Economics 310 Spring 2004
Equations and formulas for Final Exam

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1} = \frac{\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}}{n-1}$$

$\binom{N}{n} = \frac{N!}{n!(N-n)!}$ where $N!=(N)(N\text{-}1)(N\text{-}2)\ldots(2)(1)$

$P(L_1 \cap L_2) = P(L_1)P(L_2)$ if L_1 and L_2 are independent

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$\sigma_{\bar{x}} = \sigma / \sqrt{n} \qquad \sigma_{\hat{p}} = \sqrt{\frac{pq}{n}} \qquad z-score = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

$\bar{x} \pm z_{\alpha/2}\sigma_{\bar{x}}$ $\qquad$ $\hat{p} \pm z_{\alpha/2}\sigma_{\hat{p}}$ where $\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$ $\qquad$ $\bar{x} \pm t_{\alpha/2}s_{\bar{x}}$ where $s_{\bar{x}} = s/\sqrt{n}$

$$\tilde{p} = \frac{x+2}{n+4} \qquad n = \frac{(z_{\alpha/2})^2\sigma^2}{B^2} \qquad n = \frac{(z_{\alpha/2})^2 pq}{B^2}$$

$z = \frac{\hat{\theta} - \theta_0}{\sigma_{\hat{\theta}}}$ where for parameter θ=μ, $\sigma_{\bar{x}} = \sigma/\sqrt{n}$, and for parameter θ=p, $\sigma_{\hat{p}} = \sqrt{\frac{p_0 q_0}{n}}$

$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$ $\qquad$ Power = 1-β $\qquad$ $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$

$\sigma_{(\bar{x}_1 - \bar{x}_2)} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \approx \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ $\qquad$ or $\sigma_{(\bar{x}_1 - \bar{x}_2)} \approx \sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$

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

$$\sigma_{\bar{x}_D} = \frac{\sigma_D}{\sqrt{n_D}} \approx \frac{s_D}{\sqrt{n_D}}$$

$$\sigma_{(\hat{p}_1-\hat{p}_2)} = \sqrt{\frac{p_1q_1}{n_1}+\frac{p_2q_2}{n_2}} \approx \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1}+\frac{\hat{p}_2\hat{q}_2}{n_2}} \quad \text{or} \approx \sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)};\ \hat{p} = \frac{x_1+x_2}{n_1+n_2}$$

$$n_1 = n_2 = \frac{(z_{\alpha/2})^2(\sigma_1^2+\sigma_2^2)}{B^2} \qquad n_1 = n_2 = \frac{(z_{\alpha/2})^2(p_1q_1+p_2q_2)}{B^2}$$

$$F = \frac{larger \quad s^2}{smaller \quad s^2} \quad \text{or} \quad F = \frac{s_1^2}{s_2^2}$$

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x \qquad \hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}}, \hat{\beta}_0 = \bar{y} - \hat{\beta}_1\bar{x}$$

$$SS_{xy} = \sum (x_i-\bar{x})(y_i-\bar{y}) = \sum x_i y_i - \frac{\sum x_i \sum y_i}{n}$$

$$SS_{xx} = \sum (x_i-\bar{x})^2 = \sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n} \qquad SS_{yy} = \sum (y_i-\bar{y})^2 = \sum y_i^2 - \frac{\left(\sum y_i\right)^2}{n}$$

$$s^2 = \frac{SSE}{n-(k+1)} \qquad SSE = \sum (y_i-\hat{y}_i)^2 = SS_{yy} - \hat{\beta}_1 SS_{xy} \qquad s_{\hat{\beta}_1} = \frac{s}{\sqrt{SS_{xx}}}$$

$$\hat{\beta}_i \pm t_{\alpha/2} s_{\hat{\beta}_i} \qquad r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}} \qquad R^2 = \frac{SS_{yy}-SSE}{SS_{yy}}$$

$$\hat{y} \pm t_{\alpha/2} s\sqrt{\frac{1}{n}+\frac{(x_p-\bar{x})^2}{SS_{xx}}} \qquad \hat{y} \pm t_{\alpha/2} s\sqrt{1+\frac{1}{n}+\frac{(x_p-\bar{x})^2}{SS_{xx}}} \qquad t = \frac{\hat{\beta}_i - 0}{s_{\hat{\beta}_i}}$$

$$R_a^2 = 1 - \left[\frac{(n-1)}{n-(k+1)}\right](1-R^2)$$

$$F = \frac{(SS_{yy}-SSE)/k}{SSE/[n-(k+1)]} = \frac{MeanSquare(Model)}{MeanSquare(Error)}$$

$$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \qquad E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2 \qquad E(y) = \beta_0 + \beta_1 x + \beta_2 x^2$$