Economics 208D: Introduction to Econometrics
Spring 2014

Prerequisites: Intermediate Microeconomics (Econ 201D), Calculus (Math 112, 122, 202 or 212) and Introduction to Probability and Statistics (Stat 111, 130, 203 or 250; Math 230 or 342).

Lectures: Wednesday and Friday, 1:25-2:40 pm, Social Sciences 139.

Instructor: Arnaud Maurel, Social Sciences 225 (email: apm16@duke.edu).

Teaching Assistants:	E-mail	Office hours	Location
Ying (Sophia) Li (Head TA)	ying.li1@duke.edu	Th 4:30-6:30pm	134 Conf. Room
Shiv Parikh	shiv.parikh@duke.edu	M 3-5pm	03 Conf. Room
Raj Singh	raj.singh@duke.edu	Tu 11:1pm	134 Conf. Room
David Wang	d.wang@duke.edu	W 11-1pm	134 Conf. Room

Sections (<u>all in Social Sciences 229</u>):

Tu	4:55 – 5:45 pm	David
W	4:55 – 5:45 pm	Sophia
W	6:30 – 7:20pm	Shiv
Th	10:20 – 11:10 am	Raj
Th	6:30 – 7:20 pm	Sophia
F	12-12:50 pm	Raj

Objectives: This course introduces students to the statistical tools that economists use to test models, evaluate policy changes quantitatively, learn about economic behavior, and more generally study the relationship between economic variables. The goal is to learn enough theory and get enough practice to be able to do some simple but sensible data analysis on your own. To do this, you have to understand when you should use one tool rather than another. This requires some understanding of technical details, and the ability to prove simple results. This will be an important component of several parts of the course. We will also go over many real-life applications showing the usefulness of these tools in a wide variety of contexts. Finally, the course will introduce students to STATA, a widely used statistical software (both in the academia and business world). Several problem sets will involve data analysis with STATA using actual data.

Office Hours: You should ask the TAs questions about problem sets and STATA, and ask me questions about the lecture material or broader conceptual issues. My office hours are: Mondays 6-8pm, Soc. Sci. 225, or by appointment.

Required Textbook:

Stock, J. and Watson, M. (2010), *Introduction to Econometrics*, Third edition, Addison-Wesley Longman, Inc.

There is also a very good companion website for this textbook (http://wps.aw.com/aw_stock_ie_3/) providing additional material such as dataset for exercises in the text, practice quizzes and STATA tutorial.

Alternative texts include:

Wooldridge, J. (2009), *Introductory Econometrics: A Modern Approach*, Fourth Edition, South Western.

Angrist, J. and Pischke, S. (2008), *Mostly Harmless Econometrics*, Princeton University Press.

Course materials:

Lecture slides, handouts for discussion sections and problem set assignments will be posted on Sakai.

Software:

STATA will be used in the homework assignments. You will receive an email at the beginning of the semester with a key to download STATA/SE and use it on your computer (see http://public.econ.duke.edu/stata/ for more details). You can also access STATA in several labs on campus (see http://oit.duke.edu/comp-print/labs/). STATA's online help, as well as the tutorial available on the companion website for Stock and Watson (http://wps.aw.com/aw_stock_ie_3/) should be very useful to get you started with this software. Feel free to ask your TA and the OIT support in the Data and GIS lab (Perkins) if you have further STATA questions.

Assignments:

Problem sets will be distributed every couple of weeks. Four of them will be graded, the others being ungraded and optional. Graded problem sets should be handed in at the beginning of lectures the day they are due. Late problem sets will not be accepted. Should you be absent the day the problem set is due, you should hand in the problem set early (use the envelope outside my office door). If you cannot hand in your problem set on time for (documented) unexpected health reasons, the weight of the problem set will be placed on the other ones.

Problem sets are supposed to be completed *individually*.

Grading:

Problem sets: 25%
Midterm: 25%
Final: 50%

There will be some material in the textbook that we do not cover. The exams will be based on material covered in the lectures and simple extensions.

Below are a couple of comments regarding the grading rules:

1. There will be no makeup exams, and there are NO exceptions to this rule. If you miss the midterm, *and* you can document that you have a good excuse for missing the midterm, the weight of the missed exam will be placed on the final. By "having a good excuse", I mean that you will be required to submit adequate documentation to your Academic Dean, and cc me, justifying the reasons for your absence. This is *in addition* to the standard short-term illness e-mail.

