STA 441s24 Formulas

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} + \epsilon \qquad SST = SSR + SSE \qquad R^2 = \frac{SSR}{SST}$$

$$a = \frac{R^2_F - R^2_R}{1 - R^2_R} \qquad F = \left(\frac{n-p}{s}\right)\left(\frac{a}{1-a}\right) \qquad a = \frac{sF}{n-p+sF}$$

If an overall test has s numerator degrees of freedom and critical value c, the critical value of a Scheffé follow-up test with r degrees of freedom is $\left(\frac{s}{r}\right) \cdot c$.

$$\ln\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} = L \qquad \pi = \frac{e^L}{1+e^L}$$

$$\boldsymbol{\mu} = \begin{pmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_k \end{pmatrix} = \begin{pmatrix} E[y_1|\mathbf{X}=\mathbf{x}] \\ E[y_2|\mathbf{X}=\mathbf{x}] \\ \vdots \\ E[y_k|\mathbf{X}=\mathbf{x}] \end{pmatrix} = \begin{pmatrix} \beta_{0,1} + \beta_{1,1}x_1 + & \cdots & +\beta_{p-1,1}x_{p-1} \\ \beta_{0,2} + \beta_{1,2}x_1 + & \cdots & +\beta_{p-1,2}x_{p-1} \\ \vdots & \vdots & \vdots \\ \beta_{0,k} + \beta_{1,k}x_1 + & \cdots & +\beta_{p-1,k}x_{p-1} \end{pmatrix}$$

Unknown (`type=un`)

$$\begin{pmatrix} \sigma_1^2 & \sigma_{1,2} & \sigma_{1,3} & \sigma_{1,4} \\ \sigma_{1,2} & \sigma_2^2 & \sigma_{2,3} & \sigma_{2,4} \\ \sigma_{1,3} & \sigma_{2,3} & \sigma_3^2 & \sigma_{3,4} \\ \sigma_{1,4} & \sigma_{2,4} & \sigma_{3,4} & \sigma_4^2 \end{pmatrix}$$

Compound Symmetry (`type=cs`)

$$\begin{pmatrix} \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 \end{pmatrix}$$

Autoregressive (`type=ar(1)`)

$$\sigma^2 \begin{pmatrix} 1 & \rho & \rho^2 & \rho^3 \\ \rho & 1 & \rho & \rho^2 \\ \rho^2 & \rho & 1 & \rho \\ \rho^3 & \rho^2 & \rho & 1 \end{pmatrix}$$
