Econometrics

Dr. Ryan Safner

Fall 2017

ECON 480
Rosenstock Trading Room
TuTh 11:30 AM-12:45 PM

Email: safner@hood.edu
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Hours: TuTh 3:30-5:00 PM

1 Course Description

"There are three kinds of lies: lies, damned lies, and statistics." – Benjamin Disraeli

Econometrics is the application of statistical tools to quantify and measure economic relationships in the real world. It uses real data to test economic hypotheses, quantitatively estimate causal relationships between economic variables, and to make forecasts of future events. The primary tool that economists use for empirical analysis is ordinary least squares (OLS) linear regression, so the majority of this course will focus on understanding, applying, and extending OLS regressions.

I assume you have *some* working knowledge of economics at the intermediate level and some basic statistical tools.[1] We will do some basic review of some necessary statistics and probability at the beginning until everyone is comfortable, before jumping right into regressions.

I have three goals for everyone taking this course: (1) to understand and evaluate statistical and empirical claims; (2) to understand research design and hypothesis testing; (3) to gain experience working with, interpreting, and communicating real data. I am less concerned with forcing you to memorize and recite proofs of statistical estimator properties, and more concerned with the development of your intuitions and the ability to think critically as an empirical social scientist—although this will require you to demonstrate proficiency with some intermediate statistical and mathematical tools.

To these ends, in addition to lectures about the estimation methods, you will read several journal articles with an eye to understanding and appraising their empirical claims, use Stata—a leading professional software package—to complete problem sets using data, and write a brief empirical paper using data. By the end, you should feel comfortable working with economic data and understanding the empirical claims of others. Stata is an extremely powerful statistical software package that is one of the most used by professional economists of all stripes. Even if it looks like something out of the 1980s, it is very valuable and much of this course is geared towards training you how to use and apply it. The best training, of course, is for you to simply learn by doing.

[1] The formal prerequisites for this course are **ECON 205** and **ECON 206**; **ECMG 212** or **MATH 112**; and **ECON 305** or **ECON 306**

Fair warning: *Econometrics is hard. It will be one of the hardest economics courses that you will take, primarily due to the mathematical content.* I will do my best to make this class intuitive and helpful, if not interesting. If at any point you find yourself struggling in this course for any reason, please come see me. Do not suffer in silence! Coming to see me for help does not diminish my view of you, in fact I will hold you in *higher* regard for understanding your own needs and taking charge of your own learning. There are also a some fantastic resources on campus, such as the Center for Academic Achievement and Retention (CAAR) and the Beneficial-Hodson Library.

In addition to Blackboard, you can find all course materials at `ryansafner.com`.

I reserve the right to modify this syllabus with proper advance warning.

2 Course Materials

The following book is **required** and will be available from the campus bookstore.

1. Bailey, Michael A, (2017). *Real Econometrics*, New York: Oxford University Press. ISBN: 978-0-19-029682-7

The following book is **recommended** for a more theoretical and mathematical explanation.

2. Stock, James H and Mark W. Watson, (2010) *Introduction to Econometrics* (3rd Ed.), New York: Addison-Wesley, Inc ISBN: 978-0138009007

You are welcome to purchase the book by other means (e.g. Amazon, half.com, etc). I have no financial stake in requiring you to purchase this book. You are welcome to use previous version of the book, but carefully verify the reading assignments, as the material may be different across versions. You can also find a large amount of material and guides related to the topics we discuss in class on the internet (e.g. Khan Academy for statistics, Googling concepts, etc), as well as help and documentation for Stata.

You are also **recommended** to purchase a copy of **Stata**. As a student, you can buy Stata at a discount by emailing the company a copy of your student ID card. There are several options for you to purchase, depending on what you expect in your future. Small Stata is the cheapest and probably sufficient for this class, but limits you to a small number of observations, which may not be enough for your project, and I recommend against it. Go for the *Intercooled (IC) Stata* option. If you plan on taking graduate courses in Economics, or going into businesses, government agencies, or nonprofits that do empirical work, get the perpetual license ($198). Otherwise, for just this class, you can purchase the 6-month license ($75). Stata is available on all computers in the trading room, and you will have access to it during the week.

