

Dynamic Reporting

Workshop

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Reporting Dynamically

- ▶ Usually, quantitative analysis in an R script & narrative in separate documents (e.g., Word)
- ▶ Why not integrate both into a single document to combine analysis & text in a structured way?



What is R Markdown?

- ▶ Generates reproducible documents
 - ▶ Markdown is a simple way to format text
 - ▶ Markup language for creating dynamic documents that combine text, code, and outputs
 - ▶ Code chunks, narrative outside/around of chunks

```
12 - ## R Markdown
13
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS
15 Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.
16
17 When you click the **Knit** button a document will be generated that includes both content as well as the
18 output of any embedded R code chunks within the document. You can embed an R code chunk like this:
19
20 summary(cars)
21
22 ## Including Plots
23
24 You can also embed plots, for example:
25
26 ```{r pressure, echo=FALSE}
27 plot(pressure)
28 ---
29
30 Note that the echo = FALSE parameter was added to the code chunk to prevent printing of the R code that
31 generated the plot.
```

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the Knit button a document will be generated that contains the code within the document. You can embed an R code chunk like this:

www.wiley.com

```

##      speed          dist
## Min. : 4.0   Min. : 2.00
## 1st Qu.:12.0  1st Qu.:26.00
## Median :15.0  Median :36.00
## Mean   :15.4   Mean   :42.98
## 3rd Qu.:19.0  3rd Qu.:56.00
## Max.  :25.0   Max.  :120.00

```

Including Plots

You can also embed plots, for example:



Rmarkdown

TEXT. CODE. OUTPUT.
(GET IT TOGETHER, PEOPLE.)



Artwork by @allison_horst

Navigate in R Markdown

The screenshot shows the RStudio interface with the following components:

- Knit document**: A button in the top toolbar.
- Metadata (YAML)**: A section on the left containing the YAML front matter of the R Markdown file.
- Code**: A section on the left containing the R code of the document.
- Text**: A section on the right containing the main text body of the document.
- R Resources**: A section on the right listing various R-related resources.
- Posit Support**: A section on the right listing support resources for the RStudio IDE.
- Manuals**: A section on the right listing R-related manuals.
- Reference**: A section on the right listing R-related reference materials.

The R code section contains the following code:

```
1 ---  
2 title: "Causal Inference and Public Policy in Europe - Assignment 1"  
3 author: "Flynn Schirett"  
4 date: "today"  
5 output: pdf_document  
6 geometry: "left=2cm,right=2cm,top=2cm,bottom=2cm"  
7 latex_engine: xelatex  
8 ---  
9  
10 ## [1] include=FALSE  
11 # Import data  
12 ess <- read.csv("france_ess.csv")  
13 # Load necessary packages  
14 library(dplyr)  
15 library(ggplot2)  
16 library(rdrobust)  
17 library(rddtools)  
18 library(cdd)  
19 library(XkcdExtra)  
20 library(gridExtra)  
21 library(psych)  
22 ...  
23  
24 # Introduction  
25 On January 7, 2015, the office of the satirical magazine Charlie Hebdo suffered a terrorist attack by two Islamists. Twelve people have been killed and eleven injured. Not only did this ignite immediate political consequences, but it also unleashed a wave of violence against Muslim institutions and general right-wing protests. For instance, 54 Islamophobic incidents have been reported only a week after the attack. At the same time, this opened the door to overall xenophobia, going beyond the religious dimension. Therefore, it seems likely that attacks on the Muslim community and general hostility to supposedly foreigners could be an expression of a causal link to the Islamist attack (Wikimedia, 2024).  
26  
27 In line with Silva (2018), I estimate a causal effect of the Charlie Hebdo Islamist incident on xenophobic and anti-Muslim attitudes by utilizing a Regression Discontinuity Design (RDD) as my identification strategy. With the help of European Social Survey (ESS, 2018) data, my research investigates whether the Charlie Hebdo terrorist attack shapes xenophobic and anti-Muslim attitudes in France. Accordingly, I formulated my research question:  
28 ## Research Question  
29  
30 ---  
31
```

The R console at the bottom shows the command `knitr::knit()` being run.

