

Lecture Notes

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Chapter 1

Distributions

1.1 How do I get started

The R package `xtable` is useful. For a description of the bootstrap, see Efron (1979). A good book is (Cormen et al., 2009). This is Section 1.1. Check `index.Rmd` to see which R packages are loaded.

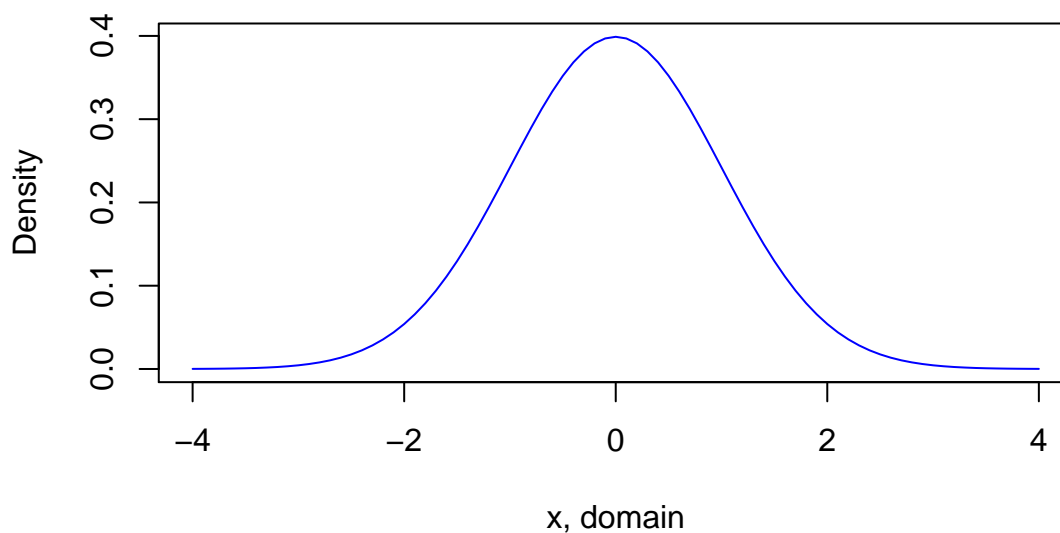
1.2 Normal Distribution

The probability density function for the standard normal distribution is (blanked out):

$$f(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-x^2} dx. \quad (1.1)$$

Equation (1.1) is awesome.

Here is a plot of the probability density function of a standard normal:



1.3 Gamma distribution

The gamma distribution has two parameters, shape k and scale θ , and is denoted $\Gamma(k, \theta)$. Data for a $\Gamma(1, 2)$ distribution can be generated as follows:

```
# We set the seed here
set.seed(1)
k <- 1
ylab <- "Value" # set elsewhere
theta <- 2
x <- rgamma(10, shape=k, scale=theta)
print(x)
#> [1] 0.31028 3.76480 3.60902 1.67236 2.44509 2.31671 1.98004
#> [8] 0.61475 0.18924 0.31440
```

And here is the data plotted in Figure 1.1:

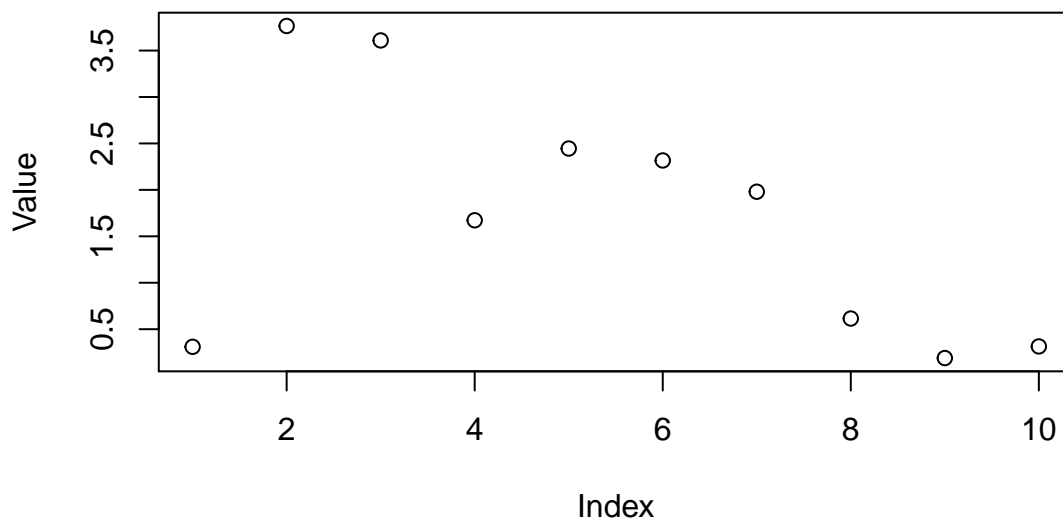
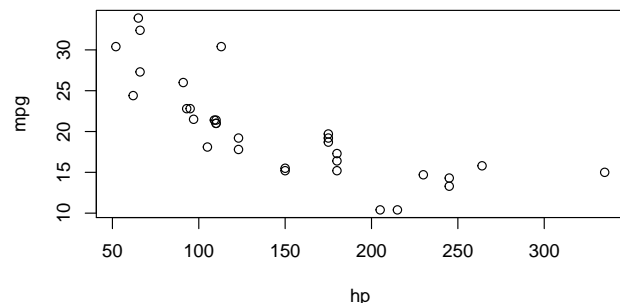


Figure 1.1: Gamma data for $\Gamma(1, 2)$

Figure 1.1 should be above this line.

