_{i=1}^{n_{ht}} E_{ih}}{\sum_{i=1}^{n_{ht}} BV_{ih}} \times BV_{iht}.$$

Precision is exclusively calculated with data pertaining to the non-exhaustive strata.

2.3. **Simple random sampling – three periods** ([2])

NON-STRATIFIED	STRATIFIED
Sample size calculation	
First period	**First period**
$$n_{1+2+3} = \frac{\left(z \times N_{1+2+3} \times \sigma_{ew1+2+3}\right)^2}{\left(TE - AE\right)^2}$$	$$n_{1+2+3} = \frac{\left(z \times N_{1+2+3} \times \sigma_{ew1+2+3}\right)^2}{\left(TE - AE\right)^2}$$
where	where
$$\sigma^2_{ew1+2+3} = \frac{N_1}{N_{1+2+3}}\sigma^2_{e1} + \frac{N_2}{N_{1+2+3}}\sigma^2_{e2} + \frac{N_3}{N_{1+2+3}}\sigma^2_{e3}$$	$$\sigma^2_{ew1+2+3} = \sum_{i=1}^{H_1}\frac{N_{h1}}{N}\sigma^2_{h1} + \sum_{i=1}^{H_2}\frac{N_{h2}}{N}\sigma^2_{h2} + \sum_{i=1}^{H_3}\frac{N_{h3}}{N}\sigma^2_{h3}$$
$$N_{1+2+3} = N_1 + N_2 + N_3$$	$$N_{1+2+3} = N_1 + N_2 + N_3$$
$$n_t = \frac{N_t}{N_{1+2+3}} n_{1+2+3}$$	$$n_{ht} = \frac{N_{ht}}{N_{1+2+3}} n_{1+2+3}$$
Second period	**Second period**
$$n_{2+3} = \frac{\left(z \times N_{2+3} \times \sigma_{ew2+3}\right)^2}{\left(TE - AE\right)^2 - z^2 \times \frac{N_1^2}{n_1} \times s^2_{e1}}$$	$$n_{2+3} = \frac{z^2 \times N_{2+3} \times \sigma_{ew2+3}}{\left(TE - AE\right)^2 - z^2 \times \sum_{h=1}^{H_1}\left(\frac{N_{h1}^2}{n_{h1}}.s^2_{eh1}\right)}$$
where	
$$\sigma^2_{ew2+3} = \frac{N_2}{N_{2+3}}\sigma^2_{e2} + \frac{N_3}{N_{2+3}}\sigma^2_{e3}$$	$$\sigma^2_{ew2+3} = \sum_{h=1}^{H_2}(N_{h2}.\sigma^2_{eh2}) + \sum_{h=1}^{H_3}(N_{h3}.\sigma^2_{eh3})$$
$$N_{2+3} = N_2 + N_3$$	
$$n_t = \frac{N_t}{N_{2+3}} n_{2+3}$$	

([2]) Simple Random Sampling may be applied with more than three sampling periods by relevant adjustments of the formulas.

Third period $n_3 = \frac{(z \times N_3 \times \sigma_{e3})^2}{(TE - AE)^2 - z^2 \times \frac{N_1^2}{n_1} \times s_{e1}^2 - z^2 \times \frac{N_2^2}{n_2} \times s_{e2}^2}$	**Third period** $n_3 = \frac{z^2 \times N_3 \times \sigma_{ew3}}{(TE - AE)^2 - z^2 \times \sum_{h=1}^{H_1} \left(\frac{N_{h1}^2}{n_{h1}} . s_{eh1}^2 \right) - z^2 \times \sum_{h=1}^{H_2} \left(\frac{N_{h2}^2}{n_{h2}} . s_{eh2}^2 \right)}$ $\sigma_{ew3} = \sum_{h=1}^{H_3} (N_{h3} . \sigma_{eh3}^2)$

Notes:
Whenever different approximations for the standard-deviations of each period cannot be obtained/are not applicable, the same value of standard deviation may be applied to all periods. In such a case $\sigma_{ew1+2+3}$ is just equal to the single standard-deviation of errors σ_e.
The parameter σ refers to the standard-deviation obtained from auxiliary data (e.g. historical data) and s refers to the standard-deviation obtained from the audited sample. In the formulas, whenever s is not available, it may be substituted by σ.
See also notes above for the two-period simple random sampling as regards the use of the standard approach to the recalculation of the sample size and the global approach referred to in Article 5(6).

Extrapolation of errors

In the framework of application of the off-the-shelf methodologies laid down in this Regulation, a single extrapolation method, ratio estimation, applies for SRS referred to in Article 5(1), point (b), and equal probability selection referred to in Article 6(1), point (b), for the purpose of simplification and legal certainty. This does not limit the application of other extrapolation methods by the audit authorities under Article 79 of Regulation (EU) 2021/1060.

