STAT 270 Lecture 34
Fall 2015
30 November 2015

- I did theory for confidence intervals.
- The relevant slides in "Inference for 1 Sample" are 1-47.
- Relevant problems: none new for this lecture.
- Handwritten slides.
- Key jargon, ideas:
  - If θ is a parameter (in this course μ, p, $\mu_1 - \mu_2$ or $p_1 - p_2$) and $\hat{\theta}$ is the corresponding estimate ($\bar{X}$, $\hat{p} = X/n$, $\bar{X} - \bar{Y}$ or $\hat{p}_1 - \hat{p}_2$) then
  $$\frac{\hat{\theta} - \theta}{\text{Estimated SE}}$$
  is an exact or approximate pivotal quantity.
  - For normally distributed populations and any size sample
  $$\frac{\bar{X} - \mu}{s/\sqrt{n}}$$
  is an exact pivot with a Student's t distribution with $\nu = n - 1$ degrees of freedom.
  - For large sample sizes (roughly $n \geq 30$ for a one-sample mean, $n \geq 30$ and $m \geq 30$ for a two sample mean, $np \geq 5$ and $n(1-p) \geq 5$ for one-sample proportion, and so on) the pivot is approximately normal.
  - You find a *critical value* $z_{\alpha/2}$ (for the normal distribution) or $t_{\alpha/2,\nu}$ (for the t distribution) such that
  $$P\left(-\text{crit val} \leq \text{pivot} \leq \text{crit val}\right) = 1 - \alpha$$
  to get a level $1 - \alpha$ confidence interval.
  - You solve the inequalities to get
  $$\hat{\theta} - \text{crit val} \times \text{Est SE} \leq \theta \leq \hat{\theta} + \text{crit val} \times \text{Est SE}$$
  for your interval.
  - For a difference between 2 population means in 2 small samples you can use the t curve with $n + m - 2$ degrees of freedom provided you believe the two populations have the *same* SD, σ, and you estimate this SD with the pooled sample standard deviation:
  $$s_{\text{pooled}} = \sqrt{\frac{(n-1)s_X^2 + (m-1)s_Y^2}{n+m-2}}.$$