ECON 7010 – Econometrics I

Lecture 1 – Course outline, intro, RStudio

Course Description

The principal objective of this course is to provide a basic introduction to econometric theory and its application. Much of the emphasis of the course is on the single-equation linear multiple regression model, under both standard and non-standard assumptions. We will be considering some of the merits and weaknesses of traditional methods of inference in the context of this model. This course is also concerned with some of the very basic approaches to identifying and handling violations of the assumptions associated with the specification of the classical multiple regression model, and some of its extensions. The course will conclude with a different estimation method: Maximum Likelihood.

Recommended Textbooks

Course notes available on the website.

- Davidson & MacKinnon, Econometric Theory & Methods
- Greene, Econometric Analysis
- Godwin, *Introduction to Econometrics* (UG level)

Course Website

Course resources (including lecture notes, past exams, assignments, and computer labs) are available on rtgodwin.com/7010

Evaluation

Assignments:	**11%**
Midterm Exam (**Oct. 21**):	**35%**
Final Exam:	**55%**

Assignments

There will be 5 assignments, each worth 2% of your grade. You will use RStudio and work with data in order to complete your assignments. All assignments must be completed independently.

Midterm and final examination

These will be closed book exams. The midterm will take place in the regular class room/time. The final exam will be scheduled by the university. The final exam is cumulative.

Grading scale

A+	92 – 100
A	85 – 92
B+	78 – 85
B	71 – 78
C+	64 – 71
C	57 – 64
D	50 – 57
F	0 – 50

- A missed assessment will result in make-up work, or reweighting of your grade.
- Nov. 18 is the last day for Voluntary Withdrawal from courses.

Academic Integrity

- All assignments and exams must be completed independently.
- Do not engage in “contract” cheating.
- Do not provide your UM Learn login information to anyone else. This is “personation”, a serious form of academic misconduct.

Ignorance is not a defense. Familiarize yourself with section 2.5 of Academic Misconduct Procedures.

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ChatGPT: YES

Tentative Course Outline

- Basic Multiple Regression
- Algebraic/geometric properties of least squares (LS)
- Finite sample properties of LS
- Hypothesis Tests
- Asymptotic properties of various estimators
- Instrumental variables
- Multiple hypothesis testing
- Non-linear relationships and NLLS
- Heteroskedasticity
- Autocorrelation and time series
- Maximum likelihood
- Bootstrapping

Student Accessibility Services

Students with disabilities should contact Student Accessibility Services to facilitate the implementation of accommodations, and meet with me to discuss the accommodations recommended by Student Accessibility Services.

Academic Supports

Sample Lecture

What is Econometrics?

- Econometrics is a subset of statistics
- Science of testing economic theories
- Used to estimate causal effects
- Used to forecast or predict (not covered in this course)
- Often characterized by “observational data”

Causal Effects

Economic models often suggest that one variable causes another. This often has *policy implications*. The economic models, however, do not provide *quantitative magnitudes* of the causal effects.

For example:

- how does another year of *education* change *earnings*?
- How does a change in *interests rates* affect *inflation*?

Using data to estimate causal effects

An experiment would be best.

- How would you determine the effect of fertilizer on crop yield?
- How would you use an experiment to determine the above causal effects?
- What is the advantage of experiments?

Economic experiments are usually unethical and/or too expensive.

We usually don't have *experimental* data in econometrics – we have *observational* data.

There are issues when dealing with observational data:

- Omitted variables
- Selection bias
- Simultaneous causality
- Correlation vs. causation

These issues lead to the need for what applied econometricians refer to as an *identification strategy*.

