Frequently Asked Questions

1. What do you mean by a simple random sample?

Answer:
Simple Random Sample is a subset of individuals (a sample) chosen from a larger set (a population). Each individual is chosen randomly and entirely by chance, such that each individual has the same probability of being chosen at any stage during the sampling process, and each subset of n individuals has the same probability of being chosen for the sample as any other subset of n individuals. Samples drawn using this technique is known as simple random samples.

2. What are the basic concepts of simple random sampling?

Answer:
Simple random sampling refers to a sampling method that has the following properties.

- The population consists of *N* objects.
- The sample consists of *n* objects.
- All possible samples of *n* objects are equally likely to occur.

3. Explain the two different ways of drawing a simple random sample?

Answer:

There are two ways to draw a sample.

1) Sampling with Replacement – Duplicated selection allowed

   With replacement means that once a person is selection to be in a sample, that person is placed back in the population to possibly be sampled again.

2) Sampling without Replacement – Duplicated selection not allowed

   In practice we use without replacement samples

   Without replacement means that once an individual is sampled, that person is not placed back in the population for re-sampling.

4. What are the possible samples that we can expect from Simple Random Sampling without Replacement?

Answer:

When drawing a sample from a population using WOR, there are many different combinations of people that could be selected.

To calculate the number of possible samples that can be drawn without replacement, disregarding order, Combination

$$^{N}C_{n} = N!/ (N-n)! n!$$

Where, N is the number of people in the population, n is the number of sampled persons, and '!' is the factorial notation for the sequential multiplication of a number times a number minus 1, continuing until reaching 1. That is, N! (Termed as "N factorial") is N times N -1 times N -2 and the like with the last number being 1.

5. What are the possible samples that we can expect from Simple Random Sampling With Replacement?

Answer:

To calculate the number of possible samples that can be drawn with replacement – Permutation - N^{n}

Where, N is the number in the total population and n is the number of units being sampled.

For example when selecting 3 persons from the population of 9 addicts the sample could have been Joe-Jon-Hall, or Sam-Bob-Nat, or Roy-Sam-Ben, or any of the many other combinations. To be exact, in sampling with replacement from the population there are N^{n} samples.

$= 9^{3} = 729$

or 729 different combinations of three addicts that could have been selected

6. In SRSWR, prove that the probability of selection of a unit at any stage in a sample is given by 1/ N.

Answer:

Proof: Let the population size be N. The probability of selecting a unit in the first draw is 1/ N.

We replace the unit back to the population before the second draw hence there will be again N units. Therefore the probability of the unit selected at the second draw is 1/ N.

Hence for every draw there will be N units in the population as the units are replaced. Therefore the probability that a unit being selected at any stage is 1/ N.

7. What is the probability of selection of samples under SRSWR and SRSWOR?

Answer:

The probability of selecting a sample under SRSWR is $1/N^n$

The probability of selecting a sample under SRSWOR is $1/{}^{N}C_{n}$.

8. In SRSWOR, prove that the probability of selection of a unit at any stage in a sample is given by 1/N.

Answer:

Proof: Let the population size be N. The probability of selecting a unit in the 1st draw is 1/N.

P(Unit being selected in the 2nd draw) = P(unit is not selected in the 1st draw) & P(unit selected in the 2nd draw /not selected in the 1st)

=(1-(1/N))(1/(N-1))

=((N-1)/N)(1/(N-1))=1/N

Similarly, P (unit being selected in the 3rd draw)

= P (unit not selected in the 1st draw)* P (not selected at the 2nd draw/ not selected in the 1stdraw) *P (selected in the 3rd draw/not selected in the 1st &2nd draw)

= (1-(1/N))(1-1/(N-1))(1/(N-2))

=((N-1)/N)((N-2)/(N-1))(1/(N-2))=1/N

Therefore P (Unit being selected in the any stage) = 1/N.

9. List the properties of Simple Random Sampling?

Answer:

Properties of simple Random sampling

1) Sample mean is an unbiased estimate of the population mean under both SRSWR and SRSWOR.
2) Sample Mean Square is unbiased for the population variance under SRSWR
3) Sample Mean Square is unbiased for the population Mean Square under SRSWOR
4) In case of sampling from a population containing attributes sample proportion is an unbiased estimate of population proportion under SRSWR and SRSWOR

10. Explain the advantages of Simple Random sampling.

Answer:

SRS has the following advantage

1) Since the selection of the items in the sample depends entirely on chance there is no possibility of personal bias affecting the results
2) As compared to a non random sampling SRS represents the universe in a better way. As the size of the sample increases it becomes increasingly representative of the population.
3) The analyst can easily assess the accuracy of this estimate because sampling errors follow the principle of chance. The theory of random sampling is further developed than that of any other type of sampling which enables the analyst to provide the most reliable information at the least cost.

11. Briefly discuss the limitations of Simple Random Sampling.

Answer:

1) The use of Simple random sampling necessitates a completely catalogued universe from which to draw the sample. But it is often difficult for the investigator to have up to date list of all the items of the population to be sampled. This restricts the use of this method in economics and business data where very often we have to employ restricted random sampling designs.
2) The size of the samples required to ensure statistical reliability is usually larger under SRS.
3) From point of view of field survey it has been claimed that the cases selected using SRS tend to be too widely dispersed geographically and the time and cost of collecting data become too large.
4) Random sampling may produce the most non-random looking results.

12. Outline the feature of Simple random sampling without replacement.

Answer:

In the realistic world of sampling, subjects are typically not included in the sample more than once. Also, the order in which subjects are selected for a survey is not important (that is, Roy-Sam-Ben is considered the same as Sam-Ben-Roy). All that matters is if the subject is in or out of the sample. Hence in most surveys, samples are selected disregarding order and without replacement. But does sampling without replacement provide unbiased estimators of the population mean and variance? The answer is "yes," but needing some additional modifications, to be presented next. Most simple random samples are drawn without replacement, since we want to avoid the strange assumption of one person being tallied as two or more. To resolve this disparity between statistical theory and practice, the variance formulas used in simple random sampling are somewhat changed

13. What do you mean by randomness in simple random selection?

Answer:

Simple Random sampling is characterized by the way in which they are selected. In SRS which items get selected in the sample is just a matter of chance – personal bias of the investigator does not influence the selection. It should be noted that the word '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.

14. What do you mean by a sample ratio?

Answer:

The ratio of sample size to the population size is known as a sample ratio. Suppose N is the population size and n is the sample size then a sample ratio is n/N.

15. From a population consisting of 3 elements (a,b,c) draw all possible samples if size 2 using SRSWR and SRSWOR.

Answer:

In the above case N = 3 and n = 2

Hence under SRSWR we get $N^n = 3^2 = 9$possible samples. They are (a,a) (a,b) (a,c) (b,a) (b,b) (b,c) (c,a) (c,b) (c,c).

Under SRSWOR we get ${}^{N}C_{n}. = 3C_2 = 3$ possible samples

They are (a,b) (a,c) and (b,c).