PBD-2802
Advance Statistical Methods

Units 1, 2 and 4 (MLR and LR only)

Unit-1
Statistical inference: Estimation

Session 1

01/03/2021

Introduction

- One of the main objective of Statistics is to draw inferences about a population from the analysis of a sample drawn from that population.
- Two important problems in statistical inference are

(i) Estimation and

(ii) Testing hypothesis

- The theory of estimation was founded by Prof. R.A.Fisher in a series of fundamental papers in 1930.

Parameter and Statistic

- A descriptive measure of the population is called a parameter. Parameters are usually denoted by Greek letters. Examples of parameters are Population mean (μ), Population variance (σ^2), and Population standard deviation (σ).
- A descriptive measure of a sample is called a Statistic. These are usually denoted by Roman letters. Examples of Statistic are sample mean ($\bar{x}$) , sample variance (s^2) and sample standard deviation(s).

Basic concepts

- A analyst often wants to estimate the value of a parameter or conduct test about a parameter. However the calculation of parameters usually either impossible or infeasible because of the amount of time and money required to take a census. In such cases, a business researcher can take a random sample of the population , calculate a statistic on the sample and infer by estimation the value of the parameter.

Descriptive and Inferential Statistics

- Descriptive Statistics: if a business analyst is using data gathered on a group to describe or reach conclusions about that same group, the statistics are called Descriptive.
- Inferential Statistics: If a researcher gathers data from a sample and uses the statistics generated to reach conclusions about the population from which the sample was taken, it is inferential statistics.

Random Variables and Probability Distribution

- Random Variable
- Discrete and Continuous Random Variable
- Probability Distributions
- Discrete probability Distribution : Bernoulli, Binomial, Poisson, Geometric etc
- Continuous probability Distribution : Exponential, Normal.

Binomial Distribution

$$P(x;n,p) = \binom{n}{x}.p^x.(q)^{n-x} = \frac{n!}{x!(n-x)!}.p^x.(q)^{n-x};$$
$$x = 0,1,2\ldots n\ and\ 0 \le p \le 1$$

where

n= number of trials

x= number of success desired

p= probability of getting a success in one trial

q= (1-p)=probability of getting a failure in one trial

Poisson Distribution

$$P(x;\lambda) = \frac{\lambda^x e^{-\lambda}}{x!}$$

$$\lambda > 0 \; and \; x = 0,1,2 \; \ldots . \infty$$

- Here λ is the long run average and e=2.718282.

Normal Distribution

- $f(x;\mu,\sigma) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

$$-\infty < \mu < \infty; 0 < \sigma < \infty$$