Objectives of this course

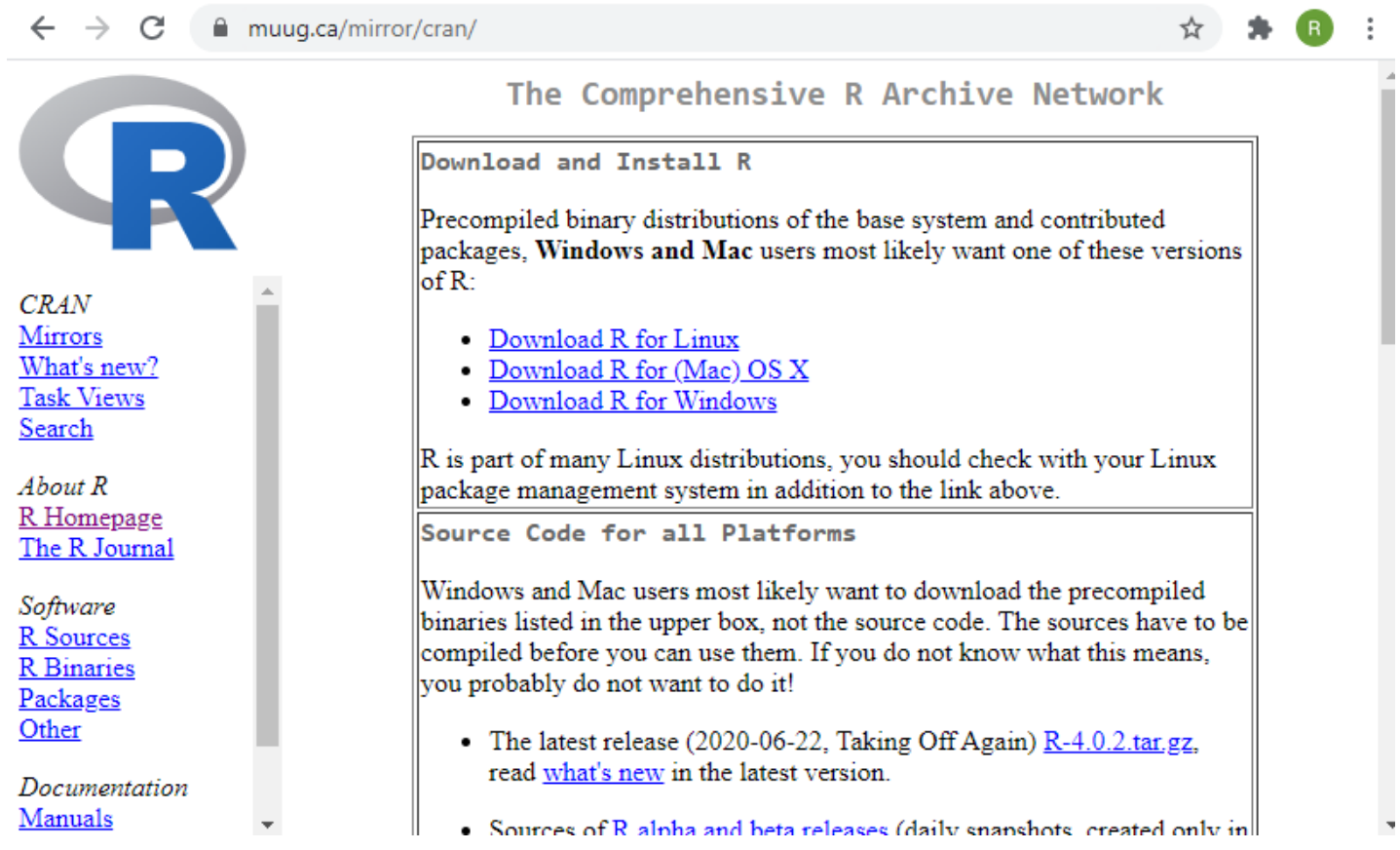
- Learn about OLS
- Learn about the OLS assumptions
- Re-evaluate the assumptions – learn new methods
- Learn about hypothesis testing