2. The final is comprehensive (and you will see it could not be otherwise, given that everything we do after the midterm builds on pre-midterm material).

3. All exams will be closed books, but you can bring a cheat sheet (handwritten, letter size, both sides allowed).

4. If you think that the midterm should be re-graded, you have to submit ***in writing*** the detailed reasons why you think this is the case. Take into account that if you ask for re-grading, the whole exam will be checked again. You have to submit requests for midterms' re-grading within two weeks from the day the exams are returned (only adding errors will be corrected later).

5. Test grading: partial credit will be given for incomplete but partially correct answers. But you earn no credit if you leave a question blank or if what you write is completely incorrect or if it is just a re-statement of the question or in similar situations. Also, incorrect statements/steps do lose you points, even when your answer includes *also* the correct solution.

6. Class attendance is *very strongly* encouraged. You are of course expected to arrive on time.

Course Outline:

Note: The course outline is tentative. Dates are subject to change.

Part 1: Statistics Review

Friday January 10
Introduction: what is Econometrics (and why do we need it)? (Ch.1)

Wednesday January 15

Random variables; probability functions and distribution functions;
expected value and variance (Ch. 2).

Friday January 17
Relationships between two random variables: marginal, joint,
conditional distributions; law of iterated expectations; correlation and independence (Ch. 2).

Wednesday January 22
Some important probability distributions; i.i.d; estimators and estimates;
example: sample mean (Ch. 2 and 3).

Friday January 24
Properties of estimators: bias, variance, Mean Squared Error, consistency, Asymptotic
Normality; the Central Limit Theorem (Ch. 3).

Wednesday January 29
Hypothesis testing and Confidence Intervals, p-values (Ch.3).

Part 2: Basic Econometrics (Ordinary Least Squares)

Friday January 31
Conditional expectations. Ordinary Least Squares (OLS) with only one regressor (Ch. 4 & 17).

Wednesday February 5
The OLS assumptions and properties of the estimators, sampling distribution (Ch. 4
& 17). Tests and confidence intervals, Goodness of Fit & R-squared (Ch. 4, 5, & 17).

Friday February 7
Review of Midterm

Wednesday February 12
Pre-midterm Q & A
Time and location: tba

Friday February 14
Midterm

Wednesday February 19
Tests and confidence intervals, Goodness of Fit & R-squared (Ch. 4, 5, & 17) (Cont'd).
Homoskedasticity vs. Heteroskedasticity, Weighted Least Squares (Ch. 5 & 17).

Friday February 21

Omitted variables, introduction to multivariate OLS (Ch. 6 & 18).

Wednesday February 26
Multivariate OLS, assumptions and properties (Ch. 6 & 18).

Friday February 28
Imperfect multicollinearity, tests and confidence intervals for single coefficients, goodness of fit and adjusted R-squared (Ch. 6, 7 & 18).

Wednesday March 5
Testing joint hypotheses (with and without homoskedasticity) (Ch. 6, 7 & 18).

Friday March 7
Extensions to OLS: nonlinearities, estimation of elasticities, dummy variables and interactions (Ch. 8).

SPRING BREAK

Wednesday March 19
Nonlinearities (cont'd) (Ch.8).

Part 3: Beyond OLS

Friday March 21
Regression with limited dependent variables; Linear probability model, logit and probit. (Ch. 11).

Wednesday March 26
Maximum Likelihood Estimation (MLE) (Ch.11)

Friday March 28
MLE and limited dependent variables (Ch. 11)

Wednesday April 2
Catch-up or Review
Q & A

Friday April 4
Linear models and panel data (Ch. 10).

Wednesday April 9
Endogenous regressors, simultaneity, and Instrumental Variables (Ch. 12 and 18).

Friday April 11
Two Stage Least Squares (2SLS) (Ch. 12 and 18).

Wednesday April 16
Instruments: Strength and Exogeneity (Ch. 12 and 18).
Testing for Weak Instruments
The Test of Over-identifying Restrictions
2SLS in Stata

Friday April 18
Experiments and Quasi-Experiments (Ch. 13).
Differences and Difference-in-Differences Estimator.
Heterogeneous Effects.

Wednesday April 23
Pre-final Q & A
Time and location: tba

Final Exam: Monday, April 28, 2pm-5pm.
Location: tba