

Importance of Statistical Sampling **in Auditing: An Illustration**

Importance of Statistical Sampling in Auditing

Application of statistical sampling in auditing has grown rapidly as

- no auditor can check 100% of auditable entities
- to provide assurance based on test checks
- Audit methodology is under **increasing scrutiny**
- auditor need to use scientific tools & techniques
- conclusions can stand scrutiny of auditee/ other professionals.
- detailed standards promulgated by various professional bodies like AICPA and CIPFA

Non Statistical Sampling in Transaction Audit

- Say there are 15,000 transactions in all
- auditor picked up a convenient/judgmental sample of 750 (5%) transactions to audit.

Questions arise:

- Whether sample of 750 transactions was **adequate and representative** of the population?
- can a reasonable conclusion be drawn about the population?

As the sample of 750 transactions selected above is non-statistical so conclusion for population

(i) would not be reliable

(ii) extrapolations are not quantifiable and justifiable

(iii) inferences can be challenged by Auditee/others

An Illustration: A - Z of Statistical Sampling

- Consider a Regional Transport Office (RTO) with 819 vehicles registered in a specified period under audit coverage.
- Audit objective: (i) to give indication of the extent (% or number) of audit objections (ii) revenue that remains to be recovered as a result of non/short levy etc. while administering the tax on vehicles.
- The optimum sample size derived is approx. 300 (**next slide**) assuming *95% confidence (of the proportion of audit objections) with 2% margin of error.*

Determination of Sample Size

Three parameters are required in case of Attribute sampling (Under Normality Assumption)

- Margin of error (d); tolerable error = 2%
- Confidence/Reliability level ($1 - \alpha$); α is prob. Of type I error; 95%, $Z_{\alpha} = 1.96$
- Expected Population Proportion (P) of deviations/ audit objections = 0.05 [for attribute sampling; can be calculated on a pilot sample of 30 or taken from previous audit reports]

Optimum sample Size (Attribute sampling)

- For estimating population proportion of errors (P)

$$n_o = \left(\frac{Z_{\alpha}^2 \cdot P \cdot (1-P)}{d^2} \right) = \frac{1.96^2 \cdot (0.05) \cdot (1-0.05)}{(.02)^2}$$

$$= 456 \text{ (Approx.)}$$

- Note that the population size (N) is not there in the formula
- As the population size is very low (less than 10 times the determined sample size) , we may reduce the sample size for SRSWOR as:

$$n_R = \frac{n_o}{1 + \frac{n_o}{N}} = \frac{456}{1 + \frac{456}{819}} = \frac{456}{1.557}$$

$$= 293 = 300 \text{ (approx.)}$$

Sample Observations & Population Results

Sample Observations

- Audit objections in 28/300 entries with Rs.21, 06,679/- is total amount of short/non-levy of taxes

Statistical evaluation

sample proportion of audit objections = $\frac{28}{300}$
= 0.0933 = 9.3%

sample **average money** value of error = $\frac{21,06,679}{300}$
= Rs.7022/-

- Remember: *According to statistical sampling theory, sample proportion / average are unbiased estimate of population proportion / average*

8. Audit conclusions:

- Most likely money value of audit objection in the population can be statistically evaluated as:
(Number of entries of vehicles in the RTO) X (sample average) = 819 X 7022 = Rs.57.5 lakhs (approx).

Audit concludes **with 95% confidence** that:

- 1) The percentage of cases with non/short levy of taxes lies between 7.3% - 11.3 % (9.3% \pm 2%).
 - 2) The amount of non/short levy of taxes in the RTO is b/w Rs. 34.15 - Rs.80.87 lakhs (next slide)
- However, the most likely percentage of cases with non/short levy of taxes in the RTO was 9.3% and Rs.57 lakhs is the corresponding amount of non/short levy of taxes during the specified period.

Standard Error (SE) and 95% Interval

- Unbiased Estimator of **variance** is given by the formula $\frac{N-n}{N} * s^2$
- SE is the **square root of the estimate of variance**.
- Standard Error = Rs.1455/- (Calculated using formula)
- The 95% confidence interval of average value of audit objection was $Av. \pm 1.96 * SE$
 $= 7022 \pm 1.96 * 1455 = 7022 \pm 2852$
 $= Rs. (4170, 9874)$
- Hence 95% confidence interval of the total value of non/short levy in the RTO was
- $(819 * 4170, 819 * 9874)$
 $= (Rs. 34.15 - Rs. 80.87 \text{ lakhs}).$

Advantage of Statistical Sampling

- offer a means of extrapolating errors/misstatement in **quantifiable and reliable manner**
- measuring risk of relying on the sample helps to arrive at meaningful inferences
- Offers a means of arriving at an optimum sample size to avoid under or over auditing
- auditors can state estimates of maximum projected error rates or values

Other Value Addition by statistical sample

- Take an account of risk and materiality: useful at the planning stage when perceived risk is a major determinant of audit effort, sample size and cost.
- Un-biasedness and Transparency: Properly designed sampling plan estimates the true population characteristics as accurately as possible and the estimates are unbiased and transparent.
- Accountability and audit management: the statistical sampling enhances accountability as it assists in the calculation of sample sizes, levels of confidence and other implications related to the cost of the audit.

