

# UNIVERSITY OF OTTAWA

Department of Economics

ECO5185

ECONOMETRICS I

Winter 2006

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While not all economists are practising econometricians, some understanding of basic econometric principles and procedures is likely to be useful to all economists, since econometric methods remain the principal tool available to economists for testing economic theories. Econometric methods are also widely used by businesses and government agencies to help them forecast future demand or the effects of different policy changes. Thus economists working in business and government (as well as in academia) need to know which econometric tests and techniques are appropriate for use in a particular situation. This knowledge will help them not only to carry out their own econometric analyses, but also to evaluate the results produced by other researchers. Econometric results obtained by applying the wrong techniques to a particular set of data cannot be regarded as reliable.

In this course, students will have the opportunity to both deepen and broaden their understanding of econometric tests and techniques. Although the focus of much of the course will be the multiple linear regression model studied in introductory econometrics courses, greater attention will be paid to the theoretical basis of the estimation methods and tests studied, and new hypothesis tests and problems in regression analysis will be examined. An equally important element of the course will be the application of the econometric techniques studied to real-world data sets in the assignments. While it would be impossible in one course to cover the complete range of econometric models and techniques, it is hoped that by the end of this course students will have a better understanding of which econometric techniques should be used in which situations, and how to evaluate and interpret econometric results.

## Course Website

A website has been set up for this course in WebCT. To access the course web page, go to

<http://maestro.uottawa.ca/>

and log in. Your *username* and *password* will be the same as for the Infoweb. Once in, you should see a list of your courses with WebCT websites. Select ECO5185 to access the course web page.

On the website you can use the calendar to check due dates and exam dates;

check for bulletins from me regarding changes to due dates, hints for assignments, etc.; check your grades; download assignment questionnaires and data files; visit the textbook web site; and send me (or other students in the class) private e-mail messages or public messages. If your question to me is about an assignment or the course material, I suggest that you use the Bulletin Board rather than private e-mail so that other students can also learn from your question and my response. Other features may be added to the web site as the course progresses. I strongly recommend that you check the web site for new postings on a regular basis. I try to check it for questions at least once each weekday (but not usually on weekends).

## Mathematical Requirements

All students registered in this class are assumed to have previously completed introductory courses in statistics and econometrics such as ECO 3150 and ECO 3151. In addition, it is assumed that students have completed one or more courses in mathematics for economists, and thus are familiar with basic calculus and matrix algebra. **Matrix algebra will be used extensively in this course.** If you feel that your background in these areas is lacking, please see me or review these topics yourself as soon as possible. Guidelines for reviewing these topics will be posted on the course web site.

## Computer Software

Each assignment for this course will include one or more questions that can only be answered with the help of an econometric software package. I recommend that you use the software package SHAZAM, for the following reasons: (i) it is fairly easy to learn, (ii) it is free for registered students, and (iii) because I am well acquainted with SHAZAM I can help you with any software problems you may have. (No support is provided either by the Computing Centre or the Department for any of the specialized econometric software packages available on campus.) SHAZAM is a widely-used general purpose econometric software package that is capable of estimating a wide variety of econometric models. Currently version 10.0 is installed on the computers in the graduate student computer lab in 200 Wilbrod, as well as in the Student Lab in TBT 086. SHAZAM is a command-driven software package, meaning that to obtain econometric results you must first write a program (a sequence of commands) and then run it. SHAZAM's Window's interface makes the procedure of writing, editing, and running programs quite simple. (Some of you may wish to try the Professional Edition of SHAZAM, which is also available on campus.) An optional tutorial to introduce students to SHAZAM will be held early in the term for those who would like an introduction to the package. Copies of SHAZAM can be downloaded from the LAN in TBT 086.

Other econometric packages are also available in the student labs for those who would prefer to use them, but if you do choose to use one of these other packages, please remember that when you complete assignments you must hand in the **computer program** used to generate the results, as well as the results themselves. (SHAZAM printouts include both the commands issued in the program and the results. Some other packages print the program listings and the results separately. Still others, like EViews, are difficult but not impossible to program in.) Also, note that if you are using a package other than SHAZAM I will not be able to provide you with as much help if you are having difficulties.