Throughout the course, I will post both required and supplemental (non-required) readings that enrich your understanding for each topic on Blackboard. Check Blackboard **frequently** for announcements and updates to assignments, readings, and grades.

3 Grading

Your final course grade is the weighted average of the following assignments, to be explained in further detail below:

1	Presentation	5%
1	Midterm	20%
x	Problem Sets (Average)	25%
1	Paper	25%
1	Final	25%

Grades for all assignments are based on the following traditional scale (in percentage terms):

		A	93-100	A-	90-92
B+	87-89	B	83-86	B-	80-82
C+	77-79	C	73-76	C-	70-72
D+	67-69	D	63-66	D-	60-62
		F	0-59		

These grades are firm cutoffs, but I do round upwards (≥0.500) for *final course grades only*. In the event that the mean or median grade for an assignment is not to my satisfaction (typically lower than a 75), I reserve the right to fairly curve all grades at my discretion. An unfortunately necessary reminder: as an academic, I am *not* in the business of *giving* out grades, I merely report the grade that you *earn*. I will not alter any of your grades unless you provide a *convincing* argument that I am in error (which does happen from time to time).

Problem Sets

There will be several problem sets (one at the end of each lesson). Problem sets will be a combination of math/statistical theory & application problems and problems that require use of Stata with real data. For problems that use Stata, *please attach a .log file* as it will describe both your inputted commands and the Stata output. These will also be good indicators of what to expect on the exams (except for the Stata parts). You may collaborate with other students to work on problem sets, but *each person must turn in an individual problem set*. Problem sets are due *one week* from the class period where we finish a lesson, and must *emailed* to me by the start of class (so please type or, if you must, hand write and scan them).

Midterm

After we have finished linear regression, there will be a midterm constituting a combination of multiple choice, problem, and short answer questions. This will cover the content we discuss in class, my lectures, and the readings. The midterm provides feedback both to you and to me that ensures everyone is progressing on schedule and comprehending the material. This is *critical*, as the rest of the course will build off of this foundation.

Final

On the college-determined date, that is **Tuesday, December 12, from 12-2 PM**, we will have a comprehensive, closed-book, in-class final exam.

Empirical Research Paper

You are required to write a short research paper any topic in political economy of your choosing, so long as it has an econometric component (at minimum, features a linear regression). I expect your topic and your findings to be very rudimentary (your results do not need to be significant). The main purpose of this paper is to walk you through the process of conducting research and using econometrics to gain insight on a problem. The most difficult part of this assignment is finding appropriate and sufficient data. I will discuss more about this paper at length in class, and briefly guide you through the craft of writing a good paper. I view this assignment as the primary demonstration of your mastery of this class, and writing is a marketable skill you will need for any gainful employment. I strongly recommend starting early and discussing your topics with me, but this is not required.

Presentations

On the final week of class, we will hold a workshop for each of you to give a short presentation of your paper, and for everyone to provide comments and constructive criticism to help you improve and complete your paper.

No extra credit is available.

4 Policies & Expectations

Attendance and Participation: I expect you to attend class and to come having already done the reading assigned for that day. I will remind you in class and possibly through Blackboard or email which readings I want you to read for the next class. You are all adults and I will treat you as such. I do not take attendance, nor do I grade formally for participation but I strongly recommended you attend class and participate for your sake and the sake of your classmates. If you are too distracted or are not prepared to learn, I suggest you stay home, where you can check Facebook more efficiently. I reserve the right to boost the final grades of students that I believe have made consistent, quality contributions above and beyond their peers in class conversations by up to 2.5 points.

