Lecture Summary: Feb. 17, 2023

- Inference about regression parameters

2. $100(1-\alpha)\%$ s.c.i. for $\beta_h, h \in G$ with $|G| = g$:

$$\hat{\beta}_h \pm B\text{s.e.}(\hat{\beta}_h),$$

where $B = t_{n-p}(1-\alpha/2g)$.

3. Simultaneous confidence intervals for mean responses: $\mathrm{E}(Y_h) = x_h'\beta = \beta_0 + \beta_1 x_{h,1} + \cdots + \beta_{p-1}x_{h,p-1}$, $h \in G$ with $|G| = g$.

First compute $\hat{Y}_h = x_h'\hat{\beta} = \hat{\beta}_0 + \hat{\beta}_1 x_{h,1} + \cdots + \hat{\beta}_{p-1}x_{h,p-1}$, and

$$\text{s.e.}(\hat{Y}_h) = \sqrt{\text{MSE}\{x_h'(X'X)^{-1}x_h\}}.$$

$$\begin{cases} \text{Bonferroni} : \hat{Y}_h \pm B\text{s.e.}(\hat{Y}_h), h \in G, & \text{where } B = t_{n-p}(1-\alpha/2g); \\ \text{Working Hotelling} : \hat{Y}_h \pm W\text{s.e.}(\hat{Y}_h), h \in G, & \text{where } W = \sqrt{pF_{p,n-p}(1-\alpha)}. \end{cases}$$

4. Simultaneous prediction intervals for future observations, Y_h, $h \in G$ with $|G| = g$:

First compute $\hat{Y}_h = x_h'\hat{\beta}$ and

$$\text{p.s.e.}(\hat{Y}_h) = \sqrt{\text{MSE}\{1 + x_h'(X'X)^{-1}x_h\}}.$$

$100(1-\alpha)\%$ s.p.i.'s for $Y_h, h \in G$ with $|G| = g$ are

$$\begin{cases} \text{Bonferroni} : \hat{Y}_h \pm B\text{p.s.e.}(\hat{Y}_h), h \in G, & \text{where } B = t_{n-p}(1-\alpha/2g); \\ \text{Scheffe} : \hat{Y}_h \pm S\text{p.s.e.}(\hat{Y}_h), h \in G, & \text{where } S = \sqrt{gF_{g,n-p}(1-\alpha)}. \end{cases}$$