As indicated below, some copies of the manual for the recommended software

package, SHAZAM, have been ordered for students in this course. Alternatively, you may sign out for a limited period of time one of the copies available in the Department of Economics office, or you may consult the on-line guide to SHAZAM available on the SHAZAM website at:

<http://shazam.econ.ubc.ca/intro/>

You will also find many useful SHAZAM examples on the SHAZAM website.

### Required Texts

The required text for this course is

Greene, William H. *Econometric Analysis*, 5<sup>th</sup> edition. Upper Saddle River, NJ: Prentice Hall, 2003.

It is available in the Agora Bookstore and Internet Café at 145 Besserer Street (slightly north of campus). Note that this edition of Greene's textbook constitutes a substantial revision of the previous edition. The contents of the text have been completely reorganized. Thus the page numbers, etc., that I refer to will not correspond at all to those of previous editions.

Limited numbers of the following book has been ordered as well:

*SHAZAM User's Reference Manual, Version 10*. Vancouver: Northwest Econometrics, 2004.

If you think that you might like to do some applied econometric work in the future, or if you want to have a more detailed reference source on hand as you work on your assignments, then you might find it useful to purchase the SHAZAM manual.

### Grading

Grades for this course will be calculated as follows:

Assignments (4, worth 5% each)	20%
Midterm exam (in class, February 28th)	30%
Final exam (during final exam period)	50%

Each assignment may include both theoretical and applied questions, and must be handed in in class on the due date. The SHAZAM computer outputs for applied questions must be handed in with your written answers. **While you will get a few marks for your computer printout alone, remember that most of the marks for applied questions will be allocated to your written answers.** If you hand in only a computer printout for applied questions, you are certain to get a failing grade on those questions. I encourage you to work with other students, particularly on the more difficult questions, but each of you must hand in your own individual answers. Note that you will probably learn more if you try to answer the questions by yourself first, before approaching other students. In addition to the assignment questions, I will assign other questions designed to help you better understand the material covered in class. I strongly recommend that you try at least some of these other questions as they or similar questions may turn up on exams.

The due dates for the assignments will be January 31<sup>st</sup>, February 14<sup>th</sup>, March

14<sup>th</sup>, and March 28<sup>th</sup>. **LATE ASSIGNMENTS WILL NOT BE ACCEPTED.** If you are unable to hand in your assignment for medical reasons and provide me with a valid medical certificate, the weight of the missing assignment will be distributed over the other components of your grade. A medical certificate will also be required if you are unable to write an exam on the scheduled date. If you miss the midterm exam for a valid reason, as in the case of a missed assignment the weight will be redistributed over the other components of the grade. If you miss the final exam you will need to write a make-up exam.

## Academic fraud

Academic fraud is an act committed by a student to distort the marking of assignments, tests, examinations and other forms of academic evaluation. Academic fraud is neither accepted nor tolerated by the University. Anyone found guilty of academic fraud is liable to severe academic sanctions.

Here are a few examples of academic fraud:

- engaging in any form of plagiarism or cheating;
- presenting falsified research data;
- handing in an assignment that was not authored, in whole or in part, by the student;
- submitting the same assignment in more than one course, without the written consent of the professors concerned.

In recent years, the development of the Internet has made it much easier to identify academic plagiarism. The tools available to your professors allow them to trace the exact origin of a text on the Web, using just a few words.

In cases where students are unsure whether they are at fault, it is their responsibility to consult the University's Website at the following address:

[http://www.socialsciences.uottawa.ca/eng/writing\\_tools.asp](http://www.socialsciences.uottawa.ca/eng/writing_tools.asp)

This web page contains links to several documents that clearly describe what is and isn't plagiarism.

