

Economics 140	ECONOMETRICS	Winter 2008
----------------------	---------------------	--------------------

Instructor:	Professor Òscar Jordà 1150 Social Sciences and Humanities Bldg. Phone: 752 7021 e-mail: ojorda@ucdavis.edu CLASS URL: http://www.econ.ucdavis.edu/faculty/jorda/class/140/140.html
Class Meets:	T – R, 1:40-3:00pm, HOAGLAND 113
Computer Lab	<u>Wednesdays</u> . <i>Group 1*</i> : 9 – 9:50am; <i>Group 2*</i> : 10 – 10:50am <u>Location</u> : HUTCHISON 93 <i>Attendance to the Computer Lab is mandatory (no exceptions).</i> <i>*Groups to be assigned in class and do not necessarily correspond to the section you registered in.</i>
Office Hours:	Mondays, 9-11am Wednesdays, 1-2, or by appointment (it is best to e-mail me before coming to office hours)
Teaching Assistant:	Ling Feng 113 SSH e-mail: linfeng@ucdavis.edu Office hours: Wednesdays, 9-11, or by appointment

If he was less annoying in regard to his classmates, he was more so in his classrooms. He had learned from Gottlieb the trick of using the word "control" in reference to the person or animal or chemical left untreated during an experiment, as a standard for comparison: and there is no trick more infuriating. When a physician boasted of his success with this drug or that electric cabinet, Gottlieb always snorted, "Where was your control? How many cases did you have under identical conditions, and how many of them did not get the treatment?" Now Martin began to mouth it – control, control, control, where's your control? – till most of his fellows and a few of his instructors desired to lynch him.

Arrowsmith (1925) by Sinclair Lewis, first American to win the Nobel Prize for literature.

COURSE GOALS: Understanding and application of the linear regression model. This tool is essential in the study of relationships between two or more economic variables, testing

hypothesis of economic behavior and forecasting economic outcomes. Economics and econometrics, unlike most sciences and statistics, is characterized by the unavailability of controlled environments and repeated/randomized experimentation. Consequently, it is that much trickier to discover or test causal relationships, to measure the effects of a particular economic policy or an economic control on economic states, and other similar thought experiments. Econometrics not only provides adequate statistical methods but also clever solutions to overcome many of these obstacles.

PRE-REQUISITES: ECN 100(105), 101(104); MAT 16A & 16B or 21A & 21B, STA 13, ECN 102 (or any upper division STA course) are prerequisites for ECN 140.

Statistics 13 and ECN 102 are the most important as the material in class assumes knowledge from these courses. Algebra (including matrix algebra) and some calculus are extensively used. Problem sets will require use of the computer (in particular the software EViews), but no previous experience is assumed.

TEXTBOOK: Stock, James H. and Mark W. Watson: Introduction to Econometrics, Addison-Wesley: Boston, MA. Can be bought bundled with the software EViews, however, this is only for convenience. If you are unsure about what to purchase, wait until the first day of class. Also see the explanation below.

COMPUTER SOFTWARE: EViews. The computer sessions should provide you with enough time (and plenty of knowledge) to complete the assignments so I expect that you will not need to install the student version of EViews in your personal computer. Don't worry, you will not need a manual either. The software is windows/menu-driven so it is very user-friendly.

ADDITIONAL RESOURCES: Check smartsite.ucdavis.edu for additional materials such as formula sheet, a brief overview of EViews, interesting web sites for econometricians, etc.

COMPLEMENTARY LITERATURE:

- R. J. Larsen and M. L. Marx, *An Introduction to Mathematical Statistics and its Applications*, Prentice Hall. This is an excellent text to review in more depth the statistical concepts presented in class and beyond. This is an undergraduate text, therefore very accessible.
- A. Spanos, *Statistical Foundations of Econometric Modelling*, Cambridge. This is a more advanced book than Larsen and Marx. However, it contains proofs and topics in great detail.
- C. Hill, W. Griffiths, and G. Judge, *Undergraduate Econometrics*, John Wiley. Very concise and to the point.
- R. Ramanathan, *Introductory Econometrics with Applications*, Dryden. It is very well written and gives a great number of useful examples. A little hard to navigate.
- W. Greene, *Econometric Analysis*, Prentice Hall. This is an advanced text. In addition to the topics we will cover in class, it contains a number of additional topics that give you a flavor of the discipline. A good resource book.

OTHER READING FOR FUN:

- Penn, Mark and E. Kinney Zalesne, *Microtrends: The Small Forces Behind Tomorrow's Big Changes*.
- Ayres, Ian, *Super Crunchers: Why Thinking-by-Numbers Is the New Way to be Smart*.
- Levitt, Steven and Stephen Dubner, *Freakonomics*. (see also their blog in the NY Times).
- Kaplan, Michael and Ellen Kaplan, *Chances Are... Adventures in Probability*.

COMPUTER ASSIGNMENTS: Homework problems that require the computer will use the software program EViews (already installed in the computer lab). I will teach a lab session illustrating how the assignments can be completed. Check the lab schedule (<http://clm.ucdavis.edu/rooms/available/>) to plan times when you can complete your assignment. The day before assignments are due, the T.A. will be available during lab hours to address any lingering questions.