Projected/extrapolated error (SRS/equal probability selection): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $EE_e = \sum_{i=1}^{n_1} E_{1i} + \sum_{i=1}^{n_2} E_{2i} + \sum_{i=1}^{n_3} E_{3i}$ For the non-exhaustive strata, the projected error is: $EE_s = BV_1 \times \frac{\sum_{i=1}^{n_1} E_{1i}}{\sum_{i=1}^{n_1} BV_{1i}} + BV_2 \times \frac{\sum_{i=1}^{n_2} E_{2i}}{\sum_{i=1}^{n_2} BV_{2i}} + BV_3 \times \frac{\sum_{i=1}^{n_3} E_{3i}}{\sum_{i=1}^{n_3} BV_{3i}}$ The projected error at the level of population is the sum of the two components above.	Projected/extrapolated error (SRS/equal probability selection): For the exhaustive strata, the projected error is the sum of the errors found in the units belonging to the strata: $EE_e = \sum_{h=1}^{H_1} \sum_{i=1}^{n_{h1}} E_{h1i} + \sum_{h=1}^{H_2} \sum_{i=1}^{n_{h2}} E_{h2i} + \sum_{h=1}^{H_2} \sum_{i=1}^{n_{h3}} E_{h3i}$ For the non-exhaustive strata, the projected error is: $EE_s = \sum_{h=1}^{H_1} BV_{h1} \times \frac{\sum_{i=1}^{n_{h1}} E_i}{\sum_{i=1}^{n_{h1}} BV_i} + \sum_{h=1}^{H_2} BV_{h2} \times \frac{\sum_{i=1}^{n_{h2}} E_i}{\sum_{i=1}^{n_{h2}} BV_i} + \sum_{h=1}^{H_3} N_{h3} \times \frac{\sum_{i=1}^{n_{h3}} E_i}{n_{h3}}$ The projected error at the level of population is the sum of the two components above.

Sampling precision: $$SE = z\times\sqrt{\left(N_1^2\times\frac{s_{q1}^2}{n_1}+N_2^2\times\frac{s_{q2}^2}{n_2}+N_3^2\times\frac{s_{q3}^2}{n_3}\right)}$$ $$q_{ti} = E_{ti} - \frac{\sum_{i=1}^{n_t} E_{ti}}{\sum_{i=1}^{n_t} BV_{ti}}\times BV_{ti}$$ Precision is exclusively calculated with data pertaining to the non-exhaustive strata.	Sampling precision: $$SE = z\times\sqrt{\sum_{h=1}^{H_1}\left(\frac{N_{h1}^2}{n_{h1}}.s_{qh1}^2\right)+\sum_{h=1}^{H_2}\left(\frac{N_{h2}^2}{n_{h2}}.s_{qh2}^2\right)+\sum_{h=1}^{H_3}\left(\frac{N_{h3}^2}{n_{h3}}.s_{qh3}^2\right)}$$ $$q_{iht} = E_{iht} - \frac{\sum_{i=1}^{n_{ht}} E_{ih}}{\sum_{i=1}^{n_{ht}} BV_{ih}}\times BV_{iht}.$$ Precision is exclusively calculated with data pertaining to the non-exhaustive strata.

ANNEX III

ADJUSTMENTS RELATED TO SINGLE AUDIT ARRANGEMENTS

The following Tables 1 and 2 include information on the approaches to sample selection, extrapolation of errors and calculation of precision under the principles of single audit arrangements, in particular where the operations cannot be audited in accordance with Article 80(3) of Regulation (EU) 2021/1060. In non-statistical sampling methods, the approach set out in those tables may be used to determine the extrapolation of errors using PPS and equal probability selection.

Such approaches apply also to exceptional cases where supporting documentation of the sampled operations is not available.