Absences and Make-Ups: You generally do *not* need to let me know if you are unable to make class, *unless* it is on the day of an exam. It will however, be your responsibility to acquire the notes from a classmate for any missed classes. If you are unable to attend an exam for a legitimate reason (e.g. sports/club events, traveling, illness, family issues), please notify me at least *one week* in advance, and we will schedule a make-up exam date. If you are ill or otherwise unable to attend on the day of the exam, contact me ASAP to make arrangements. Failure to do so, including desperate attempts to make arrangements only *after* the absence will result in a grade of 0 and little sympathy. I reserve the right to re-weight other assignments for students who I believe are legitimately unable to complete a particular assignment.

Email Accounts: Students must monitor their Hood email accounts to receive important college information, including messages related to this class. Email is also the best means of contacting me. I will do my best to respond within 24 hours.

Office Hours: I am generally in my office Monday-Thursday during normal 'business hours.' You are always welcome to walk-in and chat about class, college, careers, or whatever you like. Please try to use the official office hours stated at the head of the syllabus if possible. If you need to meet at a different time, I ask that you send me an email or let me know after class so I know when to expect you. I am always happy to go over material from class, particularly if you have *specific* questions you want answered.

Enrollment: Students are responsible for verifying their enrollment in this class. The last day to add or drop this class is **Tuesday, September 5**.

Honor Code: Hood College has an Academic Honor Code which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited. All violations of the Honor Code are taken seriously, will be reported to appropriate authority, and may result in severe penalties, including expulsion from the college. See here for more detailed information.

Students With Disabilities: Hood College complies with the Americans with Disabilities Act of 1992. Students who are in need of special assistance/accommodation should contact me by the end of the first week of classes. Appropriate reasonable assistance/accommodation will be provided for such students.

5 Class Schedule

The following schedule is a tentative outline of topics covered in the course. Expect to spend a week, on average, on each topic. The readings come from the textbook, along with scholarly journal articles that can be found on Blackboard under "Course Readings." I may remove or post additional required readings, to be announced in advance.

Unit 1: Review and Set-Up

1	Econometrics: The Quest for Causality
Concepts	Causality, randomized controlled experiment, endogeneity, selection bias
Readings	Bailey, Chs. 1-2

2	Review of Probability and Statistics
Concepts	Probability, distributions, random variables, sampling, hypothesis testing, confidence intervals
Readings	Bailey, Appendices A-I

Unit 2: Linear Regression & Simple Extensions

3	The Simple Linear Regression Model
Concepts	OLS, R^2, OLS assumptions, Gauss-Markov theorem, homoskedasticity, heteroskedasticity
Readings	Bailey, Chs. 3-4

Midterm Exam (Approximate)

4	Multivariate Regression
Concepts	omitted variable bias, multiple regression, assumptions, multicollinearity, adjusted R^2, F-test
Readings	Bailey, Ch. 5

5	Dummy Variables
Concepts	dummy variables, differences in means test, dummy variable trap, interaction terms
Readings	Bailey, Ch. 6

6	Transforming Variables
Concepts	nonlinear models, quadratic model, polynomial models, logarithmic models, standardized coefficients, F-test
Readings	Bailey, Ch. 7

Unit 3: Advanced Regression, Panel Data, and the Modern Toolkit

7	Panel Data, Fixed Effects, Difference-in Difference Models
Concepts	panel data, pooled model, (1- and 2-way) fixed effects, difference-in-difference (DND) models
Readings	Bailey, Ch. 8

8	Instrumental Variables
Concepts	instrumental variables, Two Stage Least Squares (2SLS), multiple instruments, simultaneous equation models
Readings	Bailey, Ch. 9

9	Regression Discontinuity
Concepts	regression discontinuity (RD) models
Readings	Bailey, Ch. 11

10	Dummy Dependent Variables
Concepts	linear probability model (LPM), probit model, logit model
Readings	Bailey, Ch. 12

Final Exam