

Handout #15

Two-Way MANOVA (for large samples)

H_0 : No Interaction Effect

$$\text{Test Statistic } \Lambda^* = \frac{|SSP_{\text{Residual}}|}{|SSP_{\text{Interaction}} + SSP_{\text{Residual}}|}$$

$$\text{Reject } H_0 \text{ if } -\left(gb(n-1) - \frac{p+1-(g-1)(b-1)}{2}\right) \ln \Lambda^* > \chi^2_{(g-1)(b-1)p}(\alpha)$$

H_0 : No Factor 1 effect

$$\text{Test Statistic } \Lambda^* = \frac{|SSP_{\text{Residual}}|}{|SSP_{\text{Factor 1}} + SSP_{\text{Residual}}|}$$

$$\text{Reject } H_0 \text{ if } -\left(gb(n-1) - \frac{p+1-(g-1)}{2}\right) \ln \Lambda^* > \chi^2_{(g-1)p}(\alpha)$$

H_0 : No Factor 2 effect

$$\text{Test Statistic } \Lambda^* = \frac{|SSP_{\text{Residual}}|}{|SSP_{\text{Factor 2}} + SSP_{\text{Residual}}|}$$

$$\text{Reject } H_0 \text{ if } -\left(gb(n-1) - \frac{p+1-(b-1)}{2}\right) \ln \Lambda^* > \chi^2_{(b-1)p}(\alpha)$$

Remark : See Section 6.7 for more details.

Cell Tower Repairs: Comparing Problems & Engineers (Two-Way)

The cell tower repair problem was described as consisting of 8 types of repair problem based on problem severity, problem complexity and experience of the engineer assigned to the problem. We can separate this into two factors: "Problem", a measure of problem severity/complexity at 4 levels (Low/Simple, Low/Complex, High/Simple, and High/Complex), and "Engineer", a measure of engineer experience at 2 levels (Novice, and Guru).

The eight groups previously analyzed actually consist of all possible combinations of "Problem" and "Engineer"

Source of variation	Matrix of sum of squares and cross products	Degrees of freedom
Treatment	$\begin{pmatrix} 59.45 & 120.41 \\ 120.41 & 252.95 \end{pmatrix}$	7
Problem(P)	$\begin{pmatrix} 11.73 & 28.51 \\ 28.51 & 69.31 \end{pmatrix}$	3
Engineer(E)	$\begin{pmatrix} 47.12 & 91.48 \\ 91.48 & 182.91 \end{pmatrix}$	1
P*E	$\begin{pmatrix} 0.60 & 0.42 \\ 0.42 & 0.73 \end{pmatrix}$	3
Residual (Within)	$\begin{pmatrix} 1.63 & 0.80 \\ 0.80 & 1.94 \end{pmatrix}$	8
Total (corrected)	$\begin{pmatrix} 61.08 & 121.21 \\ 121.21 & 254.89 \end{pmatrix}$	15