R and RStudio

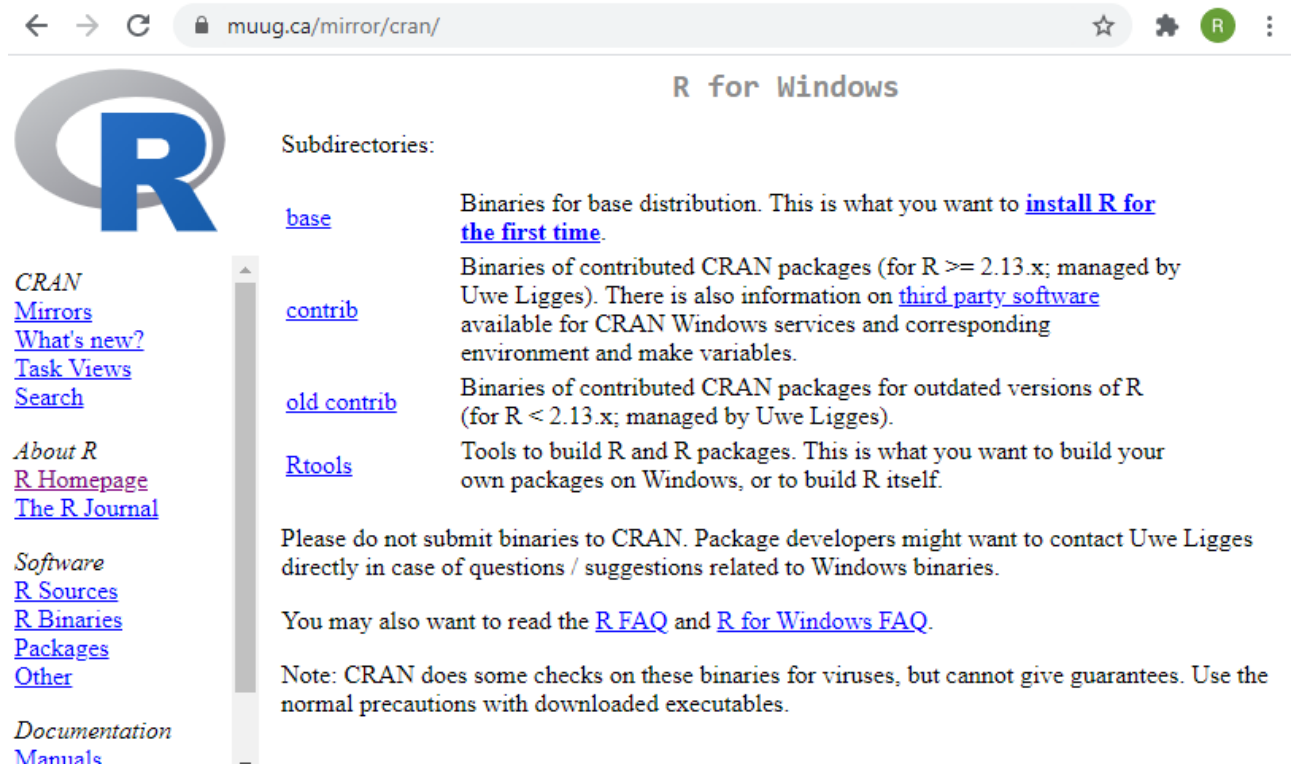
The theory and concepts presented in this course will be illustrated by analysing several data sets. Data analysis will be accomplished through the R Statistical Environment and RStudio. Both are free, and R is fast becoming the best and most widely used statistical software.

First, install R

- Go to https://muug.ca/mirror/cran/
- Choose Windows or Mac



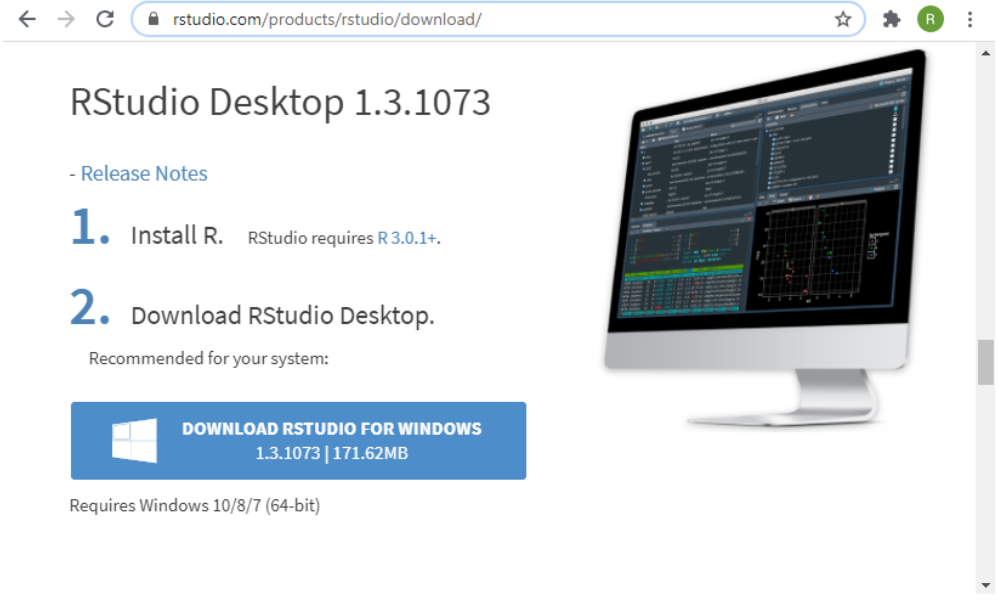
- Click “install R for the first time”



