Math 121 Statistical Formulas Fall 2009

Paired Samples

$$\mu_D = \mu_1 - \mu_2$$

$$t = \frac{\overline{d} - 0}{s_D/\sqrt{n}}$$

Independent Samples: Comparing Means

$$\mu_{\overline{x}_1 - \overline{x}_2} = \mu_1 - \mu_2$$

$$\sigma_{\overline{x}_1 - \overline{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

$$z = \frac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$t = \frac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Independent Samples: Comparing Proportions

$$\mu_{\hat{p}_1 - \hat{p}_2} = p_1 - p_2$$

$$\sigma_{\hat{p}_1 - \hat{p}_2} = \sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}}$$

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}$$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}}$$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}}$$

Linear Regression

$$b = \frac{\sum (x - \overline{x})(y - \overline{y})}{\sum (x - \overline{x})^2} = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{n\left(\sum x^2\right) - \left(\sum x\right)^2}$$

$$a = \overline{y} - b\overline{x}$$

$$\hat{y} = a + bx$$

$$r = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{\sqrt{n\left(\sum x^2\right) - \left(\sum x\right)^2}\sqrt{n\left(\sum y^2\right) - \left(\sum y\right)^2}} = \frac{\sum (x - \overline{x})(y - \overline{y})}{\sqrt{\sum (x - \overline{x})^2}\sqrt{\sum (y - \overline{y})^2}}$$

$$\text{SSE} = \sum \left(y - \hat{y}\right)^2$$

$$\text{SSR} = \sum \left(\hat{y} - \overline{y}\right)^2$$

$$\text{SST} = \sum \left(y - \overline{y}\right)^2$$

$$\text{SST} = \text{SSR} + \text{SSE}$$

$$r^2 = \frac{\text{SST} - \text{SSE}}{\text{SST}} = \frac{\text{SSR}}{\text{SST}}$$

$$\hat{\sigma} = s = \sqrt{\frac{\text{SSE}}{n - 2}}$$

$$\text{SE}(b) = \frac{s}{\sqrt{\sum (x - \overline{x})^2}}$$

$$t = \frac{b - 0}{\text{SE}(b)}$$

Tests of Goodness of Fit, Homogeneity, and Independence

$$\chi^2 = \sum_{\text{all cells}} \frac{(O - E)^2}{E}$$

$$\text{Expected count} = \frac{\text{Row total} \times \text{Column total}}{\text{Grand total}}$$