Value addition in audit through statistical sampling:

- Saving of time even by keeping one day for sampling work
- forming an opinion about the extent of audit objection/value of misstatement [non-levy/short-levy of taxes including penalty and interest] in the population with **specified sampling risk (5%)**.
- Incidentally in this particular case population proportion of non/short-levy of taxes and the amount were found to be 9.4% and Rs.64 lakhs respectively. It verifies the accuracy of inference based on sample.

Expanding the scope of audit

- Audit objective: There were 28 RTOs under D/o Tpt. located in different districts in the State. Number of vehicles registered in a specified period in different RTOs are N_h ($h=1, 2, \dots, 28$).
- Same Sampling methodology may be applied independently to the 28 RTOs
- Reliable state level estimates may be derived by suitably combining the 28 estimates.
- The auditor can come to a trustworthy conclusion on the extent of recoverable non/short levy of vehicle taxes in the state, with some specified sampling risk and write the audit report accordingly.

Control Measures for Non Sampling Errors

Sampling Errors arise due to:

- **POPULATION SPECIFICATION ERROR**—when the researcher does not understand who (s)he should survey. For e.g. in a survey about breakfast cereal consumption - who should be surveyed? The mother makes the purchase decision, but the children influence her choice.
- **SAMPLE FRAME ERROR**—when the wrong sub-population is used to select a sample. For e.g. if the sample frame is from car registrations and telephone directories. The results may be wrongly predicted.
- **SELECTION ERROR**—This occurs when only those that are interested respond. It can be controlled by pre-survey contact requesting cooperation, actual surveying, post survey follow-up if a response is not received.
- **NON-RESPONSE**—Non-response errors occur when respondents are different than those who do not respond. The extent of this non-response error can be checked through follow-up surveys etc.
- **SAMPLING ERRORS**—These errors occur because of variation in the number or representativeness of the sample that responds.
- These errors can be controlled by (1) careful sample designs, (2) large samples and (3) multiple contacts to assure representative response.

Non Sampling Errors: Types

- Conceptual Errors:
 - Lack of qualified and suitable enumerators
 - Lack of proper training of field staff to make them thorough with the concepts and definitions involved
- Errors of Recording/ Transcription: Due to carelessness and negligence of the data collector
- Errors of Inaccurate Measurement: Due to erroneous figure of measurement given by the informant

Non Sampling Errors: Types Contd...

➤ Errors in Totalling:

- When there are many items to be totalled up
- Totalling of subtotals may quite often lead to such errors

➤ Errors of Omission:

- When field worker fails to ask certain questions in the block
- Due to non availability of required information

Non Sampling Errors: Types Cont.

Bias of the Interviewer:

- Due to inadequate training or partial understanding of instructions
- Putting a question in a specific way or telling suggestive answers

Errors of Inconsistency: When data are inconsistent with the similar information collected in some other block of the schedule

Non Sampling Errors: Types Contd.

➤ **Response Error:**

- Due to wrong notion present in the mind of respondent
- Due to some kind of fear
- Due to wrong understanding of questions
- Due to Illiteracy
- Due to lack of clarity in questions
- Due to deliberate poor response.

➤ **Error due to Prestige/ Self interest:** Due to prestige, pride or self interest, informant may introduce bias by upgrading education, expenditure and downgrading age, income, etc.

Non Sampling Errors: Types Contd...

Errors due to recall lapse: If the recall period is longer, answers may be based on guess or averages

- Error due to absence of right informant
- Error due to incorrect identification of FSU/ SSU:
 - Boundaries not correctly identified due to lack of adequate effort or due to misguidance by some person
- Errors due to longer reference period:
 - Inclusion of information pertaining to period out of reference period
 - Exclusion of information pertaining to the period within the reference period .

Methods of Controlling Non Sampling Errors

- Recruitment of proper primary field worker who has got:
 - Aptitude for field work
 - Good knowledge of the survey area/local language
 - Proper academic qualification
 - Tactfulness and resourcefulness
- Training: Required for facilitating and understanding the sampling design, various concepts & definitions, schedules of enquiry and procedure of data collection

Methods of Controlling Non Sampling Errors - Cont.

- Purpose of training/workshops is to bring uniformity in concepts and procedures
- Active participation by primary field workers and supervisors
- Inspection/ Supervision:
 - On the spot verification
 - Instant feedback to the investigating staff
 - Inspection norms
- Probing:
 - Probing questions should be simple
 - Should not create any sort of bitterness
- Cross checking

Methods of Controlling Non Sampling Errors - Cont.

- Scrutiny and Super Scrutiny
- Monthly Meetings in all AOs/ SAOs
- Feedback Reports
- Role of experienced field staff in improvement of quality
- Amendments in the Schedules and Clarifications:
Pilot Survey