Semester 2	Statistical Tests (Advanced)	2011

Tutorial 5

1. Do Example 10.1 on p. 148 at the end of Lecture 10, Week 4.1

2. Do the exercise on p. 200 at the end of Lecture 13, Week 5.1.

3. To evaluate the effect of an 8 week muscle training programme, the weight was determined that each of a sample of 12 first graders was able to lift before and after the training programme. The differences (after - before) were:

   $$6.0,\ 7.0,\ 5.0,\ 10.5,\ 8.5,\ 3.5,\ 6.1,\ 4.0,\ 4.6,\ 4.5,\ 5.9,\ 6.5.$$

   (a) By noting that for $n = 12$, $P(W^+ \leq 14) = 0.0261$ (so that $P(15 \leq W^+ \leq 63) = 0.9478$) construct an approximate 95% confidence interval for the average increase in player's weight lifting ability due to the training.

   Find the Hodges-Lehmann estimator for the average weight gain.

   (b) For the case $n = 12$, calculate the mean and variance of the Wilcoxon signed rank statistic, W^+, under the hypothesis that the sample being analysed is from a continuous, symmetric distribution centred at 0. Use the normal approximation to the distribution of W^+ to obtain a value of k such that $P(k \leq W^+ \leq 78 - k) = 0.95$.

Computer Exercise

1. The datasets `ratcon` and `ratoz` are weight gains for two groups of rats kept in an ozone free environment and in an environment containing ozone. Carry out an F-test to test the claim that both samples come from populations with common variance.

2. Refer to the data in Q3 of the tutorial sheet.

   (a) Obtain and report the value of W^+.

   (b) Write `R` code to verify "manually" that $W^+ = \sum_{i=1}^{n} \sum_{j=1}^{i} I_{\{z_i+z_j>0\}}$.

   (c) Write `R` code to find the Hodges-Lehman estimator.

   (d) Write `R` code to construct an approximate 90% CI.