Introduction to Markdown and knitr

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Contents

What is Markdown?

- Markdown is a (simple) markup language for creating formatted text using a plain-text editor.
- R Markdown is a free, open source tool that is installed like any other R package.
- In fact, you need the *rmarkdown* package, but you don't need to explicitly install it or load it, as RStudio automatically does both when needed.
- It enables you to keep all of your code, results, plots, and writing in one place.
- It allows you to export your work to numerous formats including PDF, Microsoft Word, a slideshow, or an HTML document for use in a website.
- Some examples are given below, but see also the *Markdown Quick Reference* in the *Help*

1. YAML header

YAML header is a short blob of text, specially formatted with `key: value` pairs tags, that seats at the top of an Rmarkdown document. It is demarcated by three dashes `---` on either end. Instances of YAML arguments are "title", "author", and "output".

2. Markdown syntax

2.1 Headers

This is how to obtain *headers* of different size

Header level 1

Header level 2

Header level 3

Header level 4

Header level 5 Header level 6

2.2 Italic and Bold

This is *italic text*

This is also *italic text*

This is **bold text**

This is also **bold text**

And this is ***both bold and italic text***

And this is also ***both bold and italic text***

Markdown applications don't agree on how to handle underscores in the middle of a word. For compatibility, use asterisks to bold and italicize the middle of a word for emphasis.

Note that, as explained below, if you use the `RStudio's visual markdown editor`, then underscores (_) will be converted into asterisks (*).

2.3 Highlighted text and rules

You can also highlight a text using a pair of backticks so that 'like this' will be printed as `like this`

An horizontal rule can be obtained with `***`

---

but also with `---`

---

or with `___`

2.4 Ordered lists

These is how to do an ordered list:

1. the first item
2. the second item
3. the third item
    - one unordeded sub-item

    - one unordered sub-item

This is an unordered list:

- the first unordered item
- the second unordered item
- the third unordered item
    - the first unordered sub-item
    - the second unordered sub-item

2.5 Backslash

There are multiple ways to add a blank line in markdown. One way is to use the backslash (\) symbol. For example you can add two blank lines. . .

. . . like this.

Another use of backslash escapes is to generate literal characters which would otherwise have special meaning in Markdown's formatting syntax. For example, if you wanted to surround a word with literal asterisks you can use backslashes before the asterisks, like this,

literal asterisks

because otherwise asterisks are use for italic fonts, like this: *literal asterisks*.

2.6 Links

To turn a URL or an email address into a link, enclose it in angle brackets,

https://www.google.it/

or you can enclose the link text in brackets and then follow it immediately with the URL in parentheses, like this:

My favorite search engine is GOOGLE

2.7 Writing math

LaTex equations, inline, like this $\sqrt{\frac{1}{\pi}}$ or displayed like this

$$f(x) = \lambda e^{-\lambda x}$$

A pair of tildes (~) turn text to a subscript, e.g., H_3PO_4. A pair of carets (^) produce a superscript, e.g., Cu^{2+}.

2.8 Tables

To add a table, use three or more hyphens (—) to create each column's header, and use pipes (|) to separate each column. For compatibility, you should also add a pipe on either end of the row.

You can align text in the columns to the left, right, or center by adding a colon (:) to the left, right, or on both side of the hyphens within the header row.

Example	Of	Table
col 1 is	left-aligned	$1600
col 2 is	centered	$12
col 3 is	right-aligned	$1

3. knitr

- Is an engine for dynamic report generation with R. It is a package in the programming language R that enables integration of R code into `LaTeX`, LyX, HTML, `Markdown`, AsciiDoc, and reStructuredText documents.
- The basic idea in knitr is that your regular text document will be interrupted by `chunks` of code delimited in a special way.

```
paste("Hello", "World")
```

```
## [1] "Hello World"
```

```
rnorm(1:5)
```

```
## [1] -1.3189482 -2.6500694  0.7049432  0.2264680 -0.6577413
```

It is possible to add a chunk name inside braces after the `r`.

```
paste("Hello", "World")
```

```
## [1] "Hello World"
```

```
rnorm(1:5)
```

```
## [1] -1.6405591  0.8367641  0.2930938  1.0092509 -0.7921122
```

The chunk name is not necessarily required however, it is good practice to give each chunk a unique name to support more advanced knitting approaches. Furthermore, in the RStudio IDE, you can navigate to specific chunks. Open the code chunk navigation window, located in the bottom left-hand side of the Source pane.

