Economics 5213

Instructor Lee Adkins

Phone 744-8637

Office 303 Business

Hours Wednesday mornings, hours TBA

E-mail Lee.Adkins@okstate.edu

WWW http://www.LearnEconometrics.com

Date 10 August 2011. This supersedes any previously distributed edition of this syllabus.

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.

This course is the first in a two-course sequence that covers the use of regression analysis in microeconometric analyses. The second course will be offered in Spring and is just a continuation of this course. From a practical standpoint, that means that we won't be doing any time-series analysis in either course–other than in the context of models that use panel datasets. For an overview of the types of topics covered, browse the excellent Stata book by Cameron and Trivedi listed below.

Econometrics exists because much can go wrong in statistical analysis when data are not the outcomes of repeatable experiments. As part of your study you will learn a few techniques about identifying when data are not being generated in a way that will allow basic statistical models to be used. Some techniques that may yield valid inference when things go wrong will be discussed. Unfortunately, there is never any guarantee that your analysis is valid or that the assumptions that permit valid inference are met by your data. In the end, though, obtaining useful results from statistical analysis is as much art as science. Whether you are able to become a competent artist or not is a function of your knowledge, creativity, and humility. I can help you with the first part, as for the rest you are on your own.

2 Textbooks

Required

James H. Stock and Mark W. Watson, *Introduction to Econometrics*, 3rd edition, Addison-Wesley, 2010.

Other Sources

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

`http://wps.aw.com/aw_stock_ie_3`

Adkins and Hill, *Using Stata for Principles of Econometrics, 4th edition*, 2011. This book is good for point-and-click instructions and for the basics. The new version contains some additional tricks. It also contains information on time-series, something Cameron and Trivedi avoid.

Adkins, *Using gretl for Principles of Econometrics, 4th edition*, 2011. It is freely available from my website,

`http://www.LearnEconometrics.com/gretl`.

Kennedy, Peter. A Guide to Econometrics, 6th edition. John Wiley, 2008. This is a particularly valuable book for anyone whose plan of study includes more econometrics. Chapter 22 on what can go wrong and what to do about it is worth $35 that Amazon charges for this book.

3 Prerequisites

This course requires you to work with basic probability, statistics, algebra, and to use Stata or Gretl. I may use 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 undergraduate 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

    3.5 Scatter plots, sample covariance, and sample correlation

    3.6 Example: Earnings of Male and Female College Grads in the U.S.

4 Linear Regression with One Variable

    4.1 Linear regression model

    4.2 Estimating the coefficients of the linear regression model

    4.3 Least squares assumptions

    4.4 Sampling distribution of least squares

5   Software

There are two basic pieces of software that you can use to complete assignments in class: Stata and gretl. Given a choice, I'd prefer you to use Stata. It is professional strength software and learning how to use it will serve you well in the future. If you commute and are unable to get regular access to Stata, gretl is offered as a free substitute. In addition, I have written a book that will show you how to use gretl that is also free.

Please don't use SPSS. It's design encourages a particulary large number of bad statistical practices and in poorly trained hands (95% of users) can produce quite misleading results. Just because there is a button that does X, does not mean you should use it! If you learn nothing else in this course, I want you to develop a very sceptical attitude toward applied work in statistics. I would venture to guess that fewer than 1% of applications are statistically valid. This is due to user error and is not the fault of the software or techniques themselves.

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:

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

For a comparison to SAS, Stata, and SPSS visit:

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 7 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   Exams

There will be 4 exams in the course. 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.

7   Grades

Your grade in this class will be based on your performance on 4 exams, and homework assignments.

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

Grade Weights	
Exam 1	30%
Exam 2	30%
Exam 3	30%
Homework	10%

Grades	
92%–100%	A
79%–92%	B
68%–79%	C
57%–68%	D
< 57%	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**.

8   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.

9   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.

10   Cheating Policy

Cheating will not be tolerated. Any violation of the University's academic integrity policy will be prosecuted according to University regulations. If you are not sure what this is about, then visit the **Academic Integrity** link at the bottom of my website. Basically, you will receive a grade of 0 on any test or assignment you are caught cheating on. If the violation is especially egregious or it threatens my ability to evaluate work for others in the course, 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).

There are two sections of this course being offered this semester. You are under no circumstances permitted to share any information about the contents of an exam with students in the other section. This is an extreme form of cheating. I will seek to remove you from the course and you will receive the F! if it is within my power to award it. I have successfully awarded this grade in this course and will not hesitate to do it again if circumstances

warrant.

Do not share information about exams with students in the other section, either directly or indirectly. You have been warned.

Econometrics is Fun!

References

Adkins, Lee C. (2011), *Using GRETL for Principles of Econometrics, 4th edition*, `http://www.learneconometrics.com/gretl`.

Adkins, Lee C. and R. Carter Hill (2011), *Using Stata for Principles of Econometrics, 4th edition*, John Wiley & Sons, Hoboken, NJ.

Baltagi, Badi H. (2001), *A Companion To Theoretical Econometrics*, Blackwell companions to contemporary economics, Blackwell, Malden, MA.

Cameron, Adrian Colin and P. K. Trivedi (2005), *Microeconometrics : Methods and Applications*, Cambridge University Press, Cambridge.

Cameron, Adrian Colin and P. K. Trivedi (2010), *Microeconometrics Using Stata*, Stata Press, College Station, TX.

Davidson, Russell and James G. MacKinnon (1993), *Estimation and Inference in Econometrics*, Oxford University Press, New York.

Davidson, Russell and James G. MacKinnon (2004), *Econometric Theory and Methods*, Oxford University Press, New York.

Fomby, Thomas B., R. Carter Hill and Stanley R. Johnson (1984), *Advanced Econometric Methods*, Springer-Verlag, New York.

Greene, William H. (2008), *Econometric Analysis*, 6th edn, Prentice Hall, Upper Saddle River, NJ.

Greene, William H. (2012), *Econometric Analysis*, 7th edn, Prentice Hall, Boston.

Hill, R. Carter, William E. Griffiths and Guay C. Lim (2011), *Principles of Econometrics*, 4th edn, John Wiley & Sons, Hoboken, NJ.

Kennedy, Peter (2008), *A Guide to Econometrics*, 6th edn, Blackwell Pub., Malden, MA.

Schmidt, Stephen J. (2005), *Econometrics*, McGraw-Hill Irwin, Boston.

Stock, James H. and Mark W. Watson (2011), *Introduction to Econometrics*, The Addison-Wesley series in economics, 3rd edn, Addison-Wesley, Boston.

Verbeek, Marno (2008), *A guide to Modern Econometrics*, 3rd edn, John Wiley & Sons, Hoboken, NJ.

Wooldridge, Jeffrey M. (2009), *Introductory Econometrics : a Modern Approach*, 4th edn, South Western, Cengage Learning, Mason, OH.

Wooldridge, Jeffrey M. (2010), *Econometric Analysis of Cross Section and Panel Data*, 2nd edn, MIT Press, Cambridge, MA.