17.874. Quantitative Methods II
Spring 2008
Professor Orit Kedar
Tuesday, Thursday, 11-12:30
Room E51-393

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Course site: http://stellar.mit.edu/S/course/17/sp08/17.874/index.html
Office hours: Wednesday 3-4, or by appointment.
Office: E53-429

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E-mail: plwarre@MIT.edu
Office hours: TBA
Recitation: Friday, 11-12. Room: E51-061

Course description

The main goal of the course is to develop (i) understanding, (ii) ability to critically evaluate, and (iii) ability to confidently apply statistical analyses of the type covered in the course in order to answer substantive questions in political science.

The course will cover the classical linear regression (including assumptions, properties of estimators, violations of assumptions and solutions, tests, interpretation, extensions, and the like.) Toward the end of the course, we will also introduce in brief maximum likelihood and models of qualitative dependent variable.

The course should give you tools to assess what is an appropriate estimation technique by which to analyze your data, and, no less important, what are the pitfalls of using particular techniques versus others.

Books and reading materials

The following books are on reserve and available for purchase at the COOP:

We also put on reserve the following books:
They might come in handy in the matrix algebra section of the course.

Different people find different texts intuitive and helpful for different topics. I list below a few statistics/econometrics textbooks. I will occasionally refer to them. Please take the
time to browse through them and find the ones helpful to you. These books are on reserve:


And these are a few additional ones:


*Substantive readings/applications.* I weaved into the course plan substantive readings which are excellent examples of the topics learned. These readings are marked with *. A good example of an application goes a long way in demonstrating how a method is used and what its advantages are. We will discuss these readings in class. Please make sure to come prepared.

Our main textbook for the course is Greene’s. However, on some of the earlier weeks we will use other texts. Also, for every topic, I list below Greene some alternative readings from other textbooks should you prefer to consult with them. It is important that you read before the lecture.

We will have a mailing list for the class. Please make use of it to ask and answer each other’s questions. We all learn from each other’s questions.

**Assignments**

*Weekly problem set.* Problem sets will be handed on Fridays and will be due the following Friday at the beginning of class. They will include empirical and theoretical questions, depending on the topic. You may work in groups but do the write-up on your own.

The data we will use for most problem sets is the Comparative Study of Electoral Systems. The CSES is a terrific data set which allows for investigation of a variety of questions. It is a multi-country dataset including information both at the micro level about individuals and at the macro level about political systems. We will ask you to
focus on different parts of it depending on the week. The data are available at: www.cses.org. Please go ahead and acquaint yourself with these data.

Midterm exam. This will be a take-home exam, to take place on Thursday, April 3rd.

Research paper. Research paper in which students will conduct original research. More details will be provided in class. Papers are due on Monday, May 19 at 4PM. Heads up: on Friday, April 18, as part of the weekly assignment, we will ask you to demonstrate initial progress on the research paper.

Draft of research paper. A rough draft is due on May 2nd. Please hand in two copies (to us and to an assigned peer).

Peer commentary. Each student will be assigned to a peer and will provide commentary on the draft. The commentary should be constructive and aim at improvement of the work read. Please hand in two copies of the commentary. The commentary is due on May 6.

Grading. Weekly problem set - 20%, midterm exam – 30%, paper draft + peer commentary 15%, final paper - 35%.

Course plan

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<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Tuesday, February 5th</td>
<td>Introduction</td>
</tr>
<tr>
<td>Thursday, February 7th</td>
<td>Probability and Statistical Inference - Review</td>
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<td></td>
<td>bias, consistency, efficiency</td>
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<td></td>
<td>Greene, C1-C5</td>
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<td></td>
<td>Gujarati, A1-A4, A6-A8</td>
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<td></td>
<td>S+W, 2.1, 2.2, 2.5, 3.1, 3.2, 3.3</td>
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<td>For recitation on Friday, February 8th:</td>
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<td>Tuesday, February 12th</td>
<td>Linear Regression - Bivariate Model</td>
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<tr>
<td></td>
<td>Least Squares assumptions</td>
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<tr>
<td></td>
<td>model fit</td>
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<td>properties: finite sample, asymptotic</td>
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<td>Thursday, February 14th</td>
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Monday schedule, no class

**Thursday, February 21**th

**Linear Regression – Multivariate Model**
Gauss-Markov assumptions and problems (no solutions yet)
model fit properties

Gujarati, 4.1-4.3, 7.1-7.8
S+W, ch. 5.4, 5.5, 6.2-6.6
Achen, Sage monograph.

**Tuesday, February 26**th

**Review of Matrix Algebra**
Vectors, matrices, addition, multiplication, identity, inversion, rank, dependence and independence, partition.

Greene, Appendix A
Johnston, ch. 4
Simon and Blume, ch. 6, 7, 8 (partition)
Strang, ch. 1,2

**Tuesday, March 4**th

**Linear Regression Model in Matrix Form**

Greene, ch. 2, 3.1-3.2, 3.5, 4.4, 4.8, 4.9

**Thursday, March 6**th

**Linear Regression**
confidence intervals, hypothesis testing restrictions on coefficients transformations, non-linearity

Greene, ch. 4.6-4.7, 5.1-5.3, 5.6, 6.3
Gujarati, ch. 8
S+W, 5.1-5.2, 7.1-7.2 (homoskedasticity only), 8.2

**Tuesday, March 11**th

**Linear Regression**
dummy variables, interaction terms predictions interpretation

Greene, 5.6, 6.1-6.2
Gujarati, 9.1-9.6
S+W, 5.3, 8.3
Thursday, March 20th

**Linear Regression**
Plots, graphs, and common mistakes


Tuesday, March 25th
No class, spring break

Thursday, March 27th
No class, spring break

Tuesday, April 1st
catch-up and review

Thursday, April 3rd
midterm take-home exam

Tuesday, April 8th

**Problems, Violations of Assumptions, Solutions**

outliers
missing data
collinearity


Greene, 4.8.1, 4.8.2
S+W, 6.7
Gujarati, 10.1-10.5, 10.7-10.9

Thursday, April 10th

**More Problems**

heteroskedasticity
Thursday, April 17th  
correlated disturbances  
Greene, 8.4-8.7  
measurement error  
omitted-variable bias  
Instrumental variable  
Greene, 12.1-12.5  
Gujarati, 7.8  
S+W, 6.1, 7.5, ch. 12  

Tuesday, April 22nd  
No class, Patriots Day  

Thursday, April 24th  
Endogeneity, Simultaneous Equations  
Tuesday, April 29th  
Greene, 12.1-12.5 (continued)  
S+W, 6.1, 7.5, ch. 12 (continued)  

Thursday May 1st  
Maximum Likelihood  
Tuesday May 6th  
dichotomous dependent variable  
Logit, Probit  
King, ch. 4, ch. 5.1  
Long, 2.6, 4.1  

Thursday, May 8th  
Logit and Probit  
quantities of interest  
King, ch. 5.2  
Long, ch. 3.1-3.5  

Tuesday, May 13th  
Multinomial Choice Models
Thursday, May 15th

MNL, CL, IIA

Maddala, 2.10-2.12
Long, 6.1-6.3, 6.7-6.8

Application, TBA.