FORMULAS

Pearson's product-moment correlation coefficient

$$r = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2\Sigma(y-\bar{y})^2}}$$

$$= \frac{\Sigma xy - \frac{(\Sigma x\Sigma y)}{n}}{\sqrt{\left[\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right]\left[\Sigma y^2 - \frac{(\Sigma y)^2}{n}\right]}}$$

Equation of the simple regression line

$$\hat{y} = \beta_0 + \beta_1 x$$

Sum of squares

$$SS_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$$

$$SS_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$$

$$SS_{xy} = \Sigma xy - \frac{\Sigma x\Sigma y}{n}$$

Slope of the regression line

$$b_1 = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\Sigma(x-\bar{x})^2} = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n\bar{x}^2}$$

$$= \frac{\Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n}}{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}$$

y-intercept of the regression line

$$b_0 = \bar{y} - b_1\bar{x} = \frac{\Sigma y}{n} - b_1\frac{(\Sigma x)}{n}$$

Sum of squares of error

$$SSE = \Sigma(y-\hat{y})^2 = \Sigma y^2 - b_0\Sigma y - b_1\Sigma xy$$

Standard error of the estimate

$$s_e = \sqrt{\frac{SSE}{n-2}}$$

Coefficient of determination

$$r^2 = 1 - \frac{SSE}{SS_{yy}} = 1 - \frac{SSE}{\Sigma y^2 - \frac{(\Sigma y)^2}{n}}$$

Computational formula for r^2

$$r^2 = \frac{b_1^2 SS_{xx}}{SS_{yy}}$$

t test of slope

$$t = \frac{b_1 - \beta_1}{s_b}$$

$$s_b = \frac{s_e}{\sqrt{SS_{xx}}}$$

Confidence interval to estimate $E(y_x)$ for a given value of x

$$\hat{y} \pm t_{\alpha/2,\,n-2}s_e\sqrt{\frac{1}{n} + \frac{(x_0-\bar{x})^2}{SS_{xx}}}$$

Prediction interval to estimate y for a given value of x

$$\hat{y} \pm t_{\alpha/2,\,n-2}s_e\sqrt{1 + \frac{1}{n} + \frac{(x_0-\bar{x})^2}{SS_{xx}}}$$