Course Syllabus

ECO 82100
Econometrics I

City University of New York Graduate Center, Room 6496
Fall 2019, M 2:00-5:00pm

Professor Contact Information

Wim Vijverberg
CUNY.GC Room 5316.01, Phone: (212)817-8262, Email: wvijverberg@gc.cuny.edu
Office hours: T 2:45-4:00 (subject to availability) and by appointment

TA: Meng-Ting Chen
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Office hours: TBA
Lab session: T 9:30-11:30am, Room TBA

Course Pre-requisites, Co-requisites, and/or Other Restrictions

There are no formal prerequisites for this class. However, students are expected to be competent in calculus, linear algebra, and mathematical statistics. Prior exposure to econometrics at an undergraduate or master's level is highly recommended. Familiarity with Stata, a statistical/econometric computer language that enables practical applications of the techniques discussed in this course, will be useful but can be developed during the course of the semester.

Course Description

This course is the first of a two-semester graduate level study of the theory and practice of econometrics. The course assumes a working knowledge of concepts of econometric analysis. The objective is to work through a common set of principles, to formulate the theoretical underpinnings of various models, to study the workings of many econometric models, to be able to recognize variants of existing models, to develop variations of existing models that fit particular research problems.

Student Learning Objectives/Outcomes

This course promotes student learning in various ways.

1. Strengthen understanding of linear algebra and mathematical statistics that are the foundation for econometric analysis
2. Understand the importance of a proper link between econometric analysis and economic theory
3. Master the foundations of the classical general linear regression model
4. Start exploring extensions of the classical general linear regression model
5. Gain proficiency in the use of statistical/econometric software

Textbook Information

Required textbooks:
W.H. Greene, Econometric Analysis, 7th. ed., Upper Saddle River, NJ: Pearson Education (Prentice-Hall), 2012 ("Gr").

Good books for supplementary reading:
T. Amemiya, Introduction to Statistics and Econometrics, Harvard Univ. Press, 1994 ("Am").
R. Davidson and J.G. MacKinnon, Econometric Theory and Methods, Oxford Univ. Press, 2004 ("DM").
R. Davidson and J.G. MacKinnon, Estimation and inference in econometrics, Oxford Univ. Press, 1993.
J. Johnston and J. Dinardo, Econometric Methods, 4th ed., New York: McGraw-Hill, 1997.
G.G. Judge, W.E. Griffiths, R.C. Hill, H. Lütkepohl, and T.C. Lee, Introduction to the Theory and Practice of Econometrics, 2nd ed., New York: John Wiley and Sons, 1988
R.C. Mittelhammer, G.G. Judge, D.J. Miller, Econometric Foundations, Cambridge Univ. Press, 2000.
J.M. Wooldridge, Econometric Analysis of Cross Section and Panel Data, MIT Press, 2002.
F. Hayashi, Econometrics, Princeton Univ. Press, 2000.
M. Verbeek, A Guide to Modern Econometrics, John Wiley, 2008.

At a more introductory level:
D.N. Gujarati and D. Porter, Basic Econometrics, 5th ed., New York: McGraw-Hill Publ. Co., 2008.
P. Kennedy, A Guide to Econometrics, 6th ed., Cambridge, MA: The MIT Press, 2008
R.S. Pindyck and D.L. Rubinfeld, Econometric Models and Economic Forecasting, 3rd ed., New York: McGraw-Hill Book Company, 1991.
R. Ramanathan, Introductory Econometrics, with Applications, 5th ed., Southwestern College Pub, 2001.
J.M. Wooldridge, Introductory Econometrics: A Modern Approach, 5th ed., Southwestern College Publ., 2012.

Good help for foundations in statistics:
A.S. Goldberger, A Course in Econometrics, Harvard Univ. Press, 1991.
G. Casella and R.L. Berger, Statistical Inference, 2nd ed., Duxbury, 2002.
R.V. Hogg, J. McKean and A.T. Craig, Introduction to Mathematical Statistics, 7th ed., Pearson, 2012.
R.C. Mittelhammer, Mathematical Statistics for Economics and Business, 2nd ed., Springer, 2013.
T.W. Epps, Probability and Statistical Theory for Applied Researchers, World Scientific, 2014.

