Real Estate Modelling

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Tutorial 1: Introduction to R

Learning Outcomes	R Functions	Libraries	Data
Understand what R and RStudio is Know (some) fundamentals of the R language Be able to set (change) your working directory in R			

Be able to use R to download financial data
Know how to plot financial data using R
Be able to use R to download & plot house price data
	`getSymbols()`
	`chartSeries()`
	`plot()`
		`quantmod`	Yahoo finance
			
			FRED

Know how to handle and index data in R
 	
Know how to generate and handle data frames in R
	`c()`; `class()`
	`as.numeric()`
	`rnorm()`
	`data.frame()`
	`paste()`		

Know how to load data in R	`read.table()`
	`head()`; `View()`
	`summary()`
	`colnames()`
			ACC_data.txt

Installing R & RStudio

We will be working with R & RStudio in the practical exercises. **Please ensure you have installed both prior to our first meeting in class. Please note also that it is important that you install R first on your machine and RStudio after that.** If possible, please use a private laptop PC rather than a corporate one, because you may not have the required permissions to access or write to certain directories in the latter case. If you are using a PC that is administered by an institution make sure that you have sufficient admin rights to install R but also packages that we will be using throughout the classes on the fly. Also please verify your firewall does not block access to R/RStudio. Depending on your operating system, you may follow the installation instructions below.

Windows

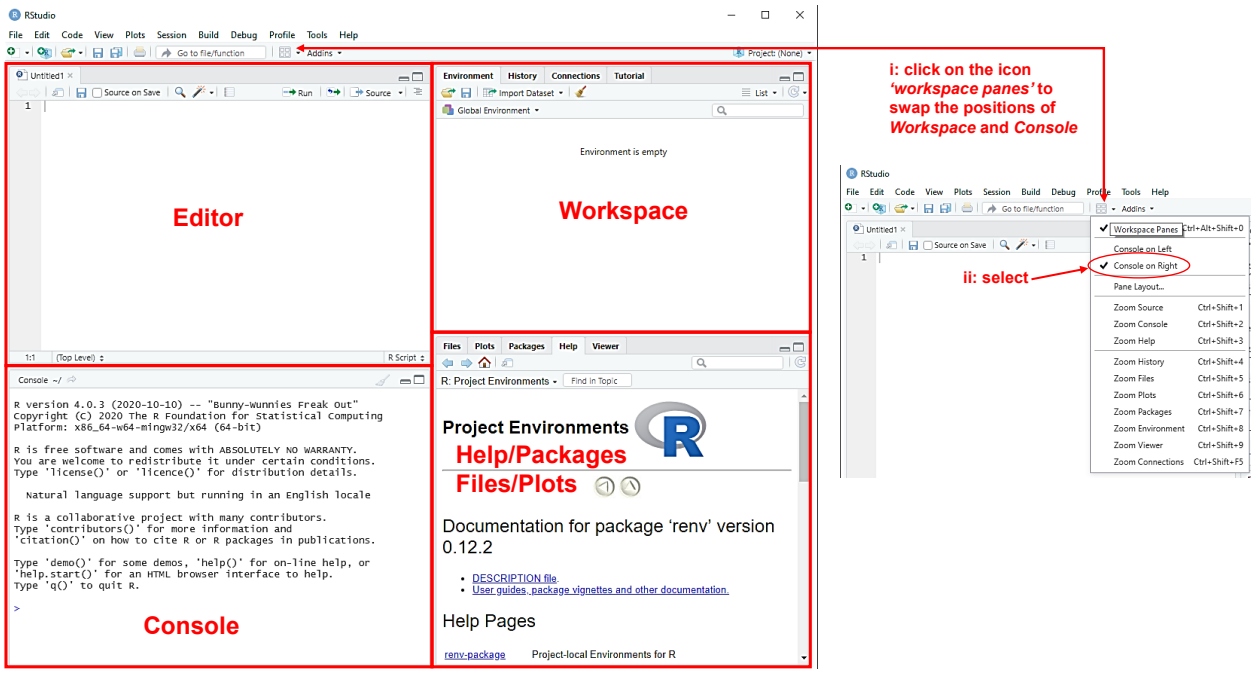
1. Open a web browser and go to `https://cran.r-project.org/`
2. Click **Download R for Windows**
3. Choose the link **install R for the first time**
4. Download the latest version
5. Run through the program installation process (my advise: choose English already here and keep the pre-selected settings when running through the installation, make sure there are no special characters (e.g. ä) in the path to the folder to which R is installed)

