6.6 Inferences about Regression Parameters

The least squares and maximum likelihood estimators in $\mathbf{b}$ are unbiased:

$$\mathbf{E}\{\mathbf{b}\} = \boldsymbol{\beta} \tag{6.44}$$

The variance-covariance matrix $\boldsymbol{\sigma}^2\{\mathbf{b}\}$:

$$\underset{p\times p}{\boldsymbol{\sigma}^2\{\mathbf{b}\}} = \begin{bmatrix} \sigma^2\{b_0\} & \sigma\{b_0, b_1\} & \cdots & \sigma\{b_0, b_{p-1}\} \\ \sigma\{b_1, b_0\} & \sigma^2\{b_1\} & \cdots & \sigma\{b_1, b_{p-1}\} \\ \vdots & \vdots & & \vdots \\ \sigma\{b_{p-1}, b_0\} & \sigma\{b_{p-1}, b_1\} & \cdots & \sigma^2\{b_{p-1}\} \end{bmatrix} \tag{6.45}$$

is given by:

$$\underset{p\times p}{\boldsymbol{\sigma}^2\{\mathbf{b}\}} = \sigma^2(\mathbf{X}'\mathbf{X})^{-1} \tag{6.46}$$

The estimated variance-covariance matrix $\mathbf{s}^2\{\mathbf{b}\}$:

$$\underset{p\times p}{\mathbf{s}^2\{\mathbf{b}\}} = \begin{bmatrix} s^2\{b_0\} & s\{b_0, b_1\} & \cdots & s\{b_0, b_{p-1}\} \\ s\{b_1, b_0\} & s^2\{b_1\} & \cdots & s\{b_1, b_{p-1}\} \\ \vdots & \vdots & & \vdots \\ s\{b_{p-1}, b_0\} & s\{b_{p-1}, b_1\} & \cdots & s^2\{b_{p-1}\} \end{bmatrix} \tag{6.47}$$

is given by:

$$\underset{p\times p}{\mathbf{s}^2\{\mathbf{b}\}} = MSE(\mathbf{X}'\mathbf{X})^{-1} \tag{6.48}$$