EPRS8540

Post Hoc Procedures

Tukey, Scheffe, Newman-Keuls, Duncan, Fisher's LSD

Purposes
1. To follow up ANOVA to find where the difference is
2. To maintain the overall α level

The Tukey Procedure

$$(\bar{x}_i - \bar{x}_j) \pm q_{\alpha;k,N-k}\sqrt{\frac{MSw}{n}}$$

The Scheffe Procedure

$$(\bar{x}_i - \bar{x}_j) \pm \sqrt{MSw \bullet (\frac{1}{n_1} + \frac{1}{n_2}) \bullet (k-1) \bullet F_{\alpha;k-1,N-k}}$$

Assumptions in ANOVA

Robustness
nominal α - set by the experimenter
actual α - % of time one is rejecting falsely

"Robust" if nominal α is close to actual α

1. Normality: Basically fairly robust
2. Homoscedasticity (Homogeneity of variances, $\sigma_1^2 = \sigma_2^2 = ... = \sigma_k^2$):
   equal n --- robust
   unequal n --- positive (large n with large σ^2) --- F is conservative (actual α < nominal α)
   --- negative (large n with small σ^2) --- F is liberal (actual α > nominal α)
   Test of homoscedasticity
   Bartlett's, Cochran's, Levene's, Hartley's F_{max} ($Fmax = \frac{S^2_{largest}}{S^2_{smallest}}$)
   What to do with heteroscedasticity: (1. use alternatives to ANOVA, 2. use more stringent α (in the negative condition), 3. use transformation)
3. Independence: Serious problem - inflation of α

   Situations (e.g., classrooms, group learning)

   What to do? (1. use stringent α, 2. group mean as the unit of analysis)