

# ECON 102B: INTRODUCTION TO ECONOMETRICS

## STANFORD UNIVERSITY, SPRING 2008

LECTURE: MW 1:15pm-3:05pm, in 200-2

PROFESSOR: Matt Harding

OFFICE: Landau Economics Building, Room 238

OFFICE HOURS: Monday, 4pm - 6pm

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TEACHING ASSISTANTS:

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There will be weekly TA sessions with times and locations to be announced by the TAs.

AIMS: This course introduces students to the study of modern econometric techniques, as employed in economics and finance. We will study the basic linear regression model and learn how to estimate, test and predict multivariate relationships. We will then consider additional extensions to deal with heteroskedasticity, dynamics and simultaneity. Additionally we will explore more advanced models for panel data, qualitative variables, time series and financial data. The course will cover both theoretical and practical issues and problems sets will contain extensive applications to real data and require the use of statistical software.

REQUIRED TEXTBOOK: *Principles of Econometrics* by R. Carter Hill, William E. Griffiths and Guay C. Lim (Wiley, 3<sup>rd</sup> Edition, 2008).

RECOMMENDED COMPUTER SUPPLEMENT BOOK: *Using STATA for Principles of Econometrics* by Lee C. Adkins and R. Carter Hill (Wiley, 3<sup>rd</sup> Edition, 2008).

PRS-RF CLICKERS. You will use PRS clickers in class to answer questions during "break-out sessions". They are available for purchase at the Stanford Bookstore. You will only be able to use the newer radio frequency (RF) version. The older IR system is no longer compatible. If you are already using a PRS-RF clicker in another class you don't need to buy another one. Answering questions in class will earn you up to 4 extra points on the final exam.

PREREQUISITES: Econ 50 (*Economic Analysis 1*), Econ102A (*Introduction to Statistical Methods*). Recall that Math 51 (*Linear Algebra and Differential Calculus of Several Variables*) is a prerequisite for Econ 50 and I will make use of material from this course freely.

**ASSUMED PREPARATION IN MATHEMATICS:** I am assuming that all students have knowledge of calculus and linear algebra at the level of Math 51. In particular, I assume students are familiar with basic multivariate calculus (first and second derivatives and how to obtain them), summation and integration, matrices and matrix operations. More generally, I expect students to be comfortable following mathematical arguments and the structure of mathematical proofs.

*If you do not have sufficient mathematical preparation, you will not be able to understand the material covered in this course and you should not take this course.*

**ASSUMED PREPARATION IN STATISTICS AND ECONOMETRICS:** I am assuming that all students have knowledge of the topics covered in Econ 102A. Particularly important are: the difference between the population and the sample, the difference between an parameter and an estimator, the properties of random variables (including both discrete and continuous random variables), calculating expectations, variances, correlations, conditional expectations and conditional variances, working with the univariate normal distribution and the construction of confidence intervals and hypothesis tests.

The sections will briefly review some of this material, but the review will be very intense and designed for people who have already learned this material in a previous course. If you have not learned this material before, or if you have forgotten this material, then you will not be able to understand the material covered in this course and you should not take this course.

#### COURSE REQUIREMENTS

- Problem Sets, 25% of your grade.
- First Midterm Exam, 15% of your grade
- Second Midterm Exam, 20% of your grade.
- Final, 40% of your grade.

#### COURSE MANAGEMENT

The course management policies can be downloaded from:

[http://www-econ.stanford.edu/academics/economics\\_department\\_course\\_management.pdf](http://www-econ.stanford.edu/academics/economics_department_course_management.pdf)

Please read these policies carefully if you have not done so already.

We will make extensive use of the course web-site throughout the quarter ([coursework.stanford.edu](http://coursework.stanford.edu)). Adding 102B to your course-list in Axess will make it much easier for you to register for the course web-site. Lecture handouts, problem sets and solutions will all be posted on coursework. In addition, important announcements about office hours, times and locations will also be made on coursework. Please make sure to check the site regularly.

#### EXAM DATES

All exams will be closed book. However, students will be allowed to carry a letter sized (8.5x11 inch) page "cheat-sheet" with them to the exams.

1. Monday 4/21 (6th Class), First midterm (Closed Book), In Class.
2. Monday 5/12 (12th Class), Second midterm (Closed Book), In Class

### 3. Tuesday 6/10, Final Exam (Closed Book), 8:30am-11:30am

The exam dates are not flexible. The only exception to this rule is for death of a family member or illness requiring immediate attention of a physician. There will be no exception for job interviews or other non-Stanford activities. Athletes on the road must take the exam at the same time and date as the rest of the class, but may do so outside of Stanford under the supervision of their coach. See the course management section for more details on these issues.

