

10.9: Formula List

Learning Objectives

- Listing of all formulas used throughout the chapter.

$$SS_{xx} = \sum x^2 - \frac{1}{n} \left(\sum x \right)^2 \quad SS_{xy} = \sum xy - \frac{1}{n} \left(\sum x \right) \left(\sum y \right) \quad SS_{yy} = \sum y^2 - \frac{1}{n} \left(\sum y \right)^2$$

Correlation coefficient:

$$r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}}$$

Least squares regression equation (equation of the least squares regression line):

$$\hat{y} = \hat{\beta}_1 x + \hat{\beta}_0 \quad \text{where} \quad \hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}} \quad \text{and} \quad \hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$$

Sum of the squared errors for the least squares regression line:

$$SSE = SS_{yy} - \hat{\beta}_1 SS_{xy}$$

Sample standard deviation of errors:

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

100(1 - α)% confidence interval for β_1 :

$$\hat{\beta}_1 \pm t_{\alpha/2} \frac{S_\varepsilon}{\sqrt{SS_{xx}}} \quad (df = n-2)$$

Standardized test statistic for hypothesis tests concerning β_1 :

$$T = \frac{\hat{\beta}_1 - B_0}{S_\varepsilon / \sqrt{SS_{xx}}} \quad (df = n-2)$$

Coefficient of determination:

$$r^2 = \frac{SS_{yy} - SSE}{SS_{yy}} = \frac{SS_{xy}^2}{SS_{xx}SS_{yy}} = \hat{\beta}_1 \frac{SS_{xy}}{SS_{yy}}$$

100(1 - α)% confidence interval for the mean value of y at $x = x_p$:

$$\hat{y}_p \pm t_{\alpha/2} S_\varepsilon \sqrt{\frac{1}{n} + \frac{(x_p - \bar{x})^2}{SS_{xx}}} \quad (df = n-2)$$

100(1 - α)% prediction interval for an individual new value of y at $x = x_p$:

$$\hat{y}_p \pm t_{\alpha/2} S_\varepsilon \sqrt{1 + \frac{1}{n} + \frac{(x_p - \bar{x})^2}{SS_{xx}}} \quad (df = n-2)$$

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