Statistical Estimation

Dr Alok Pratap Singh

08/08/2020

Statistical estimation is concerned with the methods by which population characteristics are estimated from sample information.
There are two types of estimates
Point estimates and
Interval estimates
Point estimate is a single number which ia used as an estimate of the unknown population parameter.
Interval estimate of a population parameter is a statement of two values between which it is estimated that the actual value of the parameter lies.
Properties of a good estimator
1 Unbiasedness-An estimator is said to be unbiased if its expected value is identical with the population parameter being estimated.
2 Consistent-If the estimator approaches the parameter,as the sample size increases,it is called consistent.
3 Efficient-An estimator with a smaller variance for a given sample size is said to be more efficient.
4 Sufficient-An estimator is said to be sufficient if it says enough about the parameter to be estimated and no other estimator is required.

08.08.2020

~~Interval~~ estimation

An interval estimation is an interval determined by two numbers showing the upper and lower limits; These numbers are obtained by computation of the observed sample values. It is expected that the unknown ~~true~~ value of the ~~parameter~~ parameter lies in this ~~int~~ interval.

If a population is approximately normally distributed,

$$P\left(\bar{X} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{X} + 1.96\frac{\sigma}{\sqrt{n}}\right) = 0.95$$

Thus the 95% confidence interval takes the form

$$\bar{X} \pm 1.96\frac{\sigma}{\sqrt{n}}$$

-- This statement tells that in the event of repeatedly taking sample of size n from the population, 95% of the time the confidence interval will contain the true population parameter μ.

Similarly,

a 90% confidence interval is $\bar{X} \pm 1.645\frac{\sigma}{\sqrt{n}}$ and

a 99% confidence interval is $\bar{X} \pm 2.58\frac{\sigma}{\sqrt{n}}$.

A sample of 60 orders is picked randomly to estimate the average time in days required to deliver orders by a company. The sample mean $\bar{X}$ is 5.9 days and standard deviation σ is 1.7 days. Compute a 95% confidence interval for delivery time.

Ans. A 95% confidence interval for μ or the population mean is

$$\bar{X} \pm 1.96 \frac{\sigma}{\sqrt{n}}$$

or $$5.9 \pm 1.96 \frac{1.7}{\sqrt{60}}$$

or, $$5.9 + 1.96 \frac{1.7}{\sqrt{60}} \text{ to } 5.9 - 1.96 \frac{1.7}{\sqrt{60}}.$$

or $$5.9 + 1.96 \frac{1.7}{7.74} \text{ to } 5.9 - 1.96 \frac{1.7}{7.74}$$

or $$5.9 + 1.96(0.22) \text{ to } 5.9 - 1.96(0.22)$$

or $$5.9 + 0.4312 \text{ to } 5.9 - 0.4312$$

$$6.33 \text{ to } 5.47$$

Or, the 95% confidence interval is 5.47 days to 6.33 days.