Homework 2

Due on Oct 29, 2:30pm.

Problem 1

Consider the following measurements.
Before treatment: 13.4, 3.7, 0.8, 10.3, 1.8
After treatment: 2.6, 8.2, 5.2, 7.2, 6.8
We would like to test, with size 0.1, whether the treatment effect is negligible or not.

a) Construct appropriate null and alternative hypotheses.

b) Compute the p-value of the approximate z-test and state your conclusion.

c) Compute the p-value of the Binomial test using the exact null distribution of S and state your conclusion.

d) Compute the p-value of the Binomial test using the normal approximation.

e) Compute the p-value of the Wilcoxons signed-rank test using the exact null distribution of SR+ and state your conclusion.

f) Compute the p-value of the Wilcoxons signed-rank test using the normal approximation.

Problem 2

Consider the following data:
121, 98, 95, 94, 102, 106, 112, 120, 108, 109.

a) Construct an exact 80% confidence interval for the median θ.

b) Adopt normal approximation to construct an approximated 80% confidence interval for the median θ.

c) Let $\theta_{0.75}$ be the 75% quantile. Construct the 80% confidence interval for $\theta_{0.75}$.

d) (**Bonus question**) Define $S' = \sum_{i=1}^{n}(X_i > \theta)$. Show how you could use S' to derive the 80% confidence interval for $\theta_{0.75}$.

e) Use the HL estimate to construct a different 80% confidence interval for the median.

f) Adopt normal approximation in part (e) to construct the approximated 80% confidence interval for the median.