CH7: Inference for comparing Variances

1 Aphid Example

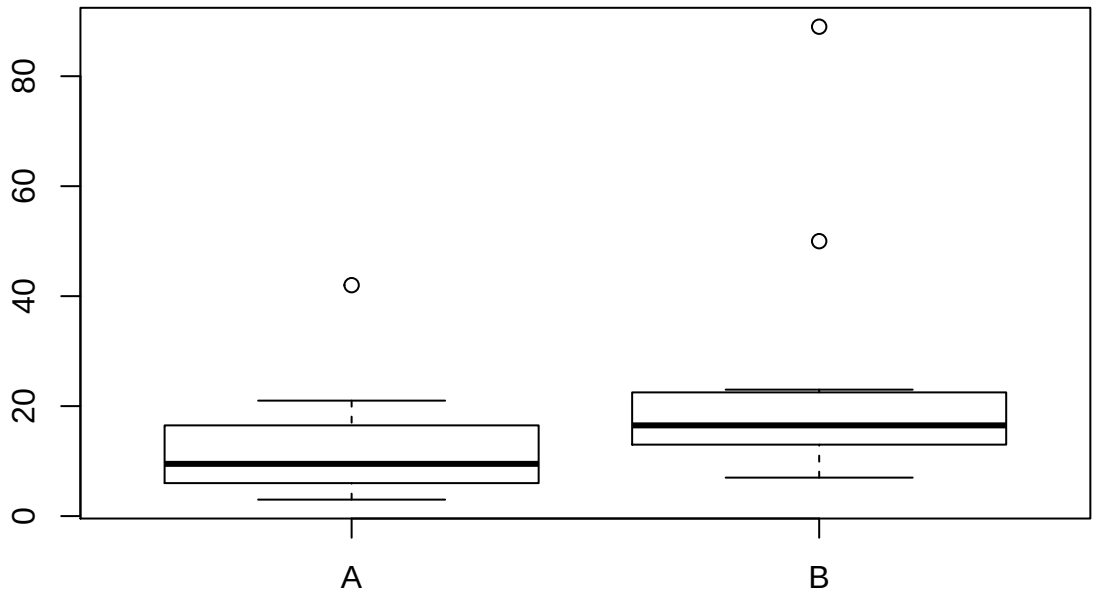
In this example, investigators were interested in comparing median aphid counts for two different treatments. The research goal is addressed using a Wilcoxon two-sample test.

But we use this data to illustrate two different tests of variances: 1. The F-test is used to compare two variances. This test requires assumption of normality, so just for illustration here. 2. Levene's test (or Brown-Forsythe test) is more commonly used to compare two (or more) variances. These tests do NOT require the assumption of normality. Hence, a more reasonable choice for this data.

```
library(car)
library(coin)
Aphids <- read.csv("C:/hess/STAT511_FA11/RData/CH7_Aphids.csv")
str(Aphids)
```

```
## 'data.frame':    24 obs. of  2 variables:
##  $ Trt   : Factor w/ 2 levels "A","B": 1 1 1 1 1 1 1 1 1 1 ...
##  $ Aphids: int  21 12 6 9 10 3 6 19 4 7 ...
```

```
boxplot(Aphids ~ Trt, data = Aphids)
```



1.1 F-test comparing variances

For illustration only. This test requires the assumption of normality, which is not reasonable based on boxplots above (with several outliers).

```
var.test(Aphids ~ Trt, data = Aphids)
```

```
##
##  F test to compare two variances
##
## data:  Aphids by Trt
## F = 0.21818, num df = 11, denom df = 11, p-value = 0.01804
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.06281032 0.75790603
## sample estimates:
## ratio of variances
##          0.2181841
```

1.2 Levene's test comparing variances

This test does NOT require the assumption of normality. It is a commonly used test to compare 2 (or more) variances. The leveneTest() function is from the car package. By default, center = "median" is used and called the Brown-Forsythe test. When we use center = "mean" this corresponds to the "traditional" Levene's test.

```
leveneTest(Aphids ~ Trt, data = Aphids)
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  1  0.7575 0.3935
##       22
```

```
leveneTest(Aphids ~ Trt, data = Aphids, center = "mean")
```

```
## Levene's Test for Homogeneity of Variance (center = "mean")
##       Df F value Pr(>F)
## group  1  1.9425 0.1773
##       22
```

2 Wilcoxon Two-sample (Rank-Sum) test

```
wilcox_test(Aphids ~ Trt, data = Aphids, distribution = "exact")
```

```
##
##  Exact Wilcoxon-Mann-Whitney Test
##
## data:  Aphids by Trt (A, B)
## Z = -2.1693, p-value = 0.02926
## alternative hypothesis: true mu is not equal to 0
```