Statistics 104 - Term Project

Due: Dec 8, 2023

The Excel file "term project.xlsx" contains data from several distributions. For this project you are asked to carry out the hypothesis tests as described below using non-parametric procedures introduced in class and comparing to results from normal and t-tests. In all analyses, carry out some diagnostics in the form of normal probability plots, histograms, boxplots and other methods you think are appropriate.

1 Analysis of sample 1: for this data carry out a test of the hypothesis $H_0 : \mu = 0$ vs $H_a : \mu > 0$, using an appropriate non-parametric test based on the median, mean or a 10% trimmed mean. Compare your results to the one-sample t-test.

2 For sample 2 test the following hypothesis:
   a $H_0 : \mu_1 = \mu_2$ vs $H_a : \mu_1 < \mu_2$
   b $H_0 : \sigma_1 = \sigma_2$ vs $H_a : \sigma_1 \neq \sigma_2$

   As in part (a) for the test comparing means, compare your results to the two-sample t-test. For the comparison of variances, compare your results to an F-test for equality of variances.

3 For the data in sample 3 compare the distributions using the Kolmogorov-Smirnov test.

4 For the data from sample 4 test the hypothesis $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$ vs the alternative that not all means are equal. Compare your results to the F-test from ANOVA.

In all cases, assess the distribution your data is sampled from using plots and other diagnostic tools. Discuss which approach you prefer and why. Also, discuss various non-parametric tests and which one you feel is the most appropriate for each of the samples. Summarize your results in the form of written report in the style of a scientific article. You will be graded on both the statistical methods used and the write-up. You are expected to create randomization (permutation distributions or Monte Carlo simulations) for parts of the project. Using established tests in R such as ks.test for Kolmogorov-Smirnov is not acceptable.

Submission of the final report

Please, follow the outline suggested below for your final report.

1 A brief introductory paragraph explaining the project and purpose.
2 Address each question in a separate paragraph. State conclusions with full sentences. Simply providing computer output some annotations is not acceptable.
3 A summary of your overall conslusions