BA5106: Statistics for Management

Two Mark Questions with Answer

Unit-II

1. What is the central limit theorem?

   This theorem states that when an infinite number of successive random samples are taken from a population, the sapling distribution of the means of those samples will become approximately normally distributed with mean μ and standard deviation $\sigma/\sqrt{N}$ as the same size becomes larger, irrespective of the shape of the population distribution.

2. What is sampling distribution?

   Suppose that we draw all possible samples of size n from a given population. Suppose further that we compute a statistic (mean, proportion, standard deviation) for each sample. The probability distribution of this statistic is called sapling distribution.

3. What is variability of a sapling distribution?

   The variability of sample distribution is measure by its variance or its standard deviation. The variability of sampling distribution depends on three factors:

   - N: the no. of observations in the population.
   - N: the no. of observations in the sample.
   - The way that the random sample is chosen.

4. How to create the sampling distribution of the mean?

   Suppose that we draw all possible samples of size n from a population of size 'N'. Suppose further that we compute a mean score for each sample. In this way we create the sampling distribution of the mean.

   We know the following. The mean of the population μ is equal to the mean of the sampling distribution μ_s. And the standard error of the sampling distribution is determined by the standard deviation of the population 'σ' , the population size and the sample size. These relationships are shown in the equations below:

   $\mu_x = \mu$ and $\sigma_x = \sigma^*$ sqrt $(1/n = 1/N)$

5. What is the sampling distribution of the population?
   In a population of size N. Suppose that the popularity of the occurrence of an event (dubbed a Success) is P: and the probability of the event's non-occurrence (dubbed a "failure") is Q. From this population, suppose that we draw all possible samples of size n. And finally, within each sample, suppose that we draw all possible samples of size n. And finally, within each sample, suppose that we

determine the proportion of successes p and failures q. In this way, we create a sampling distribution of the proportion.

6. Show the mathematical expression of the sampling distribution of the population.

   We find that the mean of the sampling distribution of the proportion (μ_p) is equal to the probability of success in the population (P). And the standard error of the sampling distribution (σ_P) is determined by the standard deviation of the population (σ), the population size, and the sample size. These relationships are shown in the equations below:

   $$\mu_p = P \text{ and } \sigma_P = \sigma^* \text{ sqrt } \left({}^{1}/_{n} = {}^{1}/_{N}\right) = \left({}^{PQ}/_{n} = {}^{PQ}/_{N}\right)$$

   Where σ = sqrt (PQ)

7. When will the sampling distribution normally distributed?

   Generally, the sampling distribution will be approximately normally distributed if any of the following conditions apply.

   - The population distribution is normal.
   - The sampling distribution is symmetric, unimodal, without outliers, and the sample size is 15 or less.
   - The sampling distribution is moderately sewed, unimodal, without outliers, and the sample size is between 16 and 40.
   - The sample size is greater than 40, without outliers.

8. Get the variability of the sample mean.

   Suppose *k* possible samples of size *n* can be selected from a population of size *N*. The standard deviation of the sampling distribution is the average deviation between the k sample means and the true population mean, μ. The standard deviation of the sample mean σ_x is.

   $$\sigma_x = \sigma^* \text{ sqrt } \left\{\left({}^{1}/_{n} = {}^{1-n}/_{N}\right) \times \left({}^{N}/_{N-1}\right)\right\}$$

   Where σ is the standard deviation of the population, N is the population size, and n is the sample size. When the population size is much larger (at least 10 times larger) than the sample size, the standard deviation can be approximated by:

   $$\sigma x\ \sigma/\sqrt{}\ (n)$$

9. How can standard error of the population calculated?

   When the standard deviation of the population σ is unknown, the standard deviation of the sampling distribution cannot be calculated. Under these circumstances, use the standard error. The standard error (SE) provides an unbiased estimate of the standard deviation. It can be calculated from the equation below.

   $$SE_x = s^* \text{ sqrt}\left\{ \left({}^{1}/_{n} = {}^{1-n}/_{N}\right) \times \left({}^{N}/_{N-1}\right)\right\}$$

10. How to find the confidence interval of the mean?
    - Identify a sample statistic. Use the sample mean to estimate the population mean.
    - Select a confidence level. The confidence level describes the uncertainty of a sampling method. Often, researchers choose 90%, 95% or 99% confidence levels; but any percentage can be used.
    - Specify the confidence interval. The range of the confidence interval is defined by the *sample statistic* ± *margin of error*. And the uncertainty is denoted by the confidence level.