**Large Sample Confidence Intervals (Section 7.2)**

Given a random sample $X\_{1}, …,X\_{n}$, we can use the CLT to construct the confidence interval for the population mean $μ. $By the CLT,

$$Z=\frac{\overbar{X}-μ}{s/√n } $$

is approximately $N\left(0, 1\right). $ Therefore,

$$P\left(-1.96<Z<1.96\right)≈0.95. $$

Or equivalently

$$P\left(-\frac{1.96s}{\sqrt{n}}<\overbar{X}-μ<\frac{1.96s}{\sqrt{n}}\right)≈0.95.$$

Or the random interval

$$(\overbar{X}-\frac{1.96s}{\sqrt{n}}, \overbar{X}+\frac{1.96s}{\sqrt{n}})$$

contains $μ$ with an approximate probability 0.95. It is approximately a 95% confidence interval.

If we want an $\left(1-α\right)100\%$ confidence interval, replace 1.96 with .

Example: (Exercise #13) For a sample of 50 kitchens with gas cooking appliances monitored during a one-week period, the sample mean $CO\_{2}$ level was 654.16 ppm and the sample standard deviation was 164.43ppm. Find a 95 percent confidence interval for true average $CO\_{2}$ level in the population of all homes from which the sample was selected.

= (608.58, 699.74). We are 95% confident that the true average CO2 level in this population of homes with gas cooking appliances is between 608.58ppm and 699.74ppm