

STAT 308 - Perry - Formula Sheet

1 Chapter 5

$$SSX = \sum_{i=1}^n x_i^2 - n\bar{x}^2$$

$$SSY = \sum_{i=1}^n y_i^2 - n\bar{y}^2$$

$$SSXY = \sum_{i=1}^n x_i y_i - n\bar{x}\bar{y}$$

$$\hat{\beta}_1 = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2} = \frac{SSXY}{SSX}$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$$

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

$$s_y^2 = \frac{1}{n-1} \sum_{i=1}^n (y_i - \bar{y})^2$$

$$SSE = SSY - \hat{\beta}_1 SSXY$$

$$S_{Y|X}^2 = MSE = \frac{1}{n-2} \sum_{i=1}^n (y_i - \hat{y}_i)^2 = \frac{1}{n-2} SSE$$

$$S_{\hat{\beta}_1} = \frac{S_{Y|X}}{\sqrt{SSX}} = \frac{S_{Y|X}}{s_x \sqrt{n-1}}$$

$$S_{\hat{\beta}_0} = S_{Y|X} \sqrt{\frac{1}{n} + \frac{\bar{x}^2}{SSX}}$$

$$S_{\hat{Y}(x_0)} = S_{Y|X} \sqrt{\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{SSX}}$$

Confidence Intervals:

$$\hat{\beta}_1 \pm t_{(n-2), 1-\alpha/2} S_{\hat{\beta}_1}$$

$$\hat{\beta}_0 \pm t_{(n-2), 1-\alpha/2} S_{\hat{\beta}_0}$$

$$\mu_{Y|X_0} : \hat{y}(x_0) \pm t_{(n-2), 1-\alpha/2} S_{\hat{Y}(x_0)}$$

Prediction Intervals:

$$\hat{y}(x_0) \pm t_{(n-2), 1-\alpha/2} S_{Y|X} \sqrt{1 + \frac{1}{n} + \frac{(x_0 - \bar{x})^2}{SSX}}$$

T-tests:

$$H_0 : \beta_i = \beta_i^{(0)}, \text{ where } i = 0 \text{ or } 1 \quad t = \frac{\hat{\beta}_i - \beta_i^{(0)}}{S_{\hat{\beta}_i}}$$

$$H_0 : \mu_{Y|X_0} = \mu_{Y|X_0}^{(0)} \quad t = \frac{\hat{y}(x_0) - \mu_{Y|X_0}^{(0)}}{S_{\hat{Y}(x_0)}}$$