

SYLLABUS

Spring 2018

Econometrics

ECON 320

In this course we learn to work with the statistical tools that economists use to test and quantify their theories. We review some basic tools that help us to describe data. We discuss how to use information from a small sample to infer features of a larger population. We employ regression analysis to evaluate relationships between economic variables and interpret the results with the help of concepts like causality and significance. I'll provide data from various sources and you'll analyze these data using Microsoft Excel. We'll also look at more advanced software packages that streamline the process of data analysis.

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Office Hours: Monday 9:30 – 11:30, Tuesday 11:30 – 12:30, Thursday 4:00 – 5:00,
by chance, or by appointment.

Text: **Real Econometrics**, by **Michael Bailey**, Oxford University Press

The lectures are designed to go hand in hand with the book. The book and the lectures are complements (one works better with the other), *not* substitutes (one replaces the other). The best way to learn is to read the book *and* participate in the lectures.

Attendance:

You are expected to attend every class. You are responsible for all material covered in class. If you have to miss class, it is your responsibility to get the notes from another student. You are welcome to come to my office if you don't understand something in the notes after you have reviewed them.

*If you have (or suspect to have) a **learning difference**, talk to me as soon as possible.*

The Washington College Honor Code

We at Washington College strive to maintain an environment in which learning and growth flourish through individuals' endeavors and honest intellectual exchanges both in and out of the classroom. To maintain such an environment, each member of the community pledges to respect the ideas, well-being, and property of others. Thus, each member of the Washington College Community abides by an Honor Code. Any form of cheating or otherwise impeding the academic progress of others is a violation of the Honor Code.

Grades:

Grades are determined by the 3 best of 4 assignments, the best 3 of 4 exams, and your participation in the classroom.

The maximum score for each assignment is 25 points. Assignments have to be handed in at the beginning of class on the due date. I encourage you to discuss the assignments in small groups, but everybody has to write up her/his own answers individually.

The maximum score in each exam is 100 points. The 4th exam is the final and will be cumulative. You do not need to take the final if you are satisfied with your performance in the three previous exams.

You can earn up to 25 points by participating in class.

Participation	+	Best 3 out of 4 assignments each 25 points	+	Best 3 out of 4 exams each 100 Points	=	Total
25 Points		75 Points		300 Points		400 Points

Grade	Total Points (max. 400)	Grade	Total Points (max. 400)
A+	390 or more	C+	305 or more, but less than 320
A	380 or more, but less than 390	C	290 or more, but less than 305
A-	365 or more, but less than 380	C-	275 or more, but less than 290
B+	350 or more, but less than 365	D+	260 or more, but less than 275
B	335 or more, but less than 350	D	245 or more, but less than 260
B-	320 or more, but less than 335	D-	225 or more, but less than 245
		F	less than 225

**If you fail to hand in an assignment or miss an exam (for any reason)
you lose the opportunity to drop your lowest score.
Exceptions to this rule will be made only in extreme circumstances.**

Dates *(If changes are necessary they'll be announced in class):*

Thursday, February 1st Assignment #1 due

Thursday, February 15th Assignment #2 due

Tuesday, March 27th Assignment #3 due

Tuesday, April 24th Assignment #4 due

Tuesday, February 27^h Exam #1

Thursday, April 5th Exam #2

Thursday, May 3rd Exam #3

May 7 – 11 Exam #4 (Final)

Course Outline

1 & 2 Introduction

What is econometrics? We preview what's to come. We talk about why econometrics is useful and important, and we discuss the methodology and goals of this course.

For example: *We address questions like: Does working during college lower grades?*

Appendix Statistics Review

We review some concepts you have encountered in your statistics class. Our approach will be less theoretical than in statistics and focus more on the application of the concepts and tools. We review tools that allow us to communicate the frequency/likelihood of events. We also talk about how to communicate uncertainty about statements we make.

For example: *How many hours per week does the average college student work?*

Do college student who work have lower grades than student who do not work?

Random Variables, Probability Distributions: Mean, Variance

Joint and Conditional Distributions: Independence, Correlation

Population and Sample, Estimators, Confidence Intervals and Hypothesis Testing

3 & 4 The Simple Regression Model

Our preferred tool to examine the relationships between different variables is regression analysis. We start out with the most basic regression model and examine the relationship between two variables. We learn how the technique works and how to interpret the results. We learn to communicate how confident we are in our results.

For example: *By how much do grades change for each extra hour of work per week?*

How confident are we in answer?

Dependent and Independent Variables, The Ordinary Least Squares Estimator (OLS)

Confidence Intervals and Hypothesis Testing

5, 6 & 7 Multiple Regression

We go a step further and learn how to examine relationships between multiple variables. We learn how to measure the influence of one variable on another variable while holding a third (or forth ...) variable fixed. We focus on the application to economic data and the interpretation of the results. We learn to communicate how much we trust our results. We use confidence intervals and statistical test to express our confidence in the direction and magnitude of relationships. We learn how to test the joint influence of several variables. We also discuss non-linear relationships and interactions between different independent variables.

For example: *By how much do grades change for each extra hour of work per week,-- while accounting for major of the student? Does the effect of one more hour of work on grades depend on the hours currently worked?*

OLS with many Independent Variables: Estimation, Mechanics and Interpretation

Omitted Variable Bias, Testing a Hypothesis; t-test, F-test, Confidence Intervals

Polynomials, Logarithms, Interaction Terms, Internal and External Validity, Forecasting

8, 9, 10 & 11 Causality

When can we use the results of our regression models to make statements about causal relationships between variables? What are potential problems that could lead to misleading interpretations of the results? We learn about possible remedies for some of these problems.

8 Fixed Effects and Difference-in-Difference models utilize data where each observational unit is observed multiple times. For example, we observe the incomes of a group of household over a number of years. The availability of panel data makes it possible to address bias from omitted variables that differ across entities but are constant over time.

9 & 10 Experiments and Instrumental variables. Experiments are usually not available to social scientists. There are however situations when experiments or situations that resemble experiments can be exploited to determine causal effects.

11 Regression Discontinuity (time permitting)

For example: *Does working during college lead to lower grades? Is it a problem if students who choose to work are different from students who choose not to work?*
What are the effects of tougher gun control laws at the state level on crime?

*Omitted Variable Bias, Causality, Experiments,
Two stage least squares, Fixed Effects, Regression Discontinuity*

Time permitting we might talk about:

12 Binary Dependent Variables and 13 Time Series Data