$$y = \alpha_0 + \alpha_1 x + \varepsilon, \qquad \hat{y} = \hat{\alpha}_0 + \hat{\alpha}_1 \bar{x},$$

$$\hat{\alpha}_1 = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2}, \qquad , \hat{\alpha}_0 = \bar{y} - \hat{\alpha}_1 \bar{x}, \qquad t = \frac{r_{xy}}{\sqrt{1 - r_{xy}^2}} \sqrt{n-2} \sim t_{n-2}\,,$$

$$\hat{\boldsymbol{y}} = \boldsymbol{X}\hat{\boldsymbol{\alpha}}, \quad \boldsymbol{e} = \boldsymbol{y} - \hat{\boldsymbol{y}} = \boldsymbol{y} - \boldsymbol{X}\hat{\boldsymbol{\alpha}}, \qquad \hat{\boldsymbol{\alpha}} = (\boldsymbol{X}'\boldsymbol{X})^{-1} \boldsymbol{X}'\boldsymbol{y},$$

$$\mathrm{D}^2(\hat{\boldsymbol{\alpha}}) = \mathrm{E}(\hat{\boldsymbol{\alpha}} - \boldsymbol{\alpha})(\hat{\boldsymbol{\alpha}} - \boldsymbol{\alpha})' = \sigma^2 (\boldsymbol{X}'\boldsymbol{X})^{-1}\,,$$

$$\hat{\sigma}^2 = \frac{1}{n-k-1} \sum_{i=1}^n e_i^2 = \frac{1}{n-k-1} \left(\boldsymbol{y}'\boldsymbol{y} - \hat{\boldsymbol{\alpha}}'\boldsymbol{X}'\boldsymbol{y}\right) = S_e^2\,,$$

$$1 = R^2 + \varphi^2, \quad R^2 = 1 - \frac{\sum_{i=1}^n e_i^2}{\sum_{i=1}^n (y_i - \bar{y})^2},$$

$$t = \frac{\hat{\alpha}_j}{S_{\alpha_j}} \sim t_{n-k-1}\,, \qquad \hat{\alpha}_j - t_\alpha S_{\alpha_j} < \alpha_j < \hat{\alpha}_j + t_\alpha S_{\alpha_j}\,,$$

$$Z = \frac{S - \mathrm{E}\,S}{\sqrt{\mathrm{D}^2\,S}} \sim \mathrm{N}(0,1) \qquad \mathrm{E}\,S = \frac{2n_1 n_2}{n_1 + n_2} + 1, \qquad \mathrm{D}^2\,S = \frac{2n_1 n_2 (2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}\,,$$

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}$$

$$\hat{\sigma}^2 = \frac{1}{n-1} \sum_{i=1}^n e_i^2, \qquad e_i = y_i - \hat{y}_i = y_i - (\hat{\alpha}_0 + \hat{\alpha}_1 x_i)\,.$$