# STAT:5400
# Homework 4
# due Wed. 10/04/17

**This homework is to be done in groups of 2 or 3 students.** All members of your group must sign up for the same "Homework 4 group" under "People" in the ICON page. Then just one group member should upload the completed homework. It automatically will count for all group members.

Two tests that are commonly used to test the null hypothesis that variances are equal in two or more populations are the F test and Bartlett's test. Statistics textbooks often point out that these tests (especially the F test) are not robust to violations of the assumption of normality in all the populations being compared.

R has a built-in function `var.test` that performs the F test of homogeneity of variance and another built-in function `bartlett.test` for Bartlett's test.

Each homework group should consider *only* the F test or *only* Bartlett's test, and should pick two or more of the factors below to vary and should evaluate test size as well as power against 3 or more specific alternatives.

1. sample sizes in the two groups (both "small" or both "large")

2. whether the sample sizes are equal in the two groups

3. shapes of the population distributions

   - symmetric/nonsymmetric
   - normal/ symmetric but not normal

Specify the specific alternatives against which you are evaluating power as the ratio of the true variances in the two populations from which the samples are drawn.

Note that the null hypothesis is true if

$$\frac{\sigma_1^2}{\sigma_2^2} = 1$$

Choose the number of replicate datasets in your simulations so that your estimates of size and power will have standard errors no larger than .005.

Here is what you need to turn in in the form of a PDF file produced using Sweave and LaTeX :

1. brief written summaries of

   (a) how you chose the levels of the factors in your study
   (b) how you chose the specific alternative hypotheses against which to evaluate power
   (c) how you chose the number of simulated datasets to use for each combination of factors

2. tables summarizing the numeric results of your study

3. (optional) figures summarizing the numeric results of your study

4. a written summary of what your results mean

5. your R code as an appendix