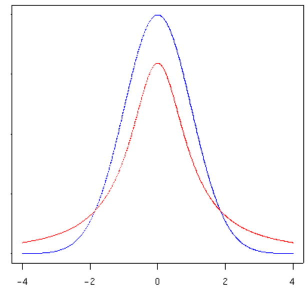
Chapter 23 -- Inferences About Means

Student's t-model



- Fatter tails, with degrees of freedom
- As degrees of freedom(n -1) increases, the *t-models* look more normal
- Unimodal, symmetric, and bell shaped

Assumptions and Conditions for t-models:

1) Independence Assumption
   - Randomization Condition: randomly sampled data are ideal.
   - 10% condition: the sample is no more than 10% of the population.
2) Normal Population Assumption
   - Nearly Normal Condition: the data come from a distribution that is unimodal and symmetric. (check this by making a histogram or Normal Probability plot)

Sample Size:

- Small samples (n<15 or so), the data follow a Normal model pretty closely. If there is skewness, or there are outliers, don't use t-models.
- Moderate samples (n between 15 and 40 or so), t-models will work well as long as the data is unimodal and reasonably symmetric. Make a histogram.
- N>40 or 50, it is safe to use the t-models even if the data are skewed or have outliers, but be sure also to report skewness and outliers in conclusion.

One-sample t-interval

When the conditions are met, we can find the confidence interval for the proportion mean, μ. The confidence interval is:

$$\bar{y} \pm t_{n-1}^{*} \times SE(\bar{y})$$

Where the standard error of the mean, $SE\,(\bar{y}) = \frac{s}{\sqrt{n}}$

*The critical value t_{n-1}^{*} depends on the particular confidence level, *C*, that you specify and on the number of degrees of freedom, *n-1*, which we get from the sample size.

One-sample t-test for the mean

The conditions for the one-sample t-test for the mean are the same as for the one-sample t-interval. We test the hypothesis $H_0 : \mu = \mu_0$ using the statistic

$$t_{n-1} = \frac{\bar{y} - \mu_0}{SE\,(\bar{y})}$$

The standard error of $\bar{y}$ is $SE\,(\bar{y}) = \frac{s}{\sqrt{n}}$.
Where the conditions are met and the null hypothesis is true, this statistic follows a Student's t-model with n-1 degrees of freedom. We use that model to obtain a P-value. With that P-value, we either fail to reject or reject H_0.