Using R-Markdown for your Statistics and Econometrics Homework

Gustavo Rojas-Matute
American University
gr4422a@american.edu

This tutorial provides students with basic tools needed to work with R Markdown. You need a basic knowledge of R/R-Studio: https://tinyurl.com/intro-R-F19 or any other language compatible with R Markdown like Python and SQL.

When we are finished you will:

- Learn how to install R Markdown
- Understand the types of content in R Markdown
- Create basic reports in R Markdown combining narrative with codes
- Insert code chunks
- Insert tables, plots and linear regressions
- Include bibliography in R Markdown reports

Introduction

In statistics and econometric courses it is very common to submit homework or final projects that include a report. Instructors also may request the script be reproducible.

R Markdown is very versatile tool for researchers since allows the combination of codes and narratives to produce high quality reports in different formats including: pdf, html, word, beamer presentations, etc.

R Markdown Definition

Markdown is a 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 includes both content as well as the output of any embedded R code chunks within the document.

Installation

Like other R packages, the installation of R Markdown is as usual:

```
install.packages("rmarkdown")
```

Starting R Markdown in R Studio

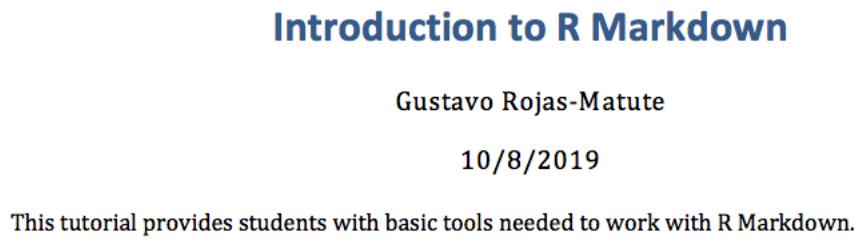
Go to RStudio: File -> New File -> R Markdown

Like in the example below, you will see A YAML header surrounded by three dashes "-", where the author can specify: title, author, institution, date, abstract, and type of document or output (word_document, html_document, pdf_document, etc).

```
---
title: '**Introduction to R Markdown**'
author: "Gustavo Rojas-Matute"
date: "10/8/2019"
output: word_document
bibliography: bibtest.bib
institution: "American University"
abstract: " This tutorial provides students with basic tools needed to work with R Markdown."
---
```

In this example, I also include a bibliography and specify the bib file, which needs to be in the same directory of the R Markdown document.

Here are the output for *word_document* and *pdf_document*:



Introduction to R Markdown

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10/8/2019

Abstract

This tutorial provides students with basic tools needed to work with R Markdown.

Embedding Codes

In the document, you can include code chunks surrounded by three back ticks like “```”. The language of the code is specified inside the curly brackets “{r}”. In this example I use R, but you can use other languages like Python.

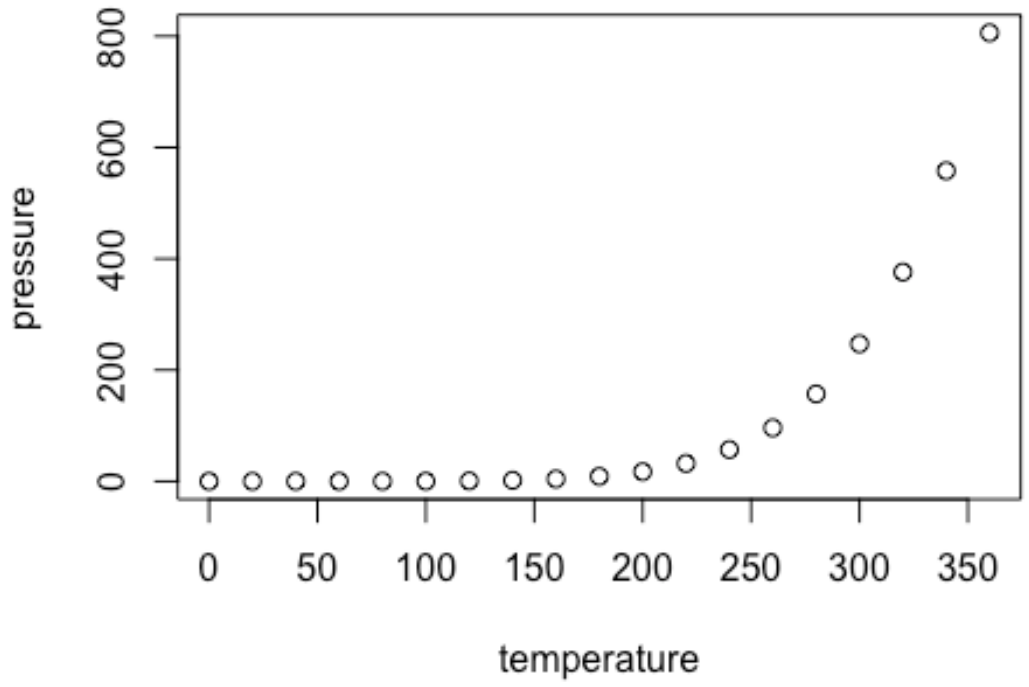
```
```{r cars}

summary(cars)

```
```

The output of the summary is:

```
summary(cars)

##      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
```

