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SOME USEFUL FORMULAS

Univariate Data

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

$\bar{x} \pm t_{\alpha/2;n-1} \times (s_x/\sqrt{n})$

$t = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$

$\text{TDIST}(t, df, 1) = \Pr[T > t]$ *and* $\text{TDIST}(t, df, 2) = \Pr[|T| > t]$

$t_{\alpha/2}$ such that $\Pr[|T| > t_{\alpha/2}] = \alpha$ is calculated using $\text{TINV}(\alpha, df)$.

Bivariate Data

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \times \sum_{i=1}^{n}(y_i - \bar{y})^2}} = \frac{s_{xy}}{\sqrt{s_{xx} \times s_{yy}}} \quad \text{[Here } s_{xx} = s_x^2 \text{ and } s_{yy} = s_y^2\text{].}$$

$$\widehat{y} = b_1 + b_2 x_i \qquad b_2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad b_1 = \bar{y} - b\bar{x}$$

$\text{TSS} = \sum_{i=1}^{n}(y_i - \bar{y}_i)^2$ $\quad$ $\text{ErrorSS}=\sum_{i=1}^{n}(y_i - \widehat{y}_i)^2$ $\quad$ RegSS = TSS - ErrorSS

$R^2 = 1-\text{ErrorSS/TSS}$

$b_2 \pm t_{\alpha/2;n-2} \times s_{b_2}$

$$t = \frac{b_2 - \beta_{20}}{s_{b_2}} \qquad s_{b_2}^2 = \frac{s_e^2}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad s_e^2 = \frac{1}{n-2}\sum_{i=1}^{n}(y_i - \widehat{y}_i)^2$$

$$y|x = x^* \in b_1 + b_2 x^* \pm t_{\alpha/2;n-2} \times s_e \times \sqrt{\frac{1}{n} + \frac{(x^*-\bar{x})^2}{\sum_i (x_i-\bar{x})^2} + 1}$$

$$\mathsf{E}[y|x = x^*] \in b_1 + b_2 x^* \pm t_{\alpha/2;n-2} \times s_e \times \sqrt{\frac{1}{n} + \frac{(x^*-\bar{x})^2}{\sum_i (x_i-\bar{x})^2}}$$

Multivariate Data

$\widehat{y} = b_1 + b_2 x_{2i} + \cdots + b_k x_{ki}$

$R^2 = 1-\text{ErrorSS/TSS}$ $\quad$ $\bar{R}^2 = R^2 - \frac{k-1}{n-k}(1 - R^2)$

$b_j \pm t_{\alpha/2;n-k} \times s_{bj}$

$$t = \frac{b_j - \beta_{j0}}{s_{b_j}}$$

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)} \quad \textit{and} \quad F = \frac{(SSE_r - SSE_u)/(k-g)}{SSE_u/(n-k)}$$