Unit- Two
Lecture (2)

Sampling

1. Theoretical Basis of Sampling

- On the basis of sample study we can predict and generalise the behaviour of mass phenomenon.
- This is possible because there is no statistical population whose elements would vary from each along without limit. For example different varieties of wheat vary in colour, size and contents but they are all identifies as wheat, look wise the apples of the same tree vary in colour, size and taste but all are identified as apples.
- Though we final diversity is a universal quality of mass data, every population has characteristic properties with limited variation.
- This makes possible to select a relatively small unbiased random sample that can portray fairly well.

There are two important laws on which the theory of sampling is based:

- **Law of 'statistical Regularity' ,** and
- **Law of 'Inertia of Large Number'.**

- **Law of 'Statistical Regularity'**
  - This law says that if a sample is taken, at random, from a population, it is likely to possess almost the same characteristics as that of the population. The size of sample should be 'moderately large'.

- **Law of Inertia of Large Number**
  - This law is a corollary (result or supplement) of the law of statistical regularity. It states that if other things being equal, larger the size of the sample, more accurate the results are likely to be.
  - Thus is because large numbers are more stable as compared to small ones.
  - The difference in the aggregate result is likely to be significant, when the number in the sample is large.

Essentials of Sampling

- If the sample results are to have any worthwhile meaning, it should possess the following essentials.
- **Representativeness:** A sample should be so selected that it truly represents the universe, otherwise the results obtained may be misleading.
- **Adequacy:** The size of sample should be adequate otherwise it may not represent the characteristics of the universe.

- **Independence:** All the items of the sample should be selected independently of one another and all the items of the universe should have the same chance of being selected in the sample.

- **Homogeneity:** The term homogeneity means that there is no basic difference in the nature of the universe and that of the sample. It two sample from the same universe are taken, they should give more or less the same unit.

Methods of Sampling

- The various methods under sampling can be grouped under two broad heads:

- The probability sampling (also known as random sampling) and

- Non-probability sampling (or non-probability sampling).

Probability Sampling

- Those methods in which every item has in the universe has a known chance, or probability, of being chosen for the sample. This implies that the selection of sample items is independent of the person making the study.

Non-Probability Sampling

- Those methods which do not provide every item in the universe with a known chance of being included is the sample. The selection process is partially subjective.

Advantage of Probability Sampling

- Probability sampling provide estimates which are essentially unbiased and have a measurable precision.

- It does not depend upon the existence of detailed information about the universe for its effectiveness.

- It is possible to evaluate the relative efficiency of various sample designs only when probability sampling is used.

Limitation

- Probability sampling requires a very high level of skill and experience for its use.

- It requires a lot of time to plan and execute a probability sample.
- The costs involved in probability sampling are generally large as compared to non-probability sampling.

(A) Non-Probability Sampling Methods:

(i) Judgement Sampling

(ii) Convenience Sampling

(iii) Quota Sampling

(iv) snow ball sampling.

(B) Probability Sampling Methods

(a) Simple or unrestricted random sampling

(b) Restricted random sampling

(i) Stratified Sampling

(ii) Systematic Sampling

(iii) Cluster Sampling

(A)Non-Probability Sampling Methods

(i) Judgement Sampling

- In this method, the choice of sample items depends exclusively on the judgement of the investigator. In other words, the investigator exercises his judgement in the choice and includes these items in the sample, which he thinks are most typical of the universe with regard to the characteristics under investigation. Example, if a sample of ten students is to be selected from, a class of sixty for analysing the spending habits of the students the investigator would select 10 students who, in his opinion, are representative of the class.

Merits

- When only is small number of sampling into are in the universe, simple random selection may miss the more important elements, whereas judgement selection would certainly include them in sample.

- When we want to study some unknown traits of a population, some of whose characteristics are known, we may stratify the population according to these known properties and select sampling units from each stratum on the basis of judgement.

- In solving every day business problem and making public policy decisions.

Quotation Sampling

- Quota sampling is a type of judgement sampling and perhaps the most commonly used sampling technique in non-probability category. In a quota sample, quotas are set up according to some specified characteristics viz. income group, age group, political or religious affiliations etc. Each interviewer is then told to interview a certain number of persons which constitute his quota with in the quota, the selection of sample items depends on personal judgement.