Now try to include a plot by embedding the following code:

```
```{r pressure, echo=FALSE}

plot(pressure)

```
```

The following figure is the output you will get:



Finally, let's include a regression:

```{r}
reg1 = lm(pressure ~ temperature , data = pressure)

summary(reg1)
```

The final output you will get:

```
##
## Call:
## lm(formula = pressure ~ temperature, data = pressure)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -158.08 -117.06  -32.84   72.30  409.43
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) -147.8989    66.5529  -2.222 0.040124 *
## temperature    1.5124     0.3158   4.788 0.000171 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 150.8 on 17 degrees of freedom
## Multiple R-squared:  0.5742, Adjusted R-squared:  0.5492
## F-statistic: 22.93 on 1 and 17 DF,  p-value: 0.000171
```

ggplot charts

You may also want to improve the visualization of data in your reports and homework by using ggplot2. Try the following code using data from *cars.*

```
```{r ggplot2-chart, echo=FALSE}

library(ggplot2)

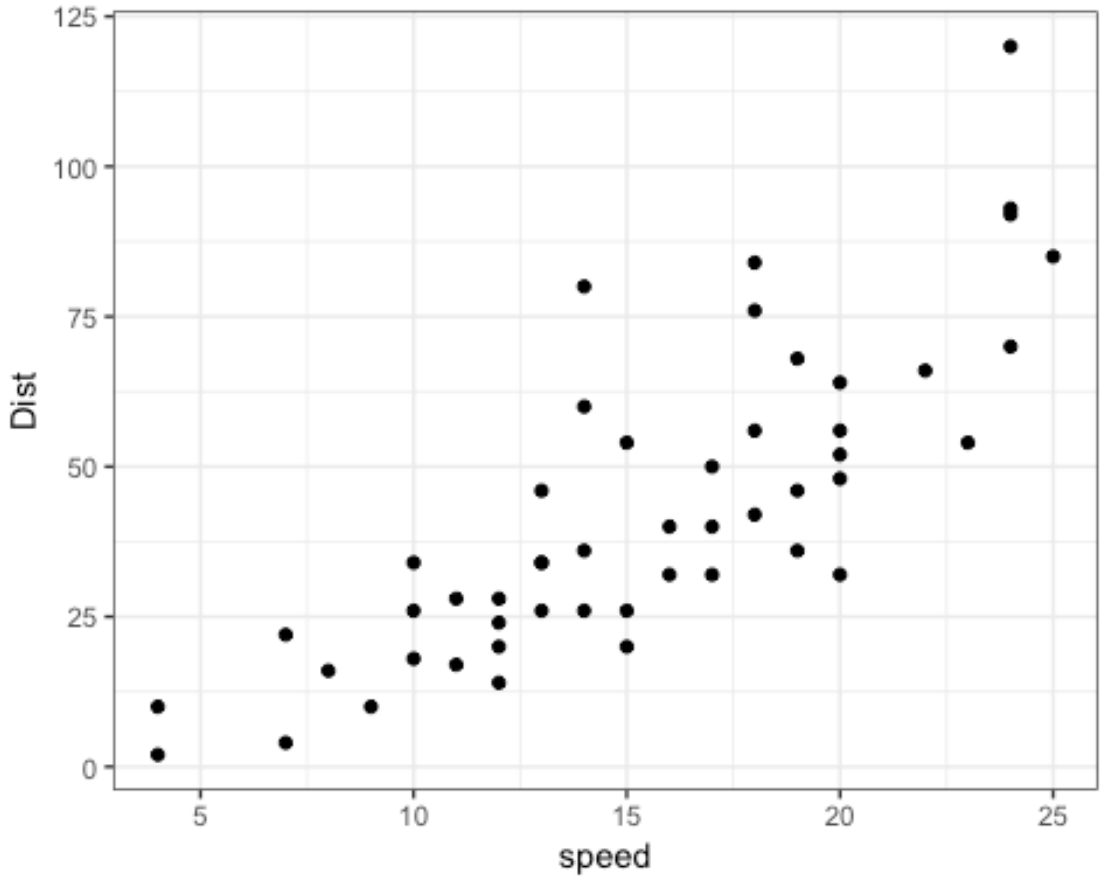
ggplot(cars, aes(x=speed, y =dist)) + geom_point()+

  theme_bw()+

  labs(x = "speed", y = "Dist")

```
```

To obtain the following figure:



Including References

Once you have created your bib file, you can cite a reference using @ and the citation key:

```
@xie2019
```

The output of the citation is: Yihui Xie (2019) and at the end of the document you will see the reference:

Yihui Xie, Garrett Grolemund, J. J. Allaire. 2019. *R Markdown: The Definitive Guide*. https://bookdown.org/yihui/rmarkdown/.

Be sure that “bookdown” package is installed.

Excercises

1. Try your first R Markdown document using these guidelines and click the **Knit** button.
2. Go to the header and replace “html_document” by “pdf_document”. Repeat it with “pdf_document” and “beamer_presentation”.