**Inference**

It is a branch of statistics in which different parameters of population are studied with sample observation. It has two parts:

a) Parameter estimation

b) Hypothesis testing

**Parameter estimation:**

It is the process of estimating one or more parameters of population by studing sample statistics. There are two types:

I )Point estimation

II)Interval estimation

Example:

From a population having mean(µ) and variance(σ2) 10 samples are observed and following values are recorded:

25,31,37,16,24,35,33,27,30,19

I) Point estimation µ and σ2

→ here, sample mean is x’ = (1/n)∑x

= 27.7

since E(x’) = µ , so point estimation of poulation mean is µ ~27.7

Next, sample variance is S2 = (1/(n-1))∑(x-x’)2

= (1/(10-1))((25-27.7)2+(31-27.7)2+….

+(19-27.7)2)

= 46.46

Alternative method:

S2 = (n/(n-1))((1/n)∑x2-x’2)

= (10/(10-1))x((1/10)(252+312+…..+102)-27.72)

= 46.46

so, point estimation of σ2 is σ2 ~ S2 or σ2 ~ 46.46

**Unbiasedness:**

If expectation of a sample statistics is equal to the population parameter then the sample statistics is called unbiased estimate of the parameter.

For example:

since E(x’) = µ, so sampled mean(x’) is unbiased estimation of population parameter(µ)

Next,

since E(s2) != σ2 , so, sample varience(s2) is not unbiassed estimation of population varience(σ2) and,

since E(S2) = σ2 ,so, sample varience(S2)is unbiased estimation of population varience(σ2).

**Interval estimation:**

It is a type of parameter estimation in which the unknown value of population parameter is expressed in terms of some interval in which it can be expected lie with specified confidence level. Confidence interval is given by:

P( -Zα/2 ≤ (x’ - µ )/√(σ2 /n) ≤ Zα/2 ) = 1 – α

P(x’-Zα/2 √(σ2 /n) ≤ µ ≤ x’+Zα/2√(σ2 /n)) = 1 – α

P(x’-Zα/2 σ/√n ≤ µ ≤ x’+Zα/2 σ/√n)

**Note:**

P(z ≤ 1.64) = 0.95 → Z0.95 = 1.64

p(z ≤ -1.64) = 0.05 → Z0.05 = -1.64

required z-values:

Z0.05 = 1.64

Z0.025 = 1.96

Z0.01 = 2.33

Z0.005 = 2.58