

Economics 4330: Applied Econometrics

Fall Semester, 2017

Course Information

- Course Dates: August 28 - December 15
- Course Time: MW 7:30 - 8:45 AM
- Course Room: Huntsman Hall 370
- Slack Channel
- Course Canvas
- Course Homepage
- Course GitHub Page

Instructor Information

- Tyler J. Brough
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Syllabus

Course Description

This course is an introduction to econometrics for finance. This differs from a typical introductory econometrics course in that the motivating examples will all come from the domain of finance. The course will cover much more on time series econometrics than a typical econometrics course, and therefore less on other traditional subjects. Sub-themes will be on computational methods, and connections to other areas of statistical practice such as data science and machine learning.

The course is very applied in nature. That means that I will focus more on models, methods and implementation than on formal proofs. We will cover theory as needed, but the focus will always be on application. We will use R programming in homework assignments and class projects to implement econometric models and methods. We will rely on the Monte Carlo simulation method as a way to build intuition and understanding of asymptotic theory.

Prerequisites

- One of STATS 2000, 2300, or 3000
- MATH 1100 or 1210 Calculus
- Or approval of the professor

Students must be prepared to program in the R programming language for computational assignments. No prior programming experience is required! But you must understand that this course will be demanding in a way that is likely to be new to you if you have never programmed before.

Textbooks

There is only one required textbook for this course:

- Introduction to Econometrics by Gary Koop.

This is an excellent introductory textbook, and is also very affordable. A used copy of the book will suffice and is likely to be available on Amazon.com for around \$30. In my opinion this is the best introductory textbook on econometrics, with just the right balance between theory and application for the absolute beginner. It is also the only introductory textbook that introduces the Bayesian paradigm, which we will explore briefly.

The following textbooks are suggested, though not *strictly* required:

- Using R for Introductory Econometrics by Florian Heiss
- A Guide to Econometrics by Peter Kennedy

Some Notes:

The first book is a guide to using the R programming language for econometrics and will be our source for learning R programming. The book is available to read online, but a cautious student would not rely on that (though a budget-constrained student may risk it). The website is here: [Using R for Introductory Econometrics](#).

The second book is known as the Graduate Student's Bible for interpreting the dense language of econometrics. It is certainly meant as a *guide* to accompany another textbook. Its strength is found in how well it explains the thinking behind econometric theory and models. It largely succeeds at this goal. The explanation of the *sampling distribution* is worth the price alone. It also has a good explanation of how the Monte Carlo method helps us to understand this crucial concept.

In addition, there will be some papers that I will post that you will be required to read and report on. These will be announced in class.

Assessment and Grading

Students will be assessed according to the following:

- Homework problems and computational assignments (20%)
 - Homework assignments will correspond with your readings
 - R computational assignments will augment your readings
- A midterm exam (20%)
 - A traditional midterm exam in the testing center
 - Students will be allowed an 8.5 x 11 inch cheat sheet
- A final exam (20%)
 - A traditional final exam in the testing center
 - Students will be allowed an 8.5 x 11 inch cheat sheet
- A final project (30%)
 - Students may work in teams of two
 - Project topics will be announced
 - The deliverable will be an R notebook with paper and code combined
- A final essay (10%)
 - Topic: “What Should Econometricians Do?”
 - I will discuss this with you in class
 - The deliverable will be an R notebook

Dates for each of these stages will be discussed in class and updated on the Google Sheet schedule.

Software

Economics 4330 is taught using the R programming language, a set of core scientific computing packages written and maintained by various third parties. I may also present other software from time to time for demonstration purposes. These might include Matlab, Python, C++, and Fortran. Students will not be required to learn these.

NB: If a diligent student desired to, I would facilitate programming in Python (which I highly recommend!). The student would have to be simultaneously enrolled in my Fall 2017 Finance 5350: Financial Modelling course.

R and R Markdown

We will use R for computational assignments in this class. R is a very powerful programming language, and the de facto language for statistical computing. More and more econometricians are starting to use R as well. Its great strength is the vast number of libraries freely available that implement statistical and econometric models and techniques.

You can download R for your platform at <https://www.r-project.org>.

Once you have R installed you will also want to install the freely available RStudio Integrated Development Environment, or IDE. It provides a great way to work with R, and is available for all major platforms. Be sure to download the desktop client. It is available here: <https://www.rstudio.com/products/rstudio/download3/>.

We will also be making use of R Markdown for homeworks, and projects.

Slack

All class communication will take place using Slack, a messaging system that replaces email. Students will be invited to the Econ 4330 Slack channel prior to the first week of class.

Clients for most computing and mobile platforms can be downloaded from the Slack website, or students may use the web client via a desktop browser.

Extra Credit

I will allow for the following extra credit assignments. These are not mutually exclusive.

Manipulation on Trial

I will allow for extra credit for a detailed report about the role of econometric methods in the Hunt silver price manipulation case as outlined in Jeffrey Williams' excellent book *Manipulation on Trial*. This is not a light undertaking, and I would caution that it might be better to just spend time polishing your final project. Nevertheless, for the serious student of econometrics it will be an excellent way to learn about the use of econometrics in policy making.

A write-up on the extra credit project will be provided if there is enough demand.

Keeping a Detailed Bullet Journal

I will give extra credit for students who keep a bullet journal throughout the semester. You can watch a video on this on youtube. You can search social media with the hashtag #BulletJournal for ideas and suggestions.

The idea is to record your study and work for ECN 4330, but I would encourage you to use it broadly. I will require that you turn in a brief writeup about the experience and also at least two posts on social media with hashtags #ECN4330 and #BulletJournal.

While you will see very expensive notebooks used online, it could be done for just a few dollars with this Staples Composition Notebook. But feel free to use whatever you want and to personalize it to your heart's content.

Schedule of Topics

- Module 1: Returns, Probability, and Mathematical Statistics Refresher
- Module 2: Linear Regression
- Module 3: Univariate Time Series and Volatility
- Module 4: Multivariate Time Series

Important Dates:

- *First Day of Class* - Aug 28
- *Labor Day* - Sep 04
- *Fall Break* - Oct 20
- *Thanksgiving Holiday* - Nov 22 - 24
- *Last Day of Class* - Dec 08
- *Final Exams* - Dec 11 - 15