Table 1

MUS standard approach/PPS selection

Sampling design	MUS standard/PPS: Exclusion of sampling units	MUS standard/PPS: Replacement of sampling units
Population used for sample selection	Reduced (adjusted) population (i.e. population excluding operations/other sampling units affected by Article 80 of Regulation (EU) 2021/1060)	Original population ([1])
Parameters used for sample size calculation	Correspond to the original population	
Recommended approach to projection/extrapolation of errors and precision calculation	Projection of error and precision calculation is carried out in the first stage for the reduced population. In the next stage it is adjusted to reflect the original population. Such adjustment may be performed by multiplying the projected error and precision by the ratio between expenditure $BV_{(h)\ original}$ of the original population and the expenditure $BV_{(h)\ reduced}$ of the reduced population. In the case of units of high-value stratum affected by Article 80 of Regulation (EU) 2021/1060 (or any other exhaustive stratum), there could be a need to calculate the error for the high-value stratum and to project this error to the units which were not audited in this stratum using the formula $EE_e = EE_{e\ reduced} \times \frac{BV_{e\ original}}{BV_{e\ reduced}}$ (where $EE_{e\ reduced}$ represents the amount of error in the sampling units of the high-value stratum audited, $BV_{e\ original}$ refers to book value of the original high-value stratum and $BV_{e\ reduced}$ refers to the book value of units in the high-value stratum which were subject to audit.)	Projection of error and precision calculation is carried out for the original population. The units of high-value stratum (or units of any other exhaustive stratum), which are excluded from the audit procedures due to provisions of Article 80 of Regulation (EU) 2021/1060 should be replaced by the sampling units of the low-value stratum. In such a case there could be a need to calculate the error for the high-value stratum and to project this error to the units which were not audited in this stratum using the formula $EE_e = EE_{e\ reduced} \times \frac{BV_{e\ original}}{BV_{e\ reduced}}$ (where $EE_{e\ reduced}$ represents the amount of error in the sampling units of the high-value stratum audited, $BV_{e\ original}$ refers to book value of the original high-value stratum and $BV_{e\ reduced}$ refers to the book value of units in the high-value stratum which were subject to audit).

([1]) In case the selected sample includes any sampling units that need to be replaced, the replacement units are selected from the population excluding the sampling units of the original sample.

Table 2

Simple Random Sampling/equal probability selection (ratio estimation)

Sampling design	Simple Random Sampling/equal probability selection: Exclusion of sampling units	Simple Random Sampling/equal probability selection: Replacement of sampling units
Population used for sample selection	Reduced (adjusted) population (i.e. population excluding operations/other sampling units affected by Article 80 of Regulation (EU) 2021/1060)	Original population ([1])
Parameters used for sample size calculation	Correspond to the original population	
Recommended approach to projection/extrapolation of errors and precision calculation	Projection of error and precision calculation is carried out for the reduced population. In the next stage it is adjusted to reflect the original population based on the following approaches: The adjustment may be performed by multiplying the projected error and precision by the ratio between expenditure $BV_{(h)\ original}$ of the original population and the expenditure $BV_{(h)\ reduced}$ of the reduced population. Projection of error may also be performed directly for the original population. Precision should not be calculated directly for the original population. The precision calculated for reduced population should be adjusted for the original population by multiplying the precision of the reduced population by the ratio $\frac{BV_{(h)\ original\ population}}{BV_{(h)\ reduced\ population}}$. In the case of units of high-value stratum (or any other exhaustive stratum) subject to Article 80 of Regulation (EU) 2021/1060, there could be a need to calculate an error for the high-value stratum and to project this error to the units which were not audited in this stratum. It would be performed using the formula $EE_e = EE_{e\ reduced} \times \frac{BV_{e\ original}}{BV_{e\ reduced}}$, where $EE_{e\ reduced}$represents the amount of error in the sampling units of the high-value stratum audited, $BV_{e\ original}$ refers to book value of the original high-value stratum and $BV_{e\ reduced}$ refers to the book value of units in the high-value stratum which were subject to audit.	Projection of error is carried out for the original population. Precision has to be calculated for the reduced population (population from which all sampling units subject to Article 80 of Regulation (EU) 2021/1060 were deducted). Subsequently, it should be in the next stage adjusted to reflect the original population. It may be performed by multiplying the precision of the reduced population by the ratio between expenditure $BV_{(h)\ original}$ of the original population and the expenditure $BV_{(h)\ reduced}$ of the reduced population. It should be also noted that even if the audit authority did not select any sampling units affected by Article 80 of Regulation (EU) 2021/1060 in its sample, the precision will also have to be calculated to the reduced population and subsequently adjusted using the above mentioned formula. In the case of units of high-value stratum (or any other exhaustive stratum) subject to Article 80 of Regulation (EU) 2021/1060, there could be a need to calculate an error for the high-value stratum and to project this error to the units which were not audited in this stratum. It would be performed using the formula $EE_e = EE_{e\ reduced} \times \frac{BV_{e\ original}}{BV_{e\ reduced}}$, where $EE_{e\ reduced}$ represents the amount of error in the sampling units of the high-value stratum audited, $BV_{e\ original}$ refers to book value of the original high-value stratum and $BV_{e\ reduced}$ refers to the book value of units in the high-value stratum which were subject to audit.

([1]) In case the selected sample includes any sampling units that need to be replaced, the replacement units are selected from the population excluding the sampling units of the original sample.