Navigate in R Markdown

The screenshot shows the RStudio interface with a R Markdown document open. The code editor on the left contains R code for a document titled "Causal Inference and Public Policy in Europe - Assignment 1". The preview pane in the center shows the rendered text and images from the document. The right sidebar contains "R Resources" and "RStudio" sections.

Code in the Source tab:

```
1 ---  
2 title: "Causal Inference and Public Policy in Europe - Assignment 1"  
3 author: "Flynn Schirett"  
4 date: "today"  
5 output: pdf_document  
6 geometry: "left=2cm,right=2cm,top=2cm,bottom=2cm"  
7 latex_engine: xelatex  
8 ---  
9  
10 ## [1] include=FALSE  
11 # Import data  
12 ess <- read.csv("france_ess.csv")  
13 # Load necessary packages  
14 library(dplyr)  
15 library(ggplot2)  
16 library(rdrobust)  
17 library(rddtools)  
18 library(rdd)  
19 library(xtableExtra)  
20 library(gridExtra)  
21  
22 Causal Inference and Public Policy in Europe - Assignment 1  
23  
24 # Introduction  
25  
26 D Theory & Hypotheses  
27  
28 h Chunk 2  
29  
30 v Research Design  
31  
32 T Data, Dependent Variables & Controls  
33  
34 e Chunk 3  
35  
36 I Chunk 4  
37  
38 g DEPENDENT VARIABLES  
39  
40 S Chunk 5  
41  
42 c COVARIATES
```

Preview pane content:

The Charlie Hebdo suffered a terrorist attack by two Islamists. Twelve people ignited immediate political consequences, but it also unleashed a wave of wing protests. For instance, 54 Islamophobic incidents have been reported opened the door to overall xenophobia, going beyond the religious dimension. Community and general hostility to supposedly foreigners could be an (ipedia, 2024).

If the Charlie Hebdo Islamist incident on xenophobic and anti-Muslim in (R00) as my identification strategy. With the help of European Social over the Charlie Hebdo terrorist attack shapes xenophobic and anti-Muslim research question:

Console output:

```
7:22 Causal Inference and Public Policy in Europe - Assignment 1 : R Markdown  
Console Terminal × Background Jobs × R 4.4.2 - ~/Desktop/Uni Koeln/FSS 2024/Causal Inference/Assignments/assignment_files/Ablage/ #  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.
```

Browsing your document

R Resources

- Learning R Online
- CRAN Task Views
- R on StackOverflow
- Getting Help with R

RStudio

- Posit Support
- Posit Community Forum for the RStudio IDE
- Posit Cheat Sheets
- Posit Packages
- Posit Products

Manuals

- An Introduction to R
- The R Language Definition
- Writing R Extensions
- R Installation and Administration
- R Data Import/Export
- R Internals

Reference

Metadata: YAML

- ▶ Acronym: *YAML Ain't Markup Language*

```
---
```

```
title: "My Title"
author: "My Name"
date: "31 March 2025"
output: pdf_document
---
```

- ▶ `Output` option is the only element you **must** specify,
everything else is optional

Headers

- ▶ Headers are created with the **hash sign**

```
# A title  
## A subtitle  
### A subsubtitle  
#### A subtitle
```

A title

A subtitle

A subsubtitle

A subtitle

Text

- ▶ Format text with [asterisks](#)

Today, we learn what **R Markdown** is.

