

Professor Jenny C. Aker
Spring 2010
EIB E213

Class hours: Wednesday 13h30-15h10
Office hours: Monday 15h30-17h00, Tuesday 15h00-17h00
Jenny.Aker@tufts.edu

EIB E213 Econometrics
The Fletcher School, Tufts University

Course Description.

This course provides an introduction to basic econometric methods. These are the tools of data analysis that economists and other social scientists use to estimate the size of economic and social relationships, and to test hypotheses about them, using real-world data. The goal of this course is to equip students with the facts, intuition and skills necessary to critically read econometric research produced by others and to conduct independent econometric research. Coursework includes problem sets, midterm and final examinations. Most of the problem sets will require students to use the statistical software package, STATA.

Pre-requisites: Introductory statistics (at the level of EIB B205) and basic multivariable calculus (at the level of EIB E210m) is required. Introductory economics is strongly recommended. All relevant statistical concepts will be reviewed as they arise, but the reviews will be brief. The basic calculus concepts employed in the course pertain to derivatives and what they tell us about the shape of relationships between variables in simple graphs.

To assess whether your background is adequate, review the appendices on probability and statistics in the Wooldridge textbook. I will offer a statistics review session on Friday, January 22, 2010, from 14h:30-16h00 in Cabot 206. If you are unable to make this review session, the slides will be posted on Blackboard.

Requirements: There will be ten problem sets, a midterm and a final exam. Class sessions will be primarily lecture-based and will rely heavily on class notes. Students are also expected to prepare for class by completing the required readings before each class and actively participating in class discussion. Lecture slide handouts will be posted on Blackboard *the day prior to class*. Grades will be based upon the following breakdown:

Problem sets (20% of grade)

Midterm exam (35% of grade)

Final exam (45% of grade):

The midterm and final examinations will be closed book exams, but students will be allowed to prepare and use one 3X5 index card of formulas and notes for each exam.

An in-class, closed book midterm examination is scheduled for Wednesday, March 3, 2010.

Readings:

The required textbook for this course is: Wooldridge, Jeffrey, *Introductory Econometrics: A Modern Approach*, Second or Third edition, South-Western College Publishing, 2003 or 2005 edition.

[In the course outline, page numbers for both the second and third editions are provided, so that students may use either. W2 refers to the second edition and W3 refers to the third edition.]

Reading an econometrics text (even a really good one like this) is never easy, but it is *absolutely essential* that you make the effort to read this book. This is your opportunity to learn the “written language” of econometrics. As with learning any language, reading goes very slowly at first, as you learn what the various symbols mean. If you make consistent effort, by the end of the semester you will find that your reading speed and comprehension have improved greatly. Developing such skills is of great value, because this course is only an *introduction* to econometrics. In almost any econometric literature you might want to read, you will run into additional concepts and methods that you will need to be able to teach yourself about by reading. One of your aims in this class should be to become a competent reader of texts targeted to applied econometricians. It is especially useful to learn how to read the Wooldridge text, because it contains extra chapters (which we will not study this semester) on many useful topics you are likely to run into as you pursue econometrics further.

An additional soft cover text that some students find useful is Peter Kennedy, *A Guide to Econometrics*, fifth edition, MIT Press, 2003. In the course outline, this is referred to K (the 5th edition, not the 6th edition).

Lecture Notes and Blackboard. The lecture slides, problem sets, data and study questions will be posted on the Blackboard web pages for the course. Lecture slides will be posted one day prior to the class. You should be enrolled automatically in the Blackboard site shortly after you register for the course. A separate calendar with the specific date for each topic is also provided.

Course Outline

I. Introduction: What is econometrics? What is it good for?

W3 or W2, Chapter 1
K, Chapter 1

II. The simple (or two-variable) linear regression model

A. Ordinary Least Squares (OLS) as a method for fitting the model to data

W3, Chapter 2, p. 24-42; Appendix A, p.707-714 (or W2, Chapter 2, p.22-40;
Appendix A, p.675-680)
Pindyck, R. and D. Rubinfeld, *Econometric Models and Economic Forecasts (4th edition)*,
Irwin McGraw-Hill, 1998, Chapter 1

B. The R-squared goodness of fit measure

W3, Chapter 2, p.42-44 (W2, Chapter 2, p. 40-41)
K, Chapter 2, p.14-15

C. Statistics review 1: probability, random variables, expected values, variances

W3, Appendix B, p.728-753 (W2, Appendix B, p. 696-720)
K, Appendix B, parts 1-3

D. Ordinary Least Squares estimators as random variables

K, Chapter 1, p.4-6

E. Statistics review 2: desirable statistical properties for estimators

W3, Appendix C, p. 763-777 (W2, Appendix C, p. 731-747)
K, Chapter 2

F. The classical assumptions under which OLS estimators have the desirable properties

W3, Chapter 2, p.50-63 (W2, Chapter 2, p.47-59)

III. Multiple regression models

A. Introduction to multiple regression analysis

W3, Chapter 3, p.73-78 (W2, Chapter 3, p. 68-73)

