Econ 310 Formulas

$$\mu = \frac{\sum_{i=1}^{N} x_i}{N}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}$$

$$s^2 = \frac{\sum_{i=1}^{n} (xi - \bar{x})^2}{n-1}$$

$$s^2 = \frac{1}{\mathrm{n}-1}\left[\sum_{i=1}^{n} x_i^2 - \frac{(\sum_{i=1}^{n} x_i)^2}{n}\right]$$

$$\sigma = \sqrt{\sigma^2}$$

$$s = \sqrt{s^2}$$

$$1 - \frac{1}{k^2}$$

$$L_P = (n+1)\frac{P}{100}$$

$$s_{xy} = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{n-1}$$

$$s_{xy} = \frac{1}{n-1}\left[\sum_{i=1}^{n} x_i y_i - \frac{\sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{n}\right]$$

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

$$\rho = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

$$P(A \mid B) = \frac{P(A\ and\ B)}{P(B)}$$

$$P(A|B) = P(A)$$

$$P(B|A) = P(B)$$

$$P(A\ and\ B) = P(A)P(B)$$

$$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$$

$$P(A\ and\ B) = P(A \mid B) \times P(B)$$

$$P(A \; and \; B) = P(B \mid A) \times P(A)$$

$$P(A \mid B) = \frac{P(B \mid A) \times P(A)}{P(B)}$$

$$E(X) = \mu = \sum_{all\,x} xP(x)$$

$$V(X) = \sigma^2 = E[(X-\mu)^2] = \sum_{all\,x} (x-\mu)^2 P(x) = E(X^2) - E(X)^2$$

$$\sigma = \sqrt{\sigma^2}$$

$$E(c) = c$$

$$E(X + c) = E(X) + c$$

$$E(cX) = cE(X)$$

$$V(c) = 0$$

$$V(X + c) = V(X)$$

$$V(cX) = c^2 V(X)$$

$$P(x) = \sum_{y} P(x,y)$$

$$P(y) = \sum\nolimits_x P(x,y)$$

$$COV(X,Y) = \sigma_{xy} = \sum\nolimits_x \sum\nolimits_y (x-\mu_x)(y-\mu_y)P(x,y) = E[(x-\mu_x)(y-\mu_y)]$$

$$COV(X,Y) = \sigma_{xy} = \sum\nolimits_x \sum\nolimits_y xyP(x,y) - \mu_x \mu_y = E(XY) - E(X)E(Y)$$

$$\rho = \frac{COV(X,Y)}{\sigma_x \sigma_y}$$

$$E(X + Y) = \sum\nolimits_x \sum\nolimits_y (x+y)P(x,y) = E(X) + E(Y)$$

$$V(X + Y) = \sum\nolimits_x \sum\nolimits_y (x+y-\mu_{x+y})^2 P(x,y) = V(X) + V(Y) + 2COV(X, Y)$$

$$E(Y|X) = \mu_{y|x} = \sum_{y} yP(y|x)$$

$$P(x) = \frac{n!}{x!\,(n-x)!} p^x (1-p)^{n-x}$$

$$\mu = np$$

$$\sigma^2 = np(1-p)$$

$$\sigma = \sqrt{np(1-p)}$$

$$P(x) = \frac{e^{-\mu}\mu^x}{x!}$$

$$E(X) = V(X) = \mu$$

$$f(x) = \frac{1}{b-a}$$

$$E(X) = \frac{(a+b)}{2}$$

$$V(X) = \frac{(b-a)^2}{12}$$

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

$$E(X) = \mu$$

$$V(X) = \sigma^2$$

$$Z = \frac{x-\mu}{\sigma}$$

$$\sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{N-1}}$$

$$\hat{P} = \frac{X}{n}$$

$$\hat{P} \sim N(p, \frac{p(1-p)}{n})$$

$$\sigma_{\hat{P}} = \sqrt{p(1-p)/n}$$

$$Z = \frac{\hat{P}-p}{\sqrt{p(1-p)/n}}$$

$$\mu_{\bar{x}-\bar{y}} = \mu_x - \mu_y$$

$$\sigma_{\bar{x}-\bar{y}} = \sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}$$

$$\bar{X} - \bar{Y} \sim N\left(\mu_x - \mu_y, \frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}\right)$$

$$\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$n = \left(\frac{z_{\alpha/2}\sigma}{B}\right)^2$$

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$N\left[\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}\right]$$

$$\frac{(n-1)s^2}{\sigma^2} \sim \chi_{n-1}^2$$

$$\frac{(n-1)s^2}{\chi_{\alpha/2}^2}$$

$$\frac{(n-1)s^2}{\chi_{1-\alpha/2}^2}$$

$$\hat{p} \pm z_{\alpha/2}\sqrt{\hat{p}(1-\hat{p})/n}$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim t_{n_1+n_2-2}$$

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

$$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2} \sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$v = (s_1^2/n_1 \; + \; s_2^2/n_2)^2 / \left( \frac{(s_1^2/n_1)^2}{n_1 - 1} + \frac{(s_2^2/n_2)^2}{n_2 - 1} \right)$$

$$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2} \sqrt{\left( \frac{s_1^2}{n_1} \; + \frac{s_2^2}{n_2} \right)}$$

$$F = \frac{s_1^2}{s_2^2}$$

$$F_{1-A, v_1, v_2} = \frac{1}{F_{A, v_2, v_1}}$$

$$\mathrm{t} = \frac{\bar{x}_D - \mu_D}{s_D/\sqrt{n_D}} \sim t_{n_D - 1}$$

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

$$\sqrt{\hat{p}\,(1 - \hat{p}) \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}$$

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

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

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

$$y = \beta_0 + \beta_1 x + \varepsilon$$

$$\hat{y} = b_0 + b_1 x$$

$$b_1 = \frac{s_{xy}}{s_x^2}$$

$$b_0 = \bar{y} - b_1 \bar{x}$$

$$SSE \equiv \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

$$s_\varepsilon^2 = \frac{SSE}{n - 2}$$

$$s_\varepsilon = \sqrt{\frac{SSE}{n - 2}}$$

$$s_{b_1} = \frac{s_\varepsilon}{\sqrt{(n-1)s_x^2}}$$

$$t = \frac{b_1 - \beta_1}{s_{b_1}} \sim t_{n-2}$$

$$R^2 = 1 - \frac{SSE}{SST} = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \overline{y_i})^2}$$