Formulas For Exam 3

Hypothesis Tests

$$z/t_{obs} = \frac{estimate - H_o value}{s.e.}$$

For small samples, mean - $d.f. = n-1$ and diff in mean $d.f. = n_1 - n_2 - 2$

Standard Errors of Estimators

Mean large and small sample

$$s.e. = \frac{\sigma}{\sqrt{n}}$$

Difference in mean large sample

$$s.e. = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Difference in mean small sample

$$s.e. = s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

Where

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

Proportion

$$s.e. = \sqrt{\frac{p_0 q_0}{n}}$$

Difference in Proportion if $D_o \neq 0$

$$s.e. = \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$$

Difference in Proportion if $D_o = 0$

$$s.e. = \sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1}\frac{1}{n_2}\right)}$$

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

β from linear regression

$$s.e. = \frac{s_y}{s_x}\sqrt{\frac{1-r^2}{n-2}}$$

Correlation

$$r_{xy} = \frac{s_{xy}}{s_x s_y}$$

where s_{xy} is the covariance of x and y and s_x, s_y is the standard deviation of x and y

Linear Regression

$$\hat{\beta} = \frac{s_{xy}}{s_x^2}$$

$$\hat{\alpha} = \overline{Y} - \hat{\beta}\overline{X}$$

Hypothesis test - see above

Confidence Interval

$$\hat{\beta} \pm t_{\alpha/2 or \alpha} \times s.e._{\hat{\beta}}$$

Prediction

$$\hat{Y} = \hat{\alpha} + \hat{\beta}X$$

$$S_{\hat{Y}} = s_\epsilon\sqrt{\frac{1}{n} + \frac{(x_o - \overline{x})^2}{\sum(x_i - \overline{x})^2}}$$

Confidence Interval

$$\hat{Y} \pm t_{\alpha/2, n-K} S_{\hat{Y}}$$

Goodness of Fit

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$$