3.1 Some chunk options

If `echo=FALSE` knitr will not display the code in the final document, but the results will appear in the final document. This is a useful way to embed figures.

```
## [1] "Hello World"
```

```
## [1] -0.7753653 -1.7483372  0.2933729 -0.8444698  0.7462586
```

If `eval=FALSE` then knitr will not run the code chunk

```
paste("Hello", "World")
rnorm(1:5)
```

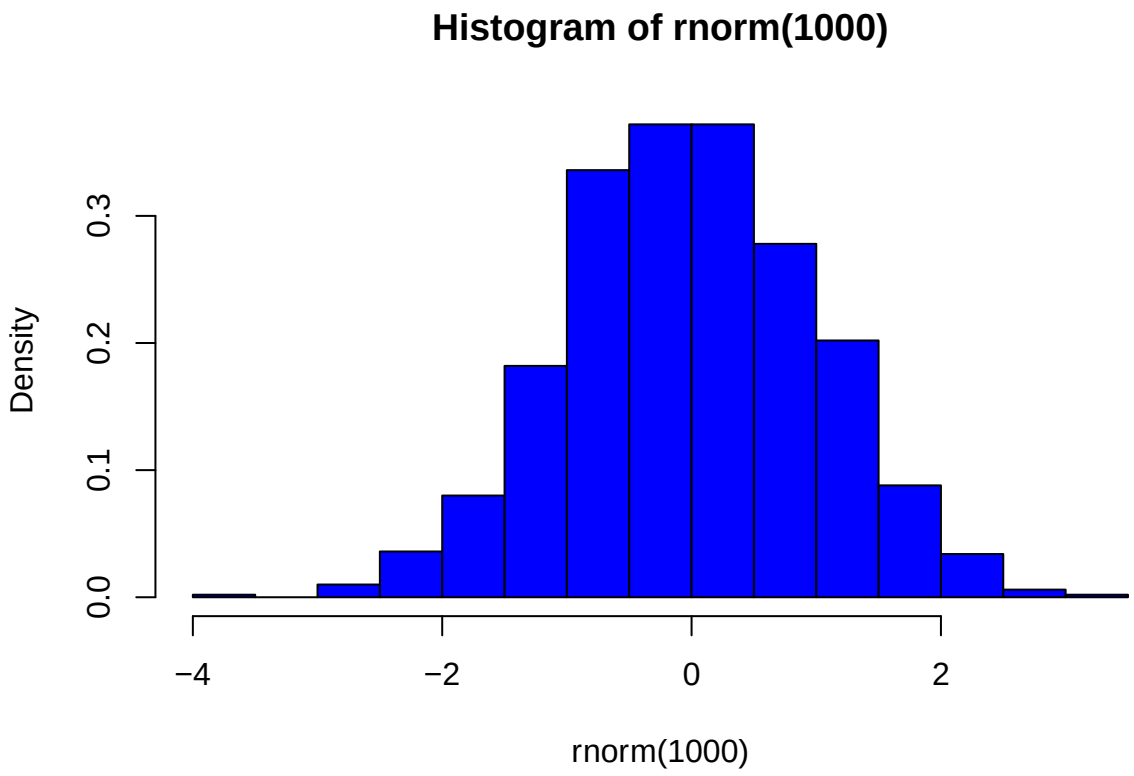
If `include=FALSE` knitr will run the chunk code but not include the chunk in the final document. However, the results can be used by other chunks.

3.2 Inline R code

Inline R code is embedded in the narratives of the document using the syntax ‘ r ‘, for example ‘ r sqrt(9)*3‘ will result in the output 9.

