SST115 - Exam 3 Formulas

Z and t-tests

The following show the test-statistic formulas and the corresponding distribution the test-stat follows.

Single Proportion

$$Z := \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \sim \mathbf{N(0,1)}$$

Conditions:

- Random Sample
- $n \times p_0 \geq 10$
- $n \times (1 - p_0) \geq 10$

Difference in Proportions

$$Z :== \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\widehat{p}_{pool}(1 - \widehat{p}_{pool})(\frac{1}{n_1} + \frac{1}{n_2})}} \sim \mathbf{N(0,1)}$$

,

$$\text{where} \quad \widehat{p}_{pool} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}$$

Conditions:

- Random Samples
- $n_1 \times \widehat{p}_1 \geq 10$ and $n_1 \times (1 - \widehat{p}_1) \geq 10$
- $n_2 \times \widehat{p}_2 \geq 10$ and $n_2 \times (1 - \widehat{p}_2) \geq 10$

Single Mean

$$T := \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim \mathbf{t(df = n\text{-}1)}$$

Conditions:

- Random Sample
- Normal population **OR** n ≥ 30

Difference in Means

$$T := \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \sim \mathbf{t(df = min(}n_1\mathbf{,}\ n_2\mathbf{)\ -\ 1)}$$

Conditions:

- Random Sample
- Normal population **OR** $n_1 \geq 30$ and $n_2 \geq 30$

χ^2 Tests

Goodness of Fit

$$\chi^2 = \sum_{i=1}^{k} \frac{(\text{Expected}_i - \text{Observed}_i)^2}{\text{Expected}_i}$$

df = k - 1, where k is the number of groups

Independence

Same formula for test-stat as the Goodness of Fit test. df = (k-1)(m-1) where k is the # of columns and m is the # of rows in the table

Strength of Evidence Chart