Chapter Five

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9/18/2017

Exercise One

Question

Consider the single response variable Y with $Y \sim \text{Bin}(n, \pi)$.

Solution

(a): Find the Wald statistic $(\hat{\pi} - \pi)^T(\hat{\pi} - \pi)$, where $\hat{pi}$ is the maximum likelihood estimator of π and $\boldsymbol{\mathcal{J}}$ is the information.

(b): Verify that the Wald statistic is the same as the score statistic $\boldsymbol{U}^T\boldsymbol{\mathcal{J}}^{-1}\boldsymbol{U}$ in this case (see Example 5.22).

(c): Find the deviance

$$2[l(\hat{\pi}; y) - l(\pi; y)].$$

(d): For large samples, both the Wald/score statistic and the deviance approximatley have the $\chi^2(1)$ distribution. For $n = 10$ and $y = 3$, use both statistics to assess the adequacy of the models:

(1) $\pi = 0.1$;
(2) $\pi = 0.3$;
(3) $\pi = 0.5$.

Do the two statistics lead to the same conclusions?

Exercise Two

Question

Solution

Exercise Four

Question

Solution