Statistics 601, Fall 2006

Assignment 1

1. Demonstrate the rank equivalence of the test statistic used in Lab 1 and the usual F-statistic from traditional one-way ANOVA

\[ F = \frac{SST/(k - 1)}{SSE/(n - k)}, \]

where \( n = \sum_i n_i \) and,

\[ SST = \sum_{i=1}^{k} n_i \left( \bar{y}_i - \bar{y} \right)^2 \]

\[ SSE = \sum_{i=1}^{k} \sum_{j=1}^{n_i} (y_{i,j} - \bar{y}_i)^2, \]

for \( \bar{y}_i = (1/n_i) \sum_{j=1}^{n_i} y_{i,j} \) and \( \bar{y} = \sum_{i=1}^{k} \sum_{j=1}^{n_i} y_{i,j} \).

2. Using the R functions provided, or ones of your own construction, conduct a randomization test using the data of Example 4.3 from the class notes and including all 4 treatments. Examine the effect of using several different numbers of randomly selected permutations of treatment assignments.

3. Also using the R functions provided, compare the switching algorithm and the sampling algorithm for selecting permutations. Do they give the same results?

4. Conduct paired comparisons among the treatments of Example 4.3 using permutation tests (i.e., all possible treatment assignments). What would you conclude about the scientific problem under study?

5. For one or two of the paired comparisons from exercise 4, use one of the randomization functions provided to repeat the comparison with random selection of permutations (of treatment assignments). Is it ok to use more randomly selected permutations than the number of possible treatment assignments that actually exist?