- For example, in a radio-listening survey, the interviewers may be told to interview 500 people living in a particular area and out of that every 100 persons interviewed 60 are to be house wives, 25 farmers and 15 children under the age of 15, within these quotas, the interviewers is free to select the people to be interviewed. The cost per person interviewed may be relatively small for quota sample but these numerous opportunities for bias, which may invalid the results.

Convenience Sampling

- A convenience sample is obtained by selecting 'convenient' population units. The method of convenience sampling is also called the chunk. A chunk refers to that fraction of the population being investigated which is selected neither by probability non by judgement but by convenience. A sample obtained from readily available lists such as automobile registrations; telephone directories etc. is a convenience sample and not a random sample even if the sample is drawn at random from the lists.

- Convenience sampling are prone to bias by their very nature selecting population elements which are convenient to choose.

Probability Sampling Methods

Simple or un restricted Random Sampling

- Simple random sampling refers to that sampling technique in which each and every unit of the population has an equal opportunity of being selected in the sample. In simple sampling which item gets selected in the sample is just a matter of chance personal bias of the investigator does not influence the selection. It must be noted that random does not mean 'haphazard' or 'hit-or-miss' - it rather means that the selection process is such that chance only determines which items shall be included in the sample.

Lottery Method

- This is a very popular method of taking a random sample under this method, all items of the universe are numbered or named on a separate steps of paper of identical shape and size. These slips are then folded and mixed up in a container or drum. A blind fold selection is then made of the number of slip required to constitute the desired sample size. The selection of items is thus depends entirely on chance.

Restricted Random Sampling

(i) Stratified Sampling

- Stratified random sampling or simply stratified sampling is one of the random methods which, by using the available information concerning the population, attempts to design a more efficient sample than obtained by simple random procedure.

- While applying stratified random sampling technique, the following procedure needs to be observed:

- The universe to be sampled is sub-divided (stratified) into groups which are mutually exclusive and include all items in the universe.

- A simple random sample is then chosen independently from each group.

Proportionate and Disproportionate Stratified Sample

- In a proportionate stratified sampling plan, the number of items drawn from each strata is proportional to the size of strata. For example, if the population is divided into five strata groups, their respective sizes being 10, 15, 20, 30 and 25 percent of the population and a sample of 5,000 is drawn. The desired proportional sample may be obtained as follows:

From stratum one	5,000 (0.10) = 500 items
From stratum two	5,000 (0.15) = 750 items
From stratum three	5,000 (0.20) = 1,000 items
From stratum four	5,000 (0.30) = 1,500 items
From stratum five	5,000 (0.25) = 1,250 items
Total	5,000

- Proportional stratification yields a sample that represents the universe with respect to the proportion in each stratum in the population.

- In disproportionate stratified sampling an equal number of cases is taken from each stratum regardless of how the stratum is represented in the universe.

Merits

- **More representative:** since the population is first divided into various strata and a sample is drawn from each stratum, the representation of units in the sample is more even.

- **Greater Accuracy:** It ensures greater accuracy.

- **Greater geographical concentration:** As the sample contains representation from each strata, the selection of units from the universe some more geographically concentrated.

Limits

- Utmost care must be exercised in dividing the population into various strata. Each stratum must contain homogenous items.

- Items is each strata be independent of each other.

Systematic Sampling

- A systematic sampling is formed by selecting one unit at random and then selecting additional units at evenly spaced intervals until the sample has been formed.

- Thus method is popularly used in those cases where a complete list of the population from which the sample is to be drawn is available. The list may

be prepared alphabetically, geographically numerical etc. The items are serially numbered. The first item is selected at random generally by following the lottery method. Subsequent items are selected by taking every the item from the list where 'k' refers to the sampling interval or sampling ratio.

or k ' N / n,

Where N = size of universe

n = size of sample

k = sampling interval

Merits

- Systematic sampling design is simple and convenient to adopt.
- Time and work involved is less.
- Results obtained are found to be generally satisfactory provided adequate care is taken to see that there is no periodic features associated with the sampling interval.

Limitations

- The method becomes less representative if we are dealing with population having "hidden periodicities".