Persons who have committed or attempted to commit (or have been accomplices to) academic fraud will be penalized. Here are some examples of the academic sanctions which can be imposed: a grade of "F" for the assignment or course in question; an additional program requirement of between three and 30 credits; suspension or expulsion from the faculty.

In recent years, most of the students found guilty of fraud were given an "F" for the course and had between three and 12 credits added to their program requirements.

## Course Outline and Reading List

A good introductory-level textbook in econometrics that I suggest you consult if you would like to review a simpler treatment of the material covered in class is:

Gujarati, Damodar N. *Basic Econometrics*, 4<sup>th</sup> edition. New York: McGraw-Hill, 2004.

It will be placed on reserve in the Morisset Library. Wooldridge's (2000) text is also a good introductory reference. Most of the recommended readings will be from Greene (2003), but a few may also be drawn from the following books:

- Berndt, Ernst R. *The Practice of Econometrics*. Reading, MA: Addison-Wesley, 1991.
- Charemza, Wojciech W., and Derek F. Deadman. *New Directions in Econometric Practice*, 2<sup>nd</sup> edition. Cheltenham, UK: Edward Elgar, 1997.
- Enders, Walter. *Applied Econometric Time Series*. New York: John Wiley and Sons, 1995.
- Johnston, J. *Econometric Methods*, 3<sup>rd</sup> edition. New York: McGraw-Hill, 1984.
- Kennedy, Peter. *A Guide to Econometrics*, 4<sup>th</sup> edition. Cambridge, MA: MIT Press, 1998.

If you feel in need of a review of basic statistics and/or matrix algebra, I suggest you consult Appendices A and B of Gujarati, chapter 4 of Johnston, and/or Appendices A-C of Greene. The latter are more advanced than Gujarati.

Kennedy's book does a good job of providing an intuitive explanation of various econometric procedures, and as such you may find it a good complement to Greene. An on-line version is also available through the library (see the link on the course web page).

Unless otherwise indicated in class or below, the only readings that are required are those from Greene. The others are provided in case you find Greene unclear and would like to consult another source. **Note that a few additional items may be added to this list as the course progresses.**

1. *Introduction*

Greene, chapter 1  
Kennedy, chapter 1  
Gujarati, chapter 1

2. *The classical linear regression model: Multiple regression*

(i) Estimation

Greene, chapter 2, 3.1-3.4, 7.3, 17.1-17.3, pp. 492-493  
Kennedy, chapter 3  
Gujarati, chapters 2, 7.1-7.4, 3.1-3.3  
Johnston, 2-1-2-3, 5-1-5-3

(ii) Properties of estimators

Greene, 4.1-4.4, 4.6, 4.8, C.5, Appendix D, 5.1-5.2, 17.4  
Kennedy, 1.4, chapter 2, appendix C  
Gujarati, 3.4, chapters 4, 6  
Johnston, chapter 7

(iii) Evaluation of regression results

Greene, 3.5, 8.4

Kennedy, 2.4  
Gujarati, 3.5-3.10, 7.8-7.12

(iv) Hypothesis Testing and Prediction

Greene, 4.7, 6.1-6.3, 6.5-6.7, 17.5  
Kennedy, chapter 4, Appendix A  
Gordon, Daniel V., Lars Osberg, and Shelley A. Phipps. "How Big Is Big Enough? The Problem of Sample Size in Studies of Labour Supply." Halifax, N.S.: Department of Economics, Dalhousie University, May 1990.  
Gujarati, chapters 5, 8

