Economics 5213

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1 Purpose

The purpose of this course is to prepare entering graduate students in business and economics to use regression analysis given a well-defined problem. Emphasis will be placed on your ability to understand when to adopt a particular model or technique, how to implement it, and how to interpret your results.

2 Textbooks

Required

James H. Stock and Mark W. Watson, *Introduction to Econometrics*, 2nd edition, Addison-Wesley, 2006.

Other Sources

There is an excellent website that is provided by the authors and publisher of your book. It can be found at

`http://wps.aw.com/aw_stock_ie_2/`

If you purchase a new textbook, the material on this site is free. It includes sample quizzes, data sets, tutorials, and other stuff.

3 Prerequisites

This course requires you to work with basic probability, statistics, algebra, and to use Stata or Gretl. I will be teaching you a little matrix algebra and I will use a very small amount of calculus. You will not be asked to derive estimators using either of these tools. They are used in order for you to see where the estimators come from (as opposed to believing that they come from the ether). As prerequisites I recommend 2 courses in statistics in addition to a good command of algebra. You should have some notion about what random variables are, what a probability distribution is, what a statistic is, and what a hypothesis test is. These are things that we will cover, but we move through them quickly. If you haven't learned about these before you'll never be able to keep up. It is not necessary that you have any previous experience with linear regression, though this would be *very* helpful.

4 Course Outline

The following outline is based on Stock and Watson.

1 Economic Questions and Data
   - 1.1 Economic questions: empirical themes of the course
   - 1.2 Causal effects and idealized experiments
   - 1.3 Data: sources and types

2 Review of Probability
   - 2.1 Random variables and probability distributions
   - 2.2 Expected values, mean and variance
   - 2.3 Two random variables
   - 2.4 Normal, χ^2, $F_{m,\infty}$, and Student-t distributions
   - 2.5 Random sampling and the distribution of the sample average
   - 2.6 Large-sample approximations to sampling distributions

3 Review of Statistics
   - 3.1 Estimation of the population mean
   - 3.2 Hypothesis tests concerning population mean
   - 3.3 Confidence intervals for population mean
   - 3.4 Comparing means from 2 populations

5 Software

There are two basic pieces of software that you can use to complete assignment in class.

Stata

The first is *Stata*. *Stata* is currently available in the CBA labs and on the CBA Trading Floor.

For those interested in what *Stata* can do, here is a link to a *Stata* brochure:

`http://www.stata.com/products/overview`

and to a brief list of *Stata*'s statistical capabilities

`http://www.stata.com/capabilities`

For a comparison to SAS and SPSS visit:

`http://www.ats.ucla.edu/stat/technicalreports/Number1/ucla_ATSstat_tr1_1.0.pdf`

Gretl

Gretl is an acronym for Gnu Regression, Econometrics and Time-series Library. It is a software package for doing econometrics that is easy to use and reasonably powerful. Gretl is distributed as free software that can be downloaded from `http://gretl.sourceforge.net` and installed on your personal computer. Unlike software sold by commercial vendors (SAS, Eviews, Shazam to name a few) you can redistribute and/or modify Gretl under the terms of the GNU General Public License (GPL) as published by the Free Software Foundation.

Gretl comes with many sample data files and a database of US macroeconomic time series. From the Gretl web site, you have access to more sample data sets from many of the leading textbooks in econometrics, including ours *Introduction of Econometrics* by Stock and Watson. Gretl can be used to

compute least-squares, weighted least squares, nonlinear least squares, instrumental variables least squares, logit, probit, tobit and a number of time series estimators. Gretl uses a separate Gnu program called *gnuplot* to generate graphs and is capable of generating output in LaTeX format. Gretl is under development so you can probably expect some bugs, but in my experience it is pretty stable to use with my Windows XP systems.

So, why use Gretl? Well, its free, its fast, it will work on any platform, and it will do everything we are going to do in this class. If you want to use Gretl instead of Stata, then feel free to do so.

Why use Stata? Stata is a professional piece of software that has many more capabilities than Gretl. In the long-run, knowing how to use Stata could be beneficial. On the other hand, by the time you get around to using Stata, you may have forgotten it all and have to start from scratch anyway. As it turns out, knowing one package well (any package) is a pretty good introduction to other packages.