B. Ordinary Least Squares and goodness of fit in the K-Variable Model

W3, Chapter 3, p.78-89; Chapter 6, p.206-213 (W2, Chapter 3, p. 73-84; Chapter 6, p.196-200)

C. The classical assumptions revisited

W3, Chapter 3, p.89-109 (W2, Chapter 3, p. 84-104)

D. Functional transformations of dependent and independent variables

W3, Appendix A, p.714-724; Chapter 2, p.46-50; Chapter 6, p.197-206
(W2, Appendix A, p.680-692; Chapter 2, p.43-47; Chapter 6, p.187-196)

E. Dichotomous (dummy) independent variables

W3, Chapter 7, p.231-252 (W2, Chapter 7, p.218-240)
K, Chapter 14

F. Units of Measurement

W3, Chapter 2, p.44-46; Chapter 6, p.192-197 (W2, Chapter 2, p.41-43; Chapter 6, p.182-187)

IV. Interval estimation and hypothesis testing

A. Motivation

B. Statistics review 3: Common families of statistical distributions

W3, Appendix B, p.753-761 (W2, Appendix B, p. 720-728)

C. OLS under the normality assumption

W3, Chapter 4, 123-126 (W2, Chapter 4, p. 116-119)

D. Confidence intervals/ interval estimation

W3, Chapter 4, p.145-147; Appendix C, p.780-788
(W2, Chapter 4, p. 137-139; Appendix C, p.748-756)

E. Testing hypotheses about a single parameter: the t test and statistical significance

W3, Chapter 4, p.126-145; Appendix C, p.788-801 (W2, Chapter 4, p. 119-137;
Appendix C, p.756-757)
K, Chapter 4, p.60-61

F. Appreciating the distinction between statistical significance and economic importance

W3, Chapter 4, p.142-145; Appendix C, p.799-800 (W2, Chapter 4, p.134-137;
Appendix C, p.767-768)
K, Chapter 4, p.61-63

G. Testing hypotheses involving several parameters: the F test

W3, Chapter 4, p.147-162 (W2, Chapter 4, p. 142-154)
K, Section 4.3

H. Presentation of regression results

W3, Chapter 4, p.163-165 (W2, Chapter 4, 154-156)

V. Models for dummy dependent variables

A. OLS when the dependent variable is dichotomous

W3, Chapter 7, p. 252- 257 (W2, Chapter 7, p.240-245)
K, Chapter 15, p.259-261

B. Statistics review: maximum likelihood as an approach to creating estimators

W3, Appendix C, p.777-779 (W2, Appendix C, p.747-749)

C. Probit and logit regression models for dummy dependent variables

W3, Chapter 17, p.582-588 (W2, Chapter 17, p.551-559)

D. Interpreting coefficients in probit and logit models

W3, Chapter 17, p.588-595 (W2, Chapter 17, p. 559-563)

E. Interval estimation and hypothesis testing in probit and logit models

VI. Introduction to model specification

A. The importance of correct model specification and overview of choices

K, Chapter 5

B. The use of economics in model specification

VII. The Problem of Omitting Relevant Variables

A. Nature of the problem and description of its consequences

W3, Chapter 3, p.95-99 (W2, Chapter 3, p.89-95)

B. The Program Evaluation Problem as a special case

W3, Chapter 7, p.258-260 (W2, Chapter 7, p.246-248?)

C. Introducing measures of previously omitted variables

W3, Chapter 9, p.310-318 (W2, Chapter 9, p.295-300)

D. Considering whether the bias “works in your favor”

E. Using fixed effects methods in panel and pseudo-panel data to eliminate bias

W3, Chapter 13, p.460-475; Chapter 14, p.485-493
(W2, Chapter 13, parts 3-5, Chapter 14, p.461-469)
K, Chapter 17

F. Using true experiments (also known as randomized trials) to avoid the problem

G. Using “natural experiments” or “quasi experiments” in repeated cross sections to eliminate bias

W3, Chapter 13, p. 449-460 (W2, Chapter 13, sections 1 and 2)

H. Using instrumental variables techniques to eliminate bias

W3, Chapter 15, p.510-529 (W2, Chapter 15, p.484-503)

VIII. Other Problems with the Dependent and Independent Variables

A. Including irrelevant variables

W3, Chapter 3, p.94-95 (W2, Chapter 3, p. 89)

B. Measurement error

W3, Chapter 9, p.318-325; Chapter 15, p.530-531
(W2, Chapter 9, p.302-309, Chapter 15, p. 503-505)
K, Sections 9.1-9.3

F. Implications of the problems studied thus far for model specification in practice

K, Chapter 21

IX. Multicollinearity and other data weaknesses

W3, Chapter 3, p.99-104 (W2, Chapter 3, p. 95-101)
K, Chapter 11

X. The Problem of Heteroskedasticity

W3 or W2, Chapter 8
K, Chapter 8, p.133-139

XI. Introduction to time series econometrics

A. Introduction to time series models

W3 or W2, Chapter 10
K, Chapter 18

B. Problems of Serial Correlation

S3, Chapter 12, p.412-436 (W2, Chapter 12, sections 1-5)
K, Chapter 8, p.139-144