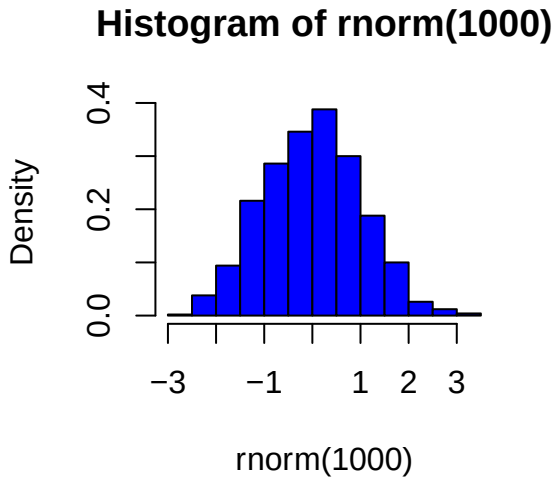
3.3 Figures

```
hist(rnorm(1000), freq= FALSE, col="blue")
```



some options for plots

```
hist(rnorm(1000), freq= FALSE, col="blue")
```



3.4 Tables

By default, R Markdown displays data frames and matrices as they would be in the R terminal.

```
library(ISLR2)
data(Auto)
Auto[1:5,]
```

```
##   mpg cylinders displacement horsepower weight acceleration year origin
## 1  18         8          307        130   3504         12.0   70      1
## 2  15         8          350        165   3693         11.5   70      1
## 3  18         8          318        150   3436         11.0   70      1
## 4  16         8          304        150   3433         12.0   70      1
## 5  17         8          302        140   3449         10.5   70      1
##                       name
## 1 chevrolet chevelle malibu
## 2         buick skylark 320
## 3        plymouth satellite
## 4             amc rebel sst
## 5               ford torino
```

If you prefer that data be displayed with additional formatting you can use the function `kable()` in the package `knitr`

```
library(knitr)
kable(Auto[1:5,], format = "simple")
```

mpg	cylinders	displacement	horsepower	weight	acceleration	year	origin	name
18	8	307	130	3504	12.0	70	1	chevrolet chevelle malibu
15	8	350	165	3693	11.5	70	1	buick skylark 320
18	8	318	150	3436	11.0	70	1	plymouth satellite
16	8	304	150	3433	12.0	70	1	amc rebel sst
17	8	302	140	3449	10.5	70	1	ford torino

```
#
# "c"enter, "l"eft and "r"ight alignment of columns
#
kable(Auto[1:5,], format = "simple", align = "clrclrccl")
```

mpg	cylinders	displacement	horsepower	weight	acceleration	year	origin	name
18	8	307	130	3504	12.0	70	1	chevrolet chevelle malibu
15	8	350	165	3693	11.5	70	1	buick skylark 320
18	8	318	150	3436	11.0	70	1	plymouth satellite
16	8	304	150	3433	12.0	70	1	amc rebel sst
17	8	302	140	3449	10.5	70	1	ford torino

```
#
# change column names
#
kable(Auto[1:5,], format = "simple", align = "clrclrccl", col.names = LETTERS[1:9])
```

A	B	C	D	E	F	G	H	I
18	8	307	130	3504	12.0	70	1	chevrolet chevelle malibu
15	8	350	165	3693	11.5	70	1	buick skylark 320
18	8	318	150	3436	11.0	70	1	plymouth satellite
16	8	304	150	3433	12.0	70	1	amc rebel sst
17	8	302	140	3449	10.5	70	1	ford torino

4 RStudio's visual markdown editor

The RStudio IDE includes a visual markdown editor that displays changes in real-time and provides support for technical writing.

To switch into the visual mode for a markdown document click the "Visual" button located on the left side of the editor toolbar.

Visual editing mode generates markdown using Pandoc, that is an open-source document converter. This means that in some cases your markdown will be rewritten to conform to standard Pandoc idioms. That is, **the Pandoc generated markdown that might differ from your own markdown writing style**.