COURSE GRADING:

Homework (5)	30%	Problem Set 1 due: January 17 Problem Set 2 due: January 31 Problem Set 3 due: February 14 Problem Set 4 due: February 28 Problem Set 5 due: March 13
Midterm	35%	Tuesday, February 5
Final (Comprehensive)	35%	Wednesday, March 19: 8-10am

Homework must be handed on time. There is no credit for late homework.

Please contact the T.A. at your convenience if you need special arrangements and rescheduling for midterm and final. All requests must be made by January 17. Make-up exams are not permitted.

REGRADE POLICY:

If you feel a question was unfairly graded or there was a mistake, *please submit it in writing* to your T.A. no later than one week after the exam. This allows your T.A. to go over the exam carefully and give your queries due consideration.

CALENDAR

Problem Set Due Dates (5):
P.S. 1 – January 17

P.S. 2 – January 31
P.S. 3 – February 14

P.S. 4 – February 28

P.S. 5 – March 13

Instructional Lab Sessions (4)

Session 1 – January 9

Session 2 – January 23

Session 3 – February 6

Session 4 – February 2

COURSE OUTLINE (NOTE I AND II WILL NOT TAKE VERY LONG)

I. STATISTICAL TOOLS FOR ECONOMETRICIANS

1. RANDOM VARIABLES

- i. DISCRETE
- ii. CONTINUOUS

2. UNIVARIATE PROBABILITY DENSITY FUNCTIONS

- i. DISCRETE PDF AND CDF
- ii. CONTINUOUS PDF AND CDF

3. MULTIVARIATE PROBABILITY DENSITY FUNCTIONS

- i. THE JOINT DISTRIBUTION
- ii. THE MARGINAL DISTRIBUTION
- iii. THE CONDITIONAL DISTRIBUTION
- iv. INDEPENDENCE

4. MOMENTS OF PROBABILITY DISTRIBUTIONS

- i. UNIVARIATE
 - a. POPULATION MEAN, MEDIAN, AND MODE
 - b. POPULATION VARIANCE
- ii. MULTIVARIATE
 - a. CONDITIONAL MEAN
 - b. COVARIANCE
 - c. CORRELATION

5. COMMON DISTRIBUTION FUNCTIONS

- i. THE NORMAL AND THE STANDARD NORMAL
- ii. THE χ^2 DISTRIBUTION
- iii. THE T-DISTRIBUTION
- iv. THE F-DISTRIBUTION

6. POPULATIONS, SAMPLES, STATISTICS AND ESTIMATION

- i. POPULATIONS VERSUS SAMPLES
- ii. MOMENTS VERSUS SAMPLE STATISTICS
- iii. LARGE SAMPLE APPROXIMATIONS
 - a. LAW OF LARGE NUMBERS
 - b. CENTRAL LIMIT THEOREM
- iv. PROPERTIES OF ESTIMATORS
 - a. UNBIASEDNESS
 - b. EFFICIENCY

7. HYPOTHESIS TESTING

- i. ELEMENTS OF A TEST
- ii. TESTING THE MEAN

II. TWO VARIABLE REGRESSION MODEL

1. MODEL ASSUMPTIONS

2. ESTIMATION

- i. METHOD OF MOMENTS
- ii. LEAST SQUARES

3. PROPERTIES OF OLS ESTIMATORS

- i. UNBIASEDNESS
- ii. EFFICIENCY

4. HYPOTHESIS TESTING

- i. CONFIDENCE INTERVALS
- ii. ONE-TAIL TESTS
- iii. TWO-TAIL TESTS

5. GOODNESS OF FIT - THE R^2

6. PREDICTION

7. VARIABLE TRANSFORMATIONS

- i. CHANGES OF SCALE
- ii. CHANGES OF ORIGIN

III. MULTIPLE LINEAR REGRESSION MODEL

1. THE MODEL AND ADDITIONAL ASSUMPTIONS

2. ESTIMATION
3. THE MULTIPLE REGRESSION MODEL IN MATRIX NOTATION
4. HYPOTHESIS TESTING
 - i. JOINT HYPOTHESIS TESTING
 - a. SIGNIFICANCE OF SUBSETS OF REGRESSORS
 - b. OVERALL SIGNIFICANCE TESTS
 - c. TESTS OF LINEAR COMBINATIONS OF PARAMETERS
5. GOODNESS OF FIT
 - i. THE R^2 AND THE ADJUSTED R^2
 - ii. MODEL SELECTION
6. PREDICTION
7. SPECIFICATION ERRORS
 - i. OMITTED VARIABLES
 - ii. IRRELEVANT VARIABLES
 - iii. MULTICOLLINEARITY

IV. EXTENSIONS

1. DUMMY VARIABLES
 - i. MULTIPLE DUMMY VARIABLES IN REGRESSION
 - ii. INTERACTIVE DUMMY VARIABLES
2. MAXIMUM LIKELIHOOD ESTIMATION
3. ENDOGENEITY: INSTRUMENTAL VARIABLE ESTIMATION