Analysis of RT distributions with R

Checking the assumptions of ANOVAs

NA1 The *Shapiro-Wilks test* is a test for checking normality. The R command is `shapiro.test(x)`, where `x` is the data. Check out the test for 100 random numbers created by a normal distribution (`rnorm(100, mean = 5, sd = 3)`) and a uniform distribution (`runif(100, min = 2, max = 4)`). Interpret the results.

NA2 To be sure, that the homoscedasticity assumption is not violated, one can perform the *Bartlett test of homogeneity of variances*. The data set `InsectSprays` displays the effectiveness of Insect Sprays.

Use the command `plot(count ~ spray, data = InsectSprays)` to have a look at the spread of the data. Then perform a Bartlett test with the command

`bartlett.test(count ~ spray, data = InsectSprays)`.

Is the result consistent with your gut feeling?

One-way ANOVAs

11.1 The morley data set contains speed-of-light measurements by Michealson and Morley (1887). There were five experiments, each consisting of multiple runs. Perform a one-way analysis of variance to see if each of the five experiments has the same population mean.

11.2 For the data set Cars93 (from package MASS) perform a one-way analysis of variance of MPG.highway for each level of DriveTrain. Does the data support the null hypothesis of equal population means?

11.4 The data set carsafety (package: UsingR) contains car-crash data. For several makes of car the number of drivers killed per million is recorded in Driver.deaths. The number of drivers of other cars killed in accidents with these cars, per million, is recorded in Other.deaths. The variable type is a factor indicating the type of car. Perform a one-way analysis of variance of the model Driver.deaths ~ type.

Is there a difference in population means? Did you assume equal variances? Normally distributed populations?

Repeat with an analysis of variance of the model Other.deaths ~ type. Is there a difference in population means?

11.6 A manufacturer needs to outsource the production of a chemical. Before deciding on a laboratory. A numeric measurement is assigned to each batch. The data is given by:

```
lab1 <- c(4.13, 4.07, 4.04, 4.07, 4.05)
lab2 <- c(3.86, 3.85, 4.08, 4.11, 4.08)
lab3 <- c(4.00, 4.02, 4.01, 4.01, 4.04)
lab4 <- c(3.88, 3.89, 3.91, 3.96, 3.92)
```

Use the command

```
stack(data.frame(lab1, lab2, lab3, lab4))
```

to combine the data into one variable chems.

Check the boxplot for the equal variance assumption. Then perform the appropriate one-way analysis of variance to see if there is a difference in the population means.