#### PROBLEM SETS

There will be 5 problem sets during the course. All problem sets must be turned in to the Economics Academic Office by 4 P.M. on the due date. Late homework will be assigned a grade of 0 and the lowest grade will be dropped in computing grades. It is *entirely* your responsibility to ensure that you complete the assignments and remember to turn them in on time at the designated location. There will be no extensions for the problem sets. The only exception to this rule is for death of a family member or illness requiring immediate attention of a physician. There will be no exception for job interviews or other non-Stanford activities or for completed work that students forget to turn in. Athletes on the road must still turn in the problem sets by the stated deadlines, although may do so by fax. Further details can be found on the course management file. Answering questions in class using the PRS-RF clickers will earn you up to 4 extra points on the final exam.

1. Monday 4/14, Problem Set 1 Due.
2. Monday 4/28, Problem Set 2 Due.
3. Monday 5/5, Problem Set 3 Due.
4. Monday 5/19, Problem Set 4 Due.
5. Monday 6/2, Problem Set 5 Due.

#### OUT OF CLASS COLLABORATION

You are allowed to work together in groups for the problem sets, but each student must turn in an individual problem set with their own solutions. It is not a violation of this policy to submit essentially the same answer on a problem set as another student, but is a violation of this policy to submit a close to exact copy.

#### COMPUTATIONAL EXERCISES

The TAs for this course will provide instruction in the use of STATA, a statistical software package that will be used for the problem sets and is available on the Stanford UNIX system. Students are welcome to use any other statistical package (such as R or SAS) that they wish to use, but the TAs are not required to support any package other than STATA. Details on how to get started with STATA on the Stanford UNIX system can be found at

[http://library.stanford.edu/services/social\\_sci\\_data\\_soft/docs/software\\_docs\\_stata\\_unix.pdf](http://library.stanford.edu/services/social_sci_data_soft/docs/software_docs_stata_unix.pdf)

and other related documents at

[http://library.stanford.edu/services/social\\_sci\\_data\\_soft/software\\_docs.html](http://library.stanford.edu/services/social_sci_data_soft/software_docs.html)

The recommended computer supplement book provides detailed, step-by-step instructions to STATA tailored to the statistical models encountered in the textbook.

You can also purchase a student version of STATA for your own computer (see the site <http://www.stanford.edu/services/softwarelic/stata> for more information) but that is not required for the course.

#### COURSE OUTLINE

	Date	Topics	Reading
1	4/2	Data and Economic Models	HGL: Ch. 1; App: A,B,C AH: Ch.1; App: A, B, C
2	4/7	Simple Linear Model	HGL: Ch. 2; AH: Ch. 2
3	4/9	Estimation, Testing and Prediction	HGL: Ch. 3, 4; AH: Ch. 3,4
4	4/14	<b>PS1</b> ; Multiple Regression Model	HGL: Ch. 5; AH: Ch. 5
5	4/16	Inference	HGL: Ch. 6; AH: Ch. 6
6	4/21	<b>Mid-Term 1</b>	HGL: Ch. 1-6
7	4/23	Nonlinear Relationships	HGL: Ch. 7; AH: Ch. 7
8	4/28	<b>PS2</b> ; Heteroskedasticity	HGL: Ch. 8; AH: Ch. 8
9	4/30	Dynamic Models	HGL: Ch. 9; AH: Ch. 9
10	5/5	<b>PS3</b> ; Moment Based Estimation	HGL: Ch. 10; AH: Ch. 10
11	5/7	Simultaneous Equations	HGL: Ch. 11; AH: Ch. 11
12	5/12	<b>Mid-Term 2</b>	HGL: Ch. 7-11
13	5/14	Panel Data Models	HGL: Ch. 15; AH: Ch. 15
14	5/19	<b>PS4</b> ; Qualitative Dependent Variables	HGL: Ch. 16; AH: Ch. 16
15	5/21	Time Series	HGL: Ch. 12; AH: Ch. 12
16	5/28	Autoregressive Models	HGL: Ch. 13; AH: Ch. 13
17	6/2	<b>PS5</b> ; Time-varying Volatility	HGL: Ch. 14; AH: Ch. 14
18	6/4	Revision	
19	6/10	<b>Final Exam: 8:30am-11:30am</b>	HGL: Ch. 1-16