

Analysis of RT distributions with R

Significance testing

NA Use the command `lines()` to overlay plots of the t -distribution (`dt(x, df)`) for the following degrees-of-freedom: 1, 2, 5, 1000. Now overlay a standard normal distribution. Describe what you can see.

8.5 A college bookstore claims that, on average, a college student will pay \$101.75 per class for textbooks. A student group investigates this claim by randomly selecting ten courses from the course catalog and finding the textbook costs for each. The data collected is:

140 125 150 124 143 170 125 94 127 53

Do a test of significance of $H_0: \mu=101.75$ against the alternative hypothesis $H_1: \mu>101.75$. Before you perform the t -test, check for normality in the data by `qqnorm(x)`. What can be concluded?

8.12 In the `babies` (`UsingR`) data set, the variable `dht` contains the father's height. Do a significance test of the null hypothesis that the mean height is 68 inches against an alternative that it is taller. Remove the values of 99 from the data, as these indicate missing data.

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8.15 The data set `normtemp` (`UsingR`) contains measurements of 130 healthy, randomly selected individuals. The variable `temperature` contains normal body temperature. Does the data appear to come from a normal distribution? If so, perform a t -test to see if the commonly assumed value of 98.6°F is correct. (A recent study suggests that 98.2 degrees is actually correct.)

8.16 We can perform simulations to see how robust the t -test is to changes in the parent distribution. For a normal population we can run a simulation with the commands:

```
m <- 250                                # m simulations
n <- 10                                  # with sample size n
res <- c()                               # prepare an empty result variable
for(i in 1:m) res[i] <- t.test(rnorm(n), mu = 0, df = n-1)$p.value
sum(res < 0.05) / length(res)           # proportion of rejections
```

Repeat with exponential data (`rexp(n)` and `mu=1`), uniform data (`runif(n)` and `mu=0.5`) and t -distributed data (`rt(n, df = 4)` and `mu=0`).
