Sampling Theory

By

Ms. V. V. Pawar

Simple random sampling

- It is a sampling technique in which each and every unit of population has an equal opportunity of being selected in the sample.

- **Types of SRS**
- Simple random sampling with replacement(SRSWR)
- Simple random sampling without replacement(SRSWOR)

Some remarks

- In SRSWOR the probability of selecting a specified unit of the population at any given draw is equal to the probability of its being selected at the first draw.i.e. 1/N
- In SRSWOR the probability of selecting a specified unit in the sample at any i^{th} draw is n/N
- Sample mean is an unbiased estimator of population mean.
- $E(\bar{y}_n) = \bar{Y}_N$
- Sample mean square is an unbiased estimator of population mean square.
- $E(s^2) = S^2$

- $\text{Var}(\bar{y}_n)_{wor} = \frac{\dot{N}-n}{N}\frac{S^2}{n}$
- $\text{Var}(\bar{y}_n)_{wor} = \left(1-\frac{n}{N}\right)\cdot\frac{S^2}{n}$

f = n/N sampling fraction

(1-f) finite population correction.

- $\text{Var}(\bar{y}_n)_{wr} = \frac{N-1}{N}\cdot\frac{S^2}{n}$
- $\text{Var}(\bar{y}_n)_{wor} \leq \text{Var}(\bar{y}_n)_{wr}$

SRSWOR provides more efficient estimator than SRSWR

Simple random sampling for attributes

- Attribute
- Dichotomous population
- P = population proportion of units possessing the given attribute
- P = sample proportion of units possessting the given attribute
- Sample proportion (p) is an unbiased estimate of population proportion(P) i.e.
- $E(p)=P$
- $Var(p)_{wor}=(N-n/N-1)*PQ/n$
- $Var(p)_{wr}=PQ/n$

Determination of sample size

- Sample size for given margin of error(d) and confidence coefficient(1-α)
- Margin of the error (d) is difference between actual value of the parameter ($\bar{Y}_N$) and estimated value ($\bar{y}_n$)
- $n = \frac{n_0}{\left(1+\frac{no}{N}\right)}$
- $n_o = \frac{z^2_{\alpha/2} \cdot S^2}{d^2}$
- In case of simple random sampling for attributes $S^2 = NPQ/N-1$

THANK YOU