Good help for foundations in linear algebra:
A.S. Anton, Elementary Linear Algebra, Harvard Univ. Press, 1991.
P. Dhrymes, Mathematics for Econometrics, Springer, 1984.

Grading Policy, Assignments, and Exam Dates

There will be two midterms, a final exam, and approximately seven homework assignments. Class participation is expected, demonstrating familiarity with the material to be covered that day.

Midterm 1	Monday, 7 October 2019	20%
Midterm 2	Monday, 11 November 2019	30%
Final	Monday, 16 December 2019	35%
Homework	Various due dates	10%
Lab assignment	Various dates	5%

The first midterm exam is devoted to the foundations in mathematics (primarily linear algebra but also numerical optimization) and statistics (probability theory, hypothesis testing, asymptotic theory), thus linking to learning objective 1. The second midterm exam and the final exam cover the theory of econometrics: definitions, concepts, proofs, application, and interpretation, thus linking to learning

objectives 2, 3 and 4. The final exam is not cumulative. Homework assignments deal with developing proofs, working out end-of-chapter exercises, and programming up some of the techniques that are introduced in the lectures. The homework assignments address learning objectives 3, 4 and 5. Lab assignments are short quizzes covering material of the last lectures and assist in learning objectives 2, 3 and 4; for more detail, see below.

If the circumstances so demand, these timelines are subject to change at the discretion of the Professor.

Course & Instructor Policies

Absence from any exam must be properly documented; otherwise a grade of 0 is assigned to a missed exam. Make-up exams are scheduled within the same week for those who missed an exam with proper documentation.

There is no extra credit work.

It has been the experience of students in the past that the amount of time spent on homework assignments is inversely related to the amount of time spent in preparation for the lectures and study of materials after the lectures.

Homework assignments that involve statistical computing may be completed with Stata or any other software that the student is familiar with. Be advised that, at the GC, people are more familiar with Stata, EViews, and Matlab: if you use other software, you may have to figure out things more on your own.

Cellphones and pagers must be turned off. Recording the lecture is not permitted.

The "Lab session" is a weekly study session supervised by the TA for this course. The session is partially evaluative (a weekly lab assignment that is part of the overall grade for Econometrics I), partially structured (planned topics will be discussed) and partially unstructured (time for a free-flowing discussion of homework, lecture material, old exams, end-of-chapter exercises, etc.). The lab is not a place to find out how to do an upcoming homework assignment. Rather, apart from the scheduled topics, the lab offers an opportunity to discuss any econometric question or problem with the TA and with other students. Your own preparation (i.e., getting topics ready, knowing what question to ask) will make the lab most productive.

Reading Assignments

The following is a tentative calendar for this semester. ***If the circumstances so demand, these timelines and course materials are subject to change at the discretion of the Professor.***
Note: "Am" refers to Amemiya; "Gr" refers to Greene; "M" refers to Mittelhammer's statistics book; "DM" refers to Davidson and MacKinnon; R(1), O(1), O(2), O(3), O(4) and O(5) are explained in a note following this calendar.

Date	**Session**	**Topic**		**Reading**
Aug. 12 to Aug. 23	Math Camp	1a	Matrix algebra	Gr, App. A Am, Ch. 11 DM, Sec. 1.4, 2.2 O(1)

