Confidence Interval Estimation - Ver B

Estimating a Population Mean μ when σ is Known

Assumptions:

1. Observations are from a simple random sample.
2. The value of the population standard deviation σ is known.
3. The population is Normally distributed OR n > 30 OR both.

Then the (1-α) confidence interval for μ is:

$$\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

As for any of our confidence intervals based on the Normal,

For 90% confidence, use $z_{\alpha/2} = 1.645$;

For 95% confidence, use $z_{\alpha/2} = 1.96$; and

For 99% confidence, use $z_{\alpha/2} = 2.576$.

Estimating a Population Mean μ with σ NOT Known

Assumptions:

1. Observations are from a simple random sample.
2. The value of the population standard deviation σ is not known.
3. The population is Normally distributed OR n > 30 OR both.

Then the (1-α) confidence interval for μ is:

$$\bar{x} - t_{\alpha/2}\frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{\alpha/2}\frac{s}{\sqrt{n}}$$

In this case, the value of $t_{\alpha/2}$ must be determined from the Student t Table using the "two-tailed" value for the confidence level wanted and using n-1 degrees of freedom.

Estimating a Population Proportion *p*

Assumptions:

1. Observations are from a simple random sample of *n* independent trials, each with two outcomes called Success and Failure.
2. The Probability of Success *p* is constant from trial to trial.
3. The quantities *np* and *nq* are each at least 5, where *q*=1-*p*.
4. The value of *p* is estimated from the sample by the quantity
$$\hat{p} = \frac{number \cdot of \cdot successes}{number \cdot of \cdot trials}.$$

Then the (1-α) confidence interval for *p* is:

$$\hat{p} - z_{\alpha/2}\sqrt{\frac{\hat{p}\,\hat{q}}{n}} < p < \hat{p} + z_{\alpha/2}\sqrt{\frac{\hat{p}\,\hat{q}}{n}}$$

As for any of our confidence intervals based on the Normal,

For 90% confidence, use $z_{\alpha/2} = 1.645$;

For 95% confidence, use $z_{\alpha/2} = 1.96$; and

For 99% confidence, use $z_{\alpha/2} = 2.576$.