Stat 215b (Spring 2004): The information matrix and estimating variance covariance

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Let l be the log-likelihood with parameters $\theta_1, \ldots \theta_p$.

Fisher Information Matrix

$$F = -\begin{bmatrix} E\left[\frac{\partial^2 l}{\partial \theta_1^2}\right] & \cdots & E\left[\frac{\partial^2 l}{\partial \theta_1 \partial \theta_p}\right] \\ \vdots & \ddots & \vdots \\ E\left[\frac{\partial^2 l}{\partial \theta_p \partial \theta_1}\right] & \cdots & E\left[\frac{\partial^2 l}{\partial \theta_p^2}\right] \end{bmatrix}$$

Relationship between Information Matrix and Variance Covariance Matrix

$$\Sigma = F^{-1}$$

Another useful relationship

$$-E\left[\frac{\partial^2 l}{\partial \theta_i \partial \theta_j}\right] = E\left[\frac{\partial l}{\partial \theta_i} \frac{\partial l}{\partial \theta_j}\right]$$