Date	Session	Topic		Reading
Sep. 2	...		No class	
Sep. 5 (**Thu.**)	1	0	Administrative matters	
		1	Review	
		1b	Probability and distribution theory	Gr, App. B Am, Ch. 1-5 DM, Sec 1.2, 4.3 M, Ch. 1-4 O(2)
		1c	Estimation and inference	Gr, App. C Am, Ch. 7-9 DM, Sec. 1.5; 4.2 M, Ch. 6-10
Sep. 9	2	1d	Large sample theory	Gr, App. D Am, Ch. 6 M, Ch. 5
		1e	Computational issues in econometrics	Gr, App. E
Sep. 16	3	2	The Classical Linear Regression Model	
		2a	What is econometrics all about?	Gr, Ch. 1 Gr, Sec. 12.1
		2b	Least squares: assumptions, OLS estimation, FWL theorem	Gr, Ch. 2-3 Am, Ch. 10 DM, Ch. 1,2
		2c	Statistical properties of OLS estimators, Gauss-Markov theorem	Gr, Ch. 4 DM, Ch. 3
Sep. 23	4	2d	Statistical inference	Gr, Ch. 5
		2e	Bootstrapping	DM, Ch.4-5 DM, Sec. 4.6 Gr, Sec.15.1-5
Sep. 30	...		No class	
Oct. 7	**Midterm 1: 2:00-3:30: topics 1b-1e**			
Oct. 7 Cont'd	5	2f	Data issues	Gr, Sec. 4.7 DM, Sec. 2.6 DM, Sec. 3.4
		2g	Model specification issues: Dummy variables Interactions Nonlinear relationships	Gr, Sec. 6.2 Gr, Sec. 6.3.3 Gr, Sec. 6.3 Gr, Sec. 6.4

Date	Session	Topic		Reading
Oct. 16 (**Wed.**)	6	2g	Model specification issues (continued): Structural break	 DM, Sec. 3.7 DM, Sec. 15.5
			Model selection	Gr, Ch. 7
		3	Nonlinear regression models	
		3a	Introduction, MoM estimation	DM, Sec. 6.1-6.2
Oct. 21	7	3b	Estimation by NLS, Gauss-Newton	Gr, Sec. 7.1-7.2 DM, Sec. 6.3-6.5
Oct. 28	8	3c	Quantile regression	Gr, Sec. 7.3 O(4), O(5)
		3d	Partially linear regression	Gr, Sec. 7.4
		3e	Nonparametric regression	Gr, Sec. 7.5
Nov. 11	9	4	Generalized Least Squares	
		4a	The GLS approach in general terms	Gr, Sec. 9.1-9.3 DM, Sec 7.1-7.4
Nov. 4	**Midterm 2: 2:00-3:30: topics 2a-3e (tentatively)**			
Nov. 4 (cont'd)	10	4a	The GLS approach (continued)	Gr, Sec. 9.1-9.3 DM, Sec. 7.1-7.4
Nov. 18	11	4b	Heteroskedasticity	Gr, Sec. 9.4-9.8 DM, Sec. 7.5
Nov. 25	12	4c	Time series data: AR and MA	Gr, Ch. 20 DM, Sec. 7.6-7.9
Dec. 2	13	4d	Time series data: ARCH and GARCH	Gr, Sec. 20.10
		4e	Nonstationary data	Gr, Ch. 21
Dec. 9	14	4f	Spatial regression models	R(1), O(3)
Dec. 16	**Final exam: 2:00-5:00: topics 4a-4f (tentatively)**			

Required:

R(1): Anselin, Luc. "Under the hood: issues in the specification and interpretation of spatial regression models." Agricultural Economics, Nov 2002, 27:3, 247-267.

R(2): Florax, Raymond J.G.M. and Arno J. van der Vlist. "Spatial econometric data analysis: moving beyond traditional models." International Regional Science Review, July 2003, 26:3, 223-243.

Optional:

O(1): Theil, Henri. "Linear algebra and matrix methods in econometrics." In Z. Griliches and M.D. Intriligator, eds., Handbook of Econometrics, Vol. 1, 1983, pp. 3-65.

O(2): Zellner, Arnold. "Statistical theory and econometrics." In Z. Griliches and M.D. Intriligator, eds., Handbook of Econometrics, Vol. 1, 1983, pp. 67-178.

O(3): Anselin, Luc. Spatial Econometrics: Methods and Models, Dordrecht, Boston: Kluwer Academic Publishers, 1988

O(4): Koenker, Roger, and Kevin F. Hallock, "Quantile regression." Journal of Economic Perspectives, Autumn 2001, 15:4, 143-156.

O(5): Koenker, Roger, and Kevin F. Hallock, "Quantile regression: an introduction." Online version: http://www.econ.uiuc.edu/~roger/research/intro/intro.html.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism.

Email Use

I recognize the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. For this reason, I will consider email from students official only if it originates from a CUNYGC student account. This allows me to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information.

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any course. These dates and times are published in the academic calendar. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.