Simulations HW 5

1. a. Create three matrices with 1000 samples of n_1= 5, n_2= 7 and n_3= 9 random numbers, respectively, from normal random variables with common standard deviation σ = 3, and means μ_1 = 10, μ_2 = 10, and μ_3 = 10 (In these case all three samples come from the same random variable, although the sample sizes are different).

b. Create vectors with the MSTO, MSE and MST for each of the lines of the three matrices you created above (that is for each of the sets of three samples from the normal distributions stated above) and obtain the mean for each of these three vectors. Do these means indicate that MSTO, MSE and MST are unbiased estimators of sigma?

2. a. Create three matrices with 1000 samples of n_1= 5, n_2= 7 and n_3= 9 random numbers, respectively, from normal random variables with common standard deviation σ = 3, and means μ_1 = 10, μ_2 = 15, and μ_3 = 20 (In these case all three samples come from different random variables sharing the same variance).

b. Create vectors with the MSTO, MSE and MST for each of the lines of the three matrices you created above (that is for each of the sets of three samples from the normal distributions stated above) and obtain the mean for each of these three vectors. Do these means indicate that MSTO, MSE and MST are unbiased estimators of sigma?

c. Compare each of the means with their corresponding theoretical expected values when the alternative hypothesis is that at least one pair of means is differnt. That is,

compare the mean of MSTO with E[MSTO] = formula given in exam MST with… etc. (Will take me a while to write it, but will get to it soon.

d. Check that the ratio MST/MSE follows an F distribution with m-1, n-m degrees of freedom by getting the percentage of the 1000 ratios MST/MSE to the right of $F_{10}, m - n, n - m$ (should be close to 10%); the percentage of 1000 ratios of MST/MSE to the right of $F_{20}, m - n, n - m$ (should be close to 20 %); ….; the percentage of the 1000 ratios MST/MSE to the right of $F_{90}, m - n, n - m$ (should be close to 90 %).