1.4 Cars

Here is some `cars` data:



(a) A figure caption

	mpg	cyl	disp	hp	drat	wt
<i>Mazda RX4</i>	21	6	160	110	3.9	2.62
<i>Mazda RX4 Wag</i>	21	6	160	110	3.9	2.875
<i>Datsun 710</i>	22.8	4	108	93	3.85	2.32
<i>Hornet 4 Drive</i>	21.4	6	258	110	3.08	3.215
<i>Hornet Sportabout</i>	18.7	8	360	175	3.15	3.44
<i>Valiant</i>	18.1	6	225	105	2.76	3.46

(b) A table caption

Figure 1.2: Caption text for Figure and Table

Look at Figure 1.2, it contains a figure (a) and a table (b).

Here is a box of text, using `ftext` command:

Don't take the following too seriously.

There are three types of lies—lies, damn lies, and statistics. There are three types of lies—lies, damn lies, and statistics There are three types of lies—lies, damn lies, and statistics There are three types of lies—lies, damn lies, and statistics There are three types of lies—lies, damn lies, and statistics

See the code for this ‘align’ example for an example of creating a gapped ‘align’.

Here is an aligned equation, need to use in `ftext`:

$$y = 2 \tag{1.2}$$

$$z = 2 \tag{1.3}$$

Equation (1.2) is blank in an align environment.

Using `fequation`:

$$t = 1 \tag{1.4}$$

It might be useful to include notes on the side, in the margin. These can be done using `sidenote`. Here is an example of a sidenote And more text goes here, and one can read the note in the margin to remember certain points.

1.5 tikz figures

Here is a figure created using `tikz`, which creates an intermediate tex and pdf.

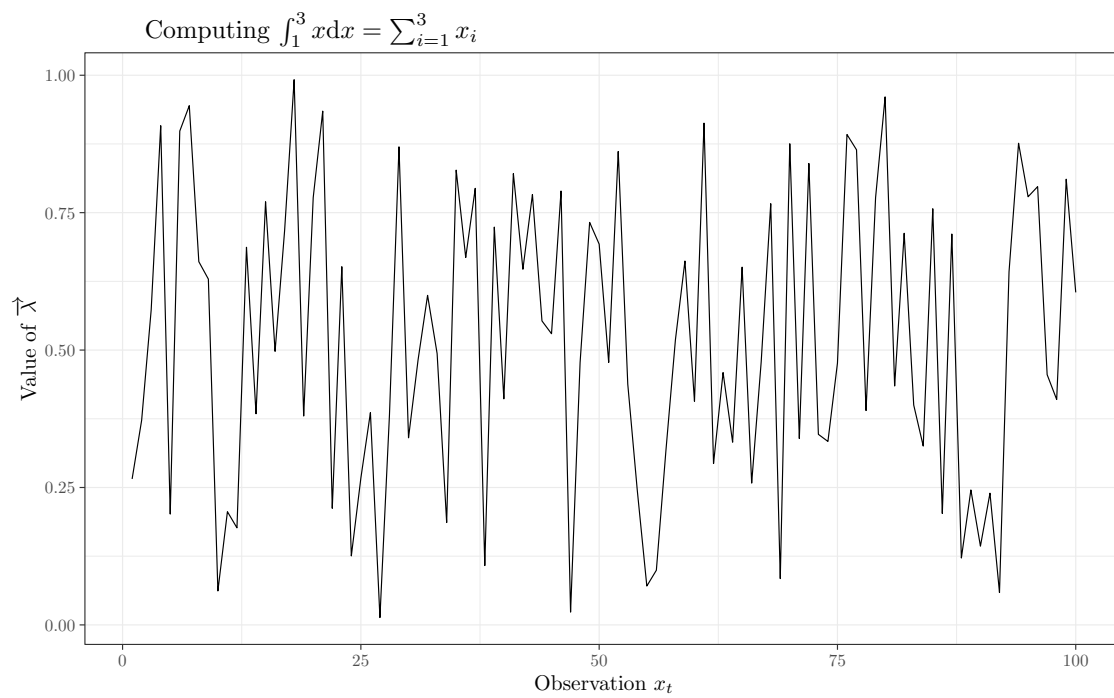


Figure 1.3: Caption for tikz figure showing $\vec{\lambda}$, and with a sum $\sum_{i=1}^3 x_i$.

Bibliography

Cormen, T. H., Leiserson, C. E., Rivest, R. L., and Stein, C. (2009). *Introduction to Algorithms*. MIT Press, 3rd edition.

Efron, B. (1979). Bootstrap methods: Another look at the jackknife. *The Annals of Statistics*, 7(1):1–26.