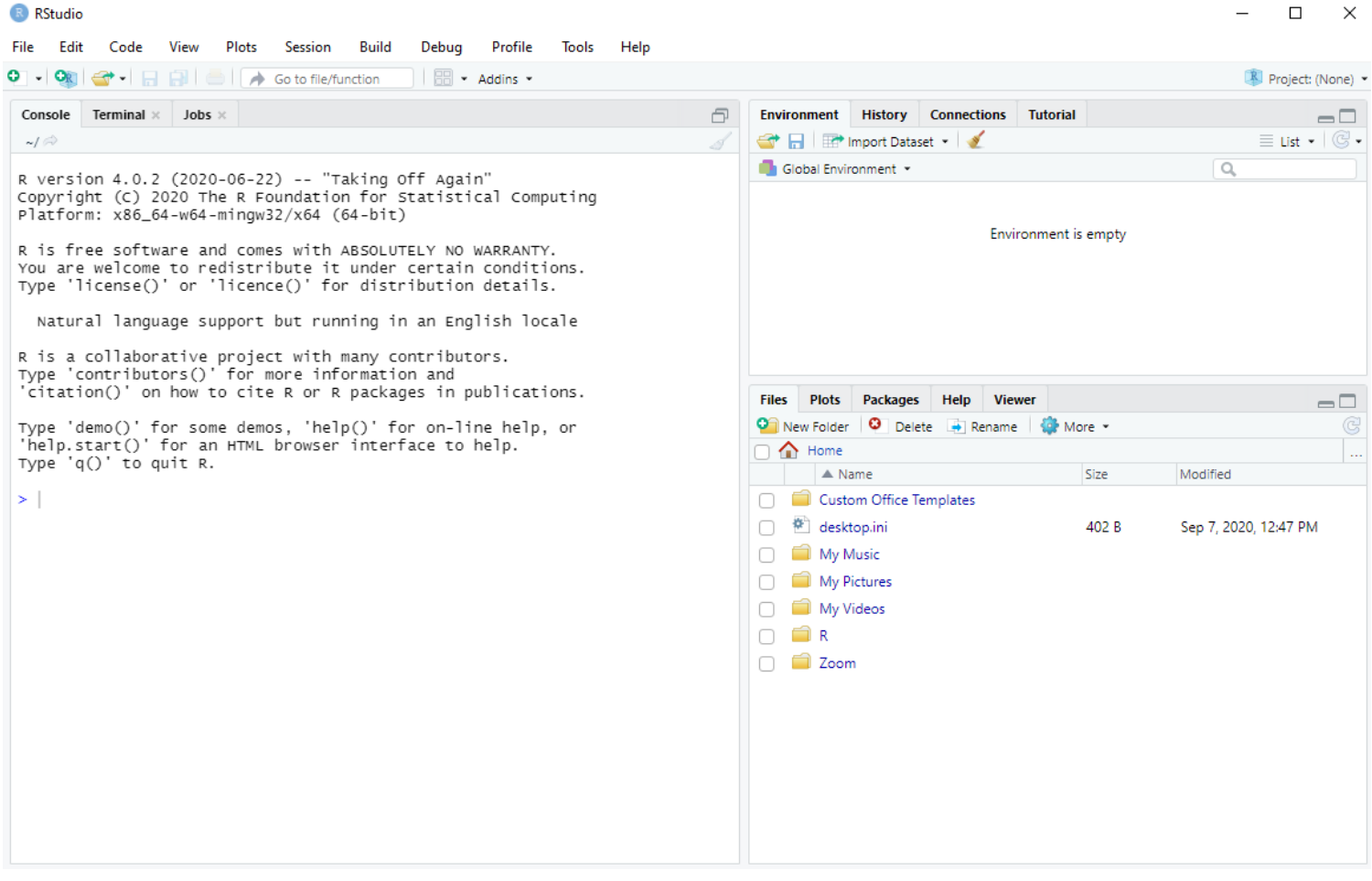
- Click “Download R 4.5.1 for Windows” (or Mac)
- Run the “.exe” file
- Click “Next” a bunch of times

Second, install RStudio

- Go to https://rstudio.com/products/rstudio/download/
- Scroll down until you see the download button “Download RStudio for Windows (Mac)”. Click it.



- Run the “.exe”
- Keep clicking “next” / “install”
- Find RStudio on your computer and open it. It should look something like this:


RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Console Terminal Jobs
~/
R version 4.0.2 (2020-06-22) -- "Taking Off Again"
Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)
R is free software and comes with ABSOLUTELY NO WARRANTY.
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Type 'license()' or 'licence()' for distribution details.
Natural language support but running in an English locale
R is a collaborative project with many contributors.
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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.
>
Environment History Connections Tutorial
Import Dataset
List
Global Environment
Environment is empty
Files Plots Packages Help Viewer
New Folder
Delete
Rename
More
Home
Name
Size
Modified
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