(v) Uses of dummy variables

Greene, 7.2  
Kennedy, chapter 14  
Gujarati, chapter 15  
Johnston, 6-3, 6-4

3. *Data problems in applied econometrics*

Greene, 4.9  
Kennedy, chapter 11  
Gujarati, chapter 10  
Johnston, 6-5

4. *Violations of the assumptions of the classical linear regression model*

(i) *Stochastic X matrix*

Greene, 4.5

(ii) *Nonnormal errors*

Greene, 5.2.2, 6.4  
Gujarati, pp. 141-144

(iii) *Parameter stability*

Greene, 7.4, 7.5.2, 7.5.3,  
Kennedy, 6.4  
Johnston, 6-2

(iv) *Incorrect choice of variables*

Greene, 8.1-8.3, 8.5  
Kennedy, 6.2, 6.3  
Gujarati, 13  
Johnston, 6-6

(v) *Correlations between  $X$  and  $\varepsilon$*

Greene, 5.4-5.6  
Kennedy, chapter 9  
Gujarati, 13.5  
Johnston, 10-6

(vi) *Nonspherical disturbances*

(a) *General treatment*

Greene, 10.1-10.3, 10.5-10.7  
Kennedy, 8.1-8.2  
Johnston, 8-1 to 8-3

(b) *Heteroskedasticity*

Greene, 11.1, 11.2, 11.4-11.7  
Kennedy, section 8.3  
Gujarati, chapter 11  
Johnston, 8-4

(c) *Autocorrelation*

Greene, 12.1-12.3, 12.5, 12.7-12.9, 12.11-12.12  
Kennedy, section 8.4  
Gujarati, chapter 12  
Johnston, 8-5

If time permits, one or more of the following topics will also be covered:

5. *Working with time-series data*

Charemza and Deadman, chapters 4 and 5  
Enders, chapters 4 and 6  
Kennedy, chapter 17  
Greene, chapter 20

6. *Panel data*

Greene, chapter 13  
Johnston, 10-3

7. *Nonlinear regression models*

Greene, chapter 9 and E.6

8. *Methodological issues in econometrics*

- Charemza and Deadman, chapters 1-3.
- Darnell, A. C., and J. L. Evans. *The Limits of Econometrics*. Aldershot, Hants, UK: Edward Elgar, 1990, chapter 4.
- Denton, F. T. "The Significance of Significance: Rhetorical Aspects of Statistical Hypothesis Testing." In *The Consequences of Economic Rhetoric*, A. Klamer, D. N. McCloskey, and R. M. Solow, eds. Cambridge: Cambridge University Press, 1988, 163-183.
- Denton, F.T. "Data Mining as an Industry." *Review of Economics and Statistics* 67 (1985): 124-27.
- Dewald, W., J. Thursby, and R. Anderson. "Replication in Empirical Economics: The *Journal of Money, Credit, and Banking* Project." *American Economic Review* 76 (1986): 587-603.
- Granger, C.W.J. *Modelling Economic Series: Readings in Econometric Methodology*. Oxford: Clarendon Press, 1990.
- Hendry, D.F. "Econometric Methodology: A Personal Perspective." In *Advances in Econometrics Fifth World Congress*, Vol. II, T.F. Bewley, ed. Cambridge: Cambridge University Press, 1987.
- Kennedy, Peter E. "Sinning in the Basement: What are the Rules? The Ten Commandments of Applied Econometrics." *Journal of Economic Surveys* 16 (2002), 569-589. See also "Comments" that follow on pp. 591-619.
- Kruskal, W. H. "Significance, Tests of." In *International Encyclopedia of the Social Sciences*, Vol. 2, W. H. Kruskal and J. M. Tanner, eds. New York: The Free Press, 1978, 944-958.
- Leamer, E.E. "Let's Take the Con Out of Econometrics." *American Economic Review* 73 (1983): 31-43.
- Lovell, M.C. "Data Mining." *Review of Economics and Statistics* 65 (1983): 1-12
- McCloskey, D. N. "Economical Writing." *Economic Inquiry* 24 (1985): 187-222.
- McCloskey, D. N., and Ziliak "The Standard Error of Regressions." *Journal of Economic Literature* 34 (1996): 97-114.
- McCloskey, D. N. *The Rhetoric of Economics*, 2<sup>nd</sup> ed. Madison, WI: University of Wisconsin Press, 1998, 112-138.
- "Symposium: Data Mining," in *Journal of Economic Methodology* 7(2000): 171-277.