*Today, we learn what **R Markdown** is.*

Lists

1. Denmark
2. Sweden
3. Norway

Ordered lists:

1. Denmark
2. Sweden
3. Norway

- Denmark
- Sweden
- Norway

Unordered lists:

- ▶ Denmark
- ▶ Sweden
- ▶ Norway

Links

- ▶ Insert links in R Markdown like this:

```
[University of Copenhagen] (https://www.ku.dk/en)
```

- ▶ University of Copenhagen

Code

- ▶ Write code in **code chunks**

```
```{r}
x = 2
x * 3
```
```

```
x = 2
x * 3
```

```
## [1] 6
```

- ▶ Shortcut: Code chunk with `Ctrl + Alt + I` or
`Command + Option + I`
- ▶ Mandatory: `r` between brackets sets language

Code in Text

- ▶ Or: Write code [inline](#)

```
X times three equals `r x * 3`
```

- ▶ X times three equals 6

Chunk Labels

- ▶ Labelling your chunks helps to identify them
- ▶ Very helpful when navigating through your document or resolving errors
- ▶ Labels are defined in the chunk header between curly braces

```
```{r label-1}
```

```

```

**Labels have to be unique, otherwise R will return an error!  
Don't use spaces or underscores!**

# Chunk Options

```
```{r label, optionx = value, optiony = value}  
...  
```
```

- ▶ `include` determines whether the code and its results are included in the knitted document ('TRUE'/'FALSE')
- ▶ `echo` determines whether code is displayed ('TRUE'/'FALSE')
- ▶ `error` determines whether error messages are shown ('TRUE'/'FALSE')
- ▶ `warning` determines whether warning messages are shown ('TRUE'/'FALSE')
- ▶ `message` determines whether messages are shown ('TRUE'/'FALSE')
- ▶ `eval` determines whether code is run ('TRUE'/'FALSE')

## Global Chunk Options

- ▶ Define global options for all chunks that follow

```
```{r global_options, include=FALSE}
knitr::opts_chunk$set(message=FALSE, warning=FALSE)
...``
```

- ▶ Therefore: Place right after YAML header

Figure Chunk Options

- ▶ `fig.align` determines positioning of the figure in output ('left', 'right', or 'center')
- ▶ `fig.cap` adds a title to the figure.
- ▶ `fig.width` & `fig.height` define figure size in R (in inches)
- ▶ `out.width` & `out.height` adjust figure size in knitted file (in %)

```
```{r figure1, fig.align = 'center', fig.cap = "Figure 1",
fig.height = 6, out.height = 60%}
ggplot + ...
```
```

Tables

- ▶ Use `kable()` from the `knitr` package

```
library(knitr)  
kable(iris[1:5, ])
```

| Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|--------------|-------------|--------------|-------------|---------|
| 5.1 | 3.5 | 1.4 | 0.2 | setosa |
| 4.9 | 3.0 | 1.4 | 0.2 | setosa |
| 4.7 | 3.2 | 1.3 | 0.2 | setosa |
| 4.6 | 3.1 | 1.5 | 0.2 | setosa |
| 5.0 | 3.6 | 1.4 | 0.2 | setosa |

Table Options

- ▶ `digits` rounds numeric values
- ▶ `align` sets alignment of columns ('l', 'c', 'r')
- ▶ `col.names` changes column headers
- ▶ `caption` adds a table caption
- ▶ Use `kableExtra` for advanced styling

```
kable(iris[1:5, ], digits = 0, align = 'c')
```

| Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|--------------|-------------|--------------|-------------|---------|
| 5 | 4 | 1 | 0 | setosa |
| 5 | 3 | 1 | 0 | setosa |
| 5 | 3 | 1 | 0 | setosa |
| 5 | 3 | 2 | 0 | setosa |
| 5 | 4 | 1 | 0 | setosa |

Output



Artwork by @allison_horst

Now it's your turn!

- ▶ Install *R Markdown* (if you haven't already)
- ▶ Download the worksheet and dataset from **Absalon**
- ▶ Use the cheatsheet and our slides for help
- ▶ Start solving the tasks!

References

- ▶ Alison Hill's *An Introduction to R Markdown*
- ▶ Alex Douglas, Deon Roos, Francesca Mancini, Ana Couto & David Lusseau (2024). *An Introduction to R – Chapter 8: Reproducible Reports with R Markdown*
- ▶ Yihui Xie, J. J. Allaire, Garrett Grolemund (2023). *R Markdown: The Definitive Guide*