Week 1 Lab

Intro to R and R Studio

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About Me

- Second year Economics PhD student
- Fields are environmental and behavioral economics
- Current research focuses on natural disasters and agriculture

Contact Info

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Goals for the Labs

- Learn basic CS skills needed to be an econemetrician
- Gain a toolset that can be used after graduation
- Get information in order to complete homework sets

Goals for Today

1. Open a Project in **R** and understand the environment
2. Use **R Script** for coding and mathematics
3. Use **R Markdown** to make a PDF with embedded code (Great for doing homework and data projects!)
4. If time, learn about packages and other features of **R**

What is a Project?

- Creates a Folder on your computer to store files, data, images, and other items.
- Allows you to easily access files with little code
  - Uploading data when file is in a Project :
  - `data ← read_excel("sw_1989_data.xls")`
- Can be very tedious without a project
  - Uploading data without a project:
  - `data ← read_excel("C:\\Users\\mdwoo\\Documents\\Oregon\\Year 2\\Time Series\\Problem Set 8 and 9\\sw_1989_data.xls")`

Steps to open a project

1. Open **R** Studio on your computer
2. Click on the "File" tab and select "New Project"
3. In the popup window select "New Directory" -> "New Project"
4. On the "New Project" Page name your project, choose a location to store it, and then click "Create Project"

The Environment of R

Console:

- Place where you can type code but doesn't save it.
- Automatically runs if you press enter.
- Errors from Script and chunks in Markdown will show here

Render:

- Shows errors from knitting

Environment:

- Shows any object that has been saved: data, values, and functions

The Environment of R

Files:

- Shows files on your computer
- When in a project shows project directory
- Can import data from here

Plots:

- Shows any plots you have generated in the console

Help

- Can search different function
- Function must be in a package that is installed

Using R Script

- A Script allows you to write and store code to be used at any time.
- In a script you can:
  - Create object such as vectors and matrices
  - Solve math problems
  - Clean Data
  - Run Regressions
  - Plot graphs
- To open a new script click "File" -> "New File" -> "R Script"

Using R Script

Vectors and Index

Create a vector, a single row of 7 observations.

```
world.pop ← c(2525779,3026003,3691173,4449049,5320817,6127700,6916183)
world.pop
```

```
#> [1] 2525779 3026003 3691173 4449049 5320817 6127700 6916183
```

Combine two vectors into a single row of 7 observations.

```
pop.first ← c(2525779,3026003,3691173,4449049)
pop.second ← c(5320817,6127700,6916183)
pop.all ← c(pop.first, pop.second)
pop.all
```

```
#> [1] 2525779 3026003 3691173 4449049 5320817 6127700 6916183
```

Using R Script

Vectors and Index

```
world.pop[2]
```

```
#> [1] 3026003
```

```
world.pop[c(2,4)]
```

```
#> [1] 3026003 4449049
```

```
world.pop_aug ← world.pop[-3]
world.pop_aug
```

```
#> [1] 2525779 3026003 4449049 5320817 6127700 6916183
```

Using R Script

Summary Statistics

```
length(world.pop)
```

```
#> [1] 7
```

```
min(world.pop)
```

```
#> [1] 2525779
```

```
max(world.pop)
```

```
#> [1] 6916183
```

```
range(world.pop)
```

```
#> [1] 2525779 6916183
```

```
mean(world.pop)
```

```
#> [1] 4579529
```

```
sum(world.pop)/length(world.pop)
```

```
#> [1] 4579529
```

```
sd(world.pop)
```

```
#> [1] 1625004
```

Using R Markdown

- Markdown allows you to have text along with your code
- Will be helpful for completing your future homework and data project
- Code must be written in a "chunk" for it to run
- You can choose if your code is seen in the final document
- Easy way to create PDF and HTML files (For PDF you need to have LaTex installed)

Starting a new R Markdown

- To open a Markdown file click "File" -> "New File" -> "R Markdown"
- Edit the Title. This can be changed later so no worries.
- HTML should be selected already. For this class leave it there and then click "OK"
- From here you can either begin typing, or insert a chunk for code.
- To insert a chunk you can:
    - click "Code" -> "Insert Chunk"
    - Click the icon of a Green box with a C and select R

Knitting a Markdown File

- To compile the markdown file into HTML you will click the Knit button
- If you have any errors in your code it will not knit
- Personal advice: knit periodically while doing homework and not at the end
- If you have trouble with this please come by my office or send me an email and I can troubleshoot your code

How to type equations in R

- To type equations in **R** you will use LaTex code (you do not need it installed)

- Example Equations:

  - $\sum_{i=1}^{n} x_i = 30$ -> `\sum_{i=1}^n x_i =30`
  - $E(X^2)$ -> `E(X^2)`
  - $Cov(X,Y) = E[(X - \mu_x)(Y - \mu_y)]$ -> `Cov(X,Y) = E[(X - \mu_x)(Y - \mu_y)]`

How to type equations in R

- For an equation to show in line put $ on both sides
- For an equation to show on its own line put $$ on both sides
- If you want to put multiple equations you will need to use the "aligned" environment

$$
\begin{aligned}
y &= mx + b \\
a^2 + b^2 &= c^2 \\
4 & = 2 + 2
\end{aligned}
$$

```
$$
\begin{aligned}
y &= mx + b \\
a^2 + b^2 &= c^2 \\
4 & = 2 + 2
\end{aligned}
$$
```

Links for Learning R and Latex Code

- R Markdown Cookbook
- Markdown Basics
- Latex Mathematical Symbols

Questions?