STUDENT SUCCESS CENTER
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

# CALCULATING THE TEST STATISTIC AND CRITICAL VALUE

## Z-Test:

- One Mean test statistic: $z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}}$
- Two Means test statistic: $z = \frac{\overline{x_1}-\overline{x_2}-\Delta}{\sqrt{\frac{\sigma^2}{n_1}+\frac{\sigma^2}{n_2}}}$
- One Proportion test statistic: $z = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$
- Two Proportions test statistic: $z = \frac{\hat{p}_1-\hat{p}_2-0}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1}+\frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}}$
- Critical Value: $Z_\alpha$: To find critical value, you must know if it is an upper-tailed, lower-tailed, or two-tailed test. For example if $\alpha = 0.05$ and it is an upper tailed test, the critical value is 1.645. For a lower tailed test it is -1.645. But if it is two tailed test then the critical values are -1.96 and 1.96.

## T-Test:

- One Mean test statistic: $t = \frac{\bar{x}-\mu}{s/\sqrt{n}}$
- Two Mean test statistic: $t = \frac{(\bar{x}_1-\bar{x}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$
- Matched Samples test statistic: $t = \frac{\bar{d}-\mu_d}{\frac{s_d}{\sqrt{n}}}$
- Critical Value: Calculate degrees of freedom and alpha. Use t-chart and look on the row of the calculated degrees of freedom and the column that matches a. Where the two meet inside the chart is the critical value.

## Chi Squared Test:

- If the test is about population variance, the test statistic is: $x^2 = \frac{(n-1)\cdot s^2}{\sigma^2}$
- Critical value: Calculate degrees of freedom (sample size- 1) and alpha. Use the chi squared table and look on the row of degrees of freedom and the column of alpha. Where the two meet is the critical value.

## F-Test:

- Test statistic: $F=\sigma^2_1/\sigma^2_2$ or $F=S^2_1/S^2_2$ *use the larger variance in the numerator*
- Critical Value: Calculate the degrees of freedom (sample size- 1) for the numerator and the denominator. On the left of the chart find the denominator degrees of freedom and at the top, the numerator degrees of freedom. Then find the correct alpha and where all three meet is the critical value.

For more information, visit a tutor. All appointments are available in-person at the Student Success Center, located in the Library, or online. Adapted from Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., & Cochran, J. J. (2018). *Statistics for Business & Economics* (13th Edition). Boston, MA: Cengage Learning.