

Handout for Lecture 13

Confidence Intervals

ECON 340: Economic Research Methods

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How to construct a confidence interval?

Known population variance: $1 - \alpha$ confidence interval for the population mean μ :

$$\bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

where $z_{\alpha/2}$ is the z -value that leaves area $\alpha/2$ in the upper tail of the standard normal distribution.

Unknown population variance: $1 - \alpha$ confidence interval for the population mean μ :

$$\bar{x} \pm t_{n-1, \alpha/2} \frac{S}{\sqrt{n}}$$

where $t_{n-1, \alpha/2}$ is the t -value that leaves area $\alpha/2$ in the upper tail of the t -distribution. $n - 1$ is the degrees of freedom.

Note: Since the t distribution looks just like the standard normal for large n , for $n \geq 100$ you can continue using the standard normal table.

Exercise: A car manufacturer wants to estimate the mean CO2 emissions of a new model of car. A sample of 196 cars is randomly selected and their CO2 emissions are measured. The sample mean and standard deviation are 120 g/km and 20 g/km, respectively. Construct a 95% confidence interval for the true mean CO2 emissions of this car model. (Note: $Pr(Z > 1.96) = 0.025$.)