6 Data sets

Here is a list and brief description of the data sets used in the course. This gives one an idea about the kinds of applications discussed. They are available for download from Stock and Watson's website as *Stata* data files, Microsoft Excel spreadsheets, and (at least for some) EViews data format.

CPS data This consists of 11130 observations on 3 variables from the current population survey.

California Test Score The California Standardized Testing and Reporting (STAR) data set contains data on test performance, school characteristics and student demographic backgrounds. The data used here are from all 420 K-6 and K-8 districts in California with data available for 1998 and 1999.

Economics Journal Subscriptions This data set contains data on 180 economics journals for the year 2000.

Massachusetts Test Scores The Massachusetts data are district-wide averages for public elementary school districts in 1998. The test score is taken from the Massachusetts Comprehensive Assessment System (MCAS) test, administered to all fourth graders in Massachusetts public schools in the spring of 1998.

Auto Fatalities The data are for the "lower 48" U.S. states (excluding Alaska and Hawaii), annually for 1982 through 1988.

Boston Mortgage Applications The Boston HMDA data set was collected by researchers at the Federal Reserve Bank of Boston. The data set combines information from mortgage applications and a follow-up survey of the banks and other lending institutions that received these mortgage applications. The data pertain to mortgage applications made in 1990 in the greater Boston metropolitan area. The full data set has 2925 observations, consisting of all mortgage applications by blacks and Hispanics plus a random sample of mortgage applications by whites.

Cigarette The data set consists of annual data for the 48 continental U.S. states from 1985 - 1995. The series include annual per capita cigarette sales in packs per fiscal year, the average retail cigarette price per pack, per capita income, the average cents per pack tax (which includes the sales tax), the tax applied to cigarettes only, and the cpi.

Tennessee STAR experiments The Project STAR public access data set contains data on test scores, treatment groups, and student and teacher characteristics for the four years of the experiment, from academic year 1985-86 to academic year 1988-89.

7 Exams

There will be 3 exams in the course. The final (exam 3) may include a take-home portion that will be due at the beginning of the period at the time of our regularly scheduled final exam.

All exams must be taken at the designated time. No make up exams will be given. If you miss an exam you will receive a grade of zero.

8 Grades

Your grade in this class will be based on your performance on 3 exams, and homework assignments.

Grades will carry the following weights and be measured according to the accompanying scale.

Grade Weights	
Exam 1	26%
Exam 2	27%
Exam 3	27%
Homework	20%

Grades	
92%–100%	A
78%–92%	B
65%–78%	C
50%–65%	D
$< 50\%$	F

Note: One or more of the exams may contain a take-home portion that will require you to do some work using Stata or Gretl. Although I encourage you to collaborate with fellow students on homework assignments, **I expect you to work alone on any take-home tests**.

9 Homework

There will be some homework in the course. The best way to learn econometrics is to do econometrics. A large portion of your homework will require you to use a computer. The computer software we are using is Stata or Gretl. Stata is a Windows program that operates under the Windows XP operating system on the microcomputers in the CBA lab. Gretl is free and has Mac, Windows, and Linux versions available for download.

I will not accept late homework under any circumstance. I expect homework to be legible and well organized. I encourage you to work with others in the class while doing homework, and you may turn in assignments in groups of 2. The homework receives style points, so identical answers may receive different grades. I am predisposed to to look favorably upon work that is well organized and legible.

Unless you are specifically told otherwise by me, all homework must be turned in at the beginning of the class period on the date that it is due. Homework will not be accepted if late.

10 Attendance

Regular attendance is expected. You are responsible for any material you miss because of absence. In general, I do not permit students to copy my notes. If you miss class and need a copy of the notes, please obtain them from one of your classmates. And remember, if you miss an exam, you'll earn a zero.

11 Cheating Policy

Cheating will not be tolerated. Any violation of the University's academic integrity policy will be prosecuted according to University regulations. Basically, you will receive a grade of 0 on any test or assignment you are caught cheating on. If the violation is especially egregious, then you could earn an F for the course and be suspended from the University. Remember, you are responsible for the security of your work (in other words, if someone copies your work, you will also receive a zero on the test or assignment).

Econometrics is Fun!