Mac OS

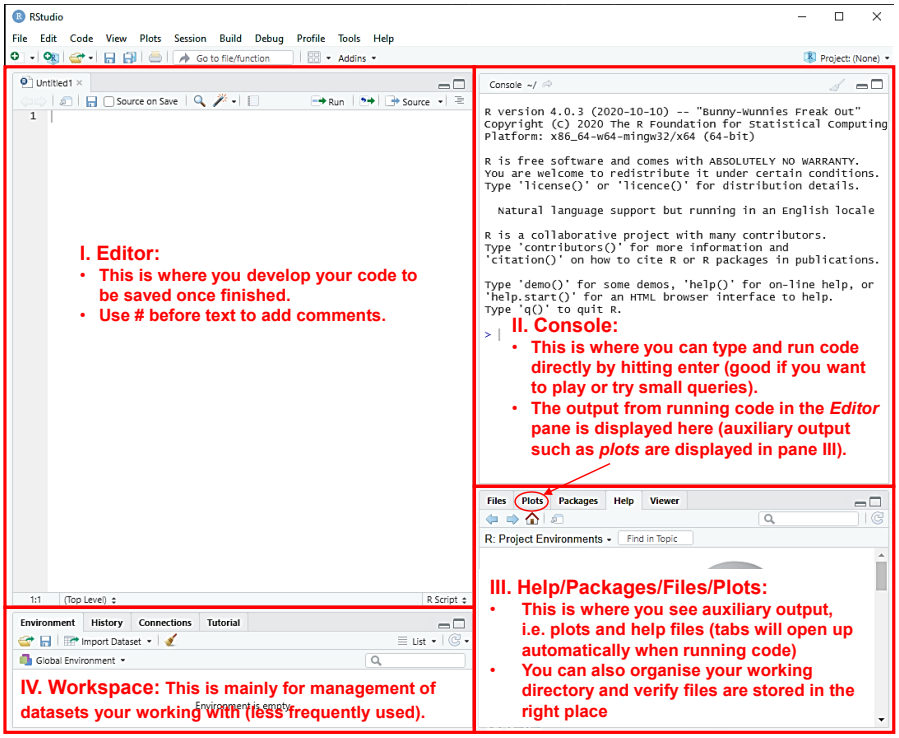
1. Open a web browser and go to `https://cran.r-project.org/`
2. Click **Download R for macOS**
3. Download the latest version, which is suitable for your operating system
4. Run through the program installation process (my advise: choose English already here and keep the pre-selected settings when running through the installation, make sure there are no special characters (e.g. ä) in the path to the folder to which R is installed)

Once R is installed, proceed to install RStudio

1. Open a web browser and go to `https://www.rstudio.com/products/rstudio/download/#download`
2. Depending on your operating system, click **Download RStudio for Windows** or **Download RStudio for Mac** to obtain the latest version
3. Run through the program installation process
4. Open RStudio on your device to arrange the windows (panes) in a way that suits you best (see below)



I recommend that you have the **Editor** window on the left and the **Console** on the right.



Practical 1: Downloading and Plotting Data

a. Download the **Swiss Market Index** (financial data) from *Yahoo finance* and plot the series.

b. Add the *rate of change indicator* of the series to the plot.

c. Download and plot (daily) financial data throughout the years 1990 and 2020.

d. Download the **All-Transactions House Price Index for the United States** (real estate data) from *Federal Reserve Economic Data (FRED)* and plot the series.

Practical 2: Data Handling and Indexing

a. Download the **All-Transactions House Price Index for the United States** (see P1 d.). Which class does the R object **USSTHPI** belong to?

b. Generate an R object of class numeric, containing the same data as **USSTHPI**.

c. Generate a **data frame** containing three variables x, y & z with five elements each. Variable x is numeric, y is of class character and the elements of z should be randomly drawn from the standard normal distribution. Label the variable y *"Name"*, variable x *"ID"* and variable z *"Return"*.

d. Remove variable *Name* from the data frame & add a variable called *Month* with elements January through May.

e. Add a variable, called *Date* to the data frame. *Date* also contains five elements: the first is 2015M1, the second is 2015M2, ..., the fifth is 2015M5.

Practical 3: Indexing

a. Load the dataset **ACC_data.txt** into RStudio, which contains information on **American Campus Communities** (property data). Familiarise with the data structure: Which variables (of which class) and how many property observations does it contain? Could you discard some of the variables from the data frame, once you know what it is about?

b. Call a subset from the **ACC_data** that only contains properties with more than 1000 beds.

c. Call a subset from the **ACC_data** that only contains properties in Florida that have been built before 2000 and assign it to a new data frame.