Appendix A
Switching from Matlab to R

Most analysts find that it is not difficult to switch from Matlab to R, especially if a few key differences are kept in mind. This appendix provides a list of such differences, gleaned from the experience of the author and his colleagues (especially Clark Richards, who helped to compile the list).

Syntax

1. Assignment to a variable is denoted with "=" in Matlab, but with "`<-`" in R. (Actually, it *is* possible to use "=" for R assignment, but not recommended.)
2. In R, assignment statements do not print their value, so there is no need for the Matlab convention of using "`;`" for silencing an assignment.
3. In R, as in most modern languages *except* Matlab, square brackets are used for indexing; see Sect. 2.3.4.
4. R matrices are not constructed with a square-bracket syntax, but rather with `matrix()`, `as.matrix()`, `cbind()` or `rbind()`; see Sect. 2.3.5.
5. In Matlab, vectors (one-dimensional sequences of values) are often represented as single-column matrices. The same form can be used in R, but most functions work with vectors, instead. The `drop()` function, which drops unused matrix dimensions, helps to convert Matlab data to R format, e.g. the following shows how to create vectors for regression with `lm()`.

```
library(R.matlab)
m <- readMat("filename.mat")
x <- drop(m$x)
y <- drop(m$y)
lm(y ~ x)
```

6. R coerces arrays to a lower dimension whenever it can (Sect. 2.3.5.2), but the `drop=FALSE` argument can override this, e.g.

D. E. Kelley, *Oceanographic Analysis with R*,
https://doi.org/10.1007/978-1-4939-8844-0

```
a <- matrix(1:10, nrow=2)
a[1,]                                    # a vector
 [1] 1 3 5 7 9
```

yields a vector, whereas

```
a[1,,drop=FALSE]                        # a 1-row matrix
     [,1] [,2] [,3] [,4] [,5]
[1,]    1    3    5    7    9
```

yields a one-row matrix. (Note the second comma in the `drop=FALSE` case.)

7. Matrix multiplication in R uses the `%*%` operator, while the `*` operator does item-by-item multiplication. See Sect. 2.3.5.1 for this and other matrix operations.
8. In Matlab, a period in a variable name indicates the selection of a subcomponent of a structure. In R, a period in a variable name is generally taken to have no particular meaning *except* for generalized functions. See Sect. 2.3.2.
9. The `q()` function is called to exit R. Since this is a function call, the parentheses are required. Dropping the parentheses yields a cryptic message that does little to suggest that R is a friendly language!

Graphics

1. In Matlab, `hold on` is used to indicate a desire to embellish an existing plot. Instead, R provides a suite of functions whose whole purpose is to add to existing plots, such as `points()` for adding points, `lines()` for adding lines, `title()` for adding titles, `legend()` for adding legends, `mtext()` for writing in plot margins, etc., plus an `add` argument to `contour()` and a few other functions to make them add to an existing plot; see Sect. 2.4.
2. Matlab offers better interactive control of plots than is available in the basic R graphics system, although the `shiny` package makes up for this, at some coding cost. See Sects. 2.4.15 and 2.8, plus Appendix B.
3. Matlab produces "flashier" default graphics, e.g. automatically using colours to distinguish between lines on a plot. The R strategy is to produce more utilitarian black/white default plots, in accordance with the tenets outlined by Cleveland and McGill (1984) and others who have studied the interpretation of graphical material. R also offers colour schemes that are suitable for viewers with vision limitations (Ihaka 2003; Light and Bartlein 2004; Zeileis et al. 2009).

Freedom

1. Matlab is a commercial product, sold at a price that is significant to many research groups and is likely to be prohibitive to those "citizen scientists" who might wish to use code provided in the supplemental materials of research papers. R costs nothing.

2. Portions of Matlab are in closed-source form, making it difficult for users to check the methods for veracity or appropriateness. The entire R source is open to inspection.
3. Matlab is covered by commercial licences that may be untoward in some circumstances. R is covered by a GNU license.