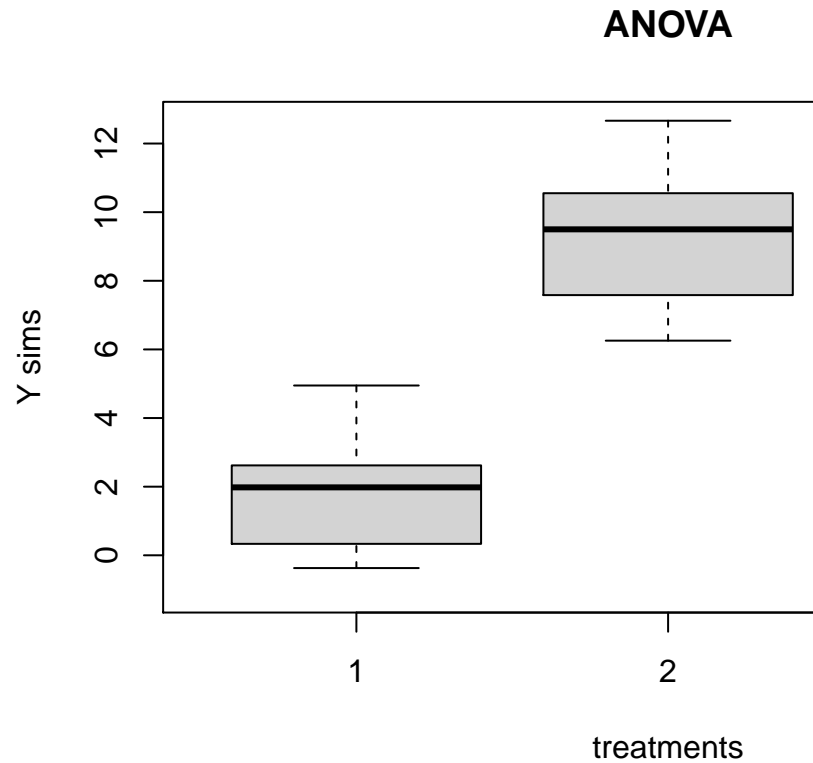# STAT461 HW3

Xiangyu Ren

9/18/2020

```r
treatment = c(rep(1, 10), rep(2, 10), rep(3, 10))
mu = 4.7
sig_s = 4
t1 = -3
t2 = 5
t3 = -2
n = length(treatment)
exp.units = 1:n
treatment.random = sample(treatment)
mean1 = mu + t1
mean2 = mu + t2
mean3 = mu + t3
l1 = treatment.random == 1
l2 = treatment.random == 2
l3 = treatment.random == 3
means = rep(NA, n)
means[l1] = mean1
means[l2] = mean2
means[l3] = mean3
ep = rnorm(n, mean = 0, sd = sqrt(sig_s))
Y = means + ep
boxplot(Y~treatment.random, xlab = "treatments", ylab = "Y sims", main = "ANOVA")
```

Problem 1. Use R to randomly assign 10 experimental units to each of three treatments (1, 2, and 3). Then simulate responses for the 30 experimental units satisfying the one-way ANOVA model:

$$Y_{it} = \mu + \tau_i + \epsilon_{it} \quad i = 1, 2, ..., v \quad t = 1, 2, ..., r_i$$

$$\epsilon_{it} \overset{\text{iid}}{\sim} N(0, \sigma^2)$$

with $\mu = 4.7$, $\sigma^2 = 4$, and treatment effects $\tau_1 = -3$, $\tau_2 = 5$, $\tau_3 = -2$. Your solution should include

ANOVA

your R code and a plot of the simulated values.

```
treatment = c(rep(1, 10), rep(2, 10), rep(3, 10))
mu = 4.7
sig_s = 4
t1 = 0
t2 = 0
t3 = 0
n = length(treatment)
exp.units = 1:n
treatment.random = sample(treatment)
mean1 = mu + t1
mean2 = mu + t2
mean3 = mu + t3
l1 = treatment.random == 1
l2 = treatment.random == 2
l3 = treatment.random == 3
means = rep(NA, n)
means[l1] = mean1
means[l2] = mean2
means[l3] = mean3
ep = rnorm(n, mean = 0, sd = sqrt(sig_s))
Y = means + ep
boxplot(Y~treatment.random, xlab = "treatments", ylab = "Y sims", main = "ANOVA")
```

Problem 2. Consider the situation in Problem 1. The experimenter wants to consider a reduced model where $\tau_1 = \tau_2 = \tau_3 = 0$. Simulate responses for the 30 experimental units satisfying this reduced model. Compare boxplots of simulated responses under this reduced model with boxplots of simulated responses under the full model described in Problem 1 (where there are differences in the treatment effects).

ANOVA