

ECON 213A-1: Applied Econometrics with R

Fall 2018

International Business School
Brandeis University

Lemberg 180

Tu Th 9:30 - 10:50 am

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Course Description and Objectives

This course focuses on the application of econometric models. The emphases are not just on using the proper statistical methods, but also the proper interpretation of the results. These analyses provide valuation information across many areas of the business analytic world.

We begin by reviewing probability distributions, basic statistics, and the ordinary least squares (OLS) model: foundations, assumptions, and limitations. There will be an emphasis on correcting for some of the violations of the model, including transformations, non-linear variables, working with both panel and time-series data, and limited dependent variables (logit and probit models). The intent is to take the statistical methods and apply it to real world data.

In this course we will review empirical studies that utilize the techniques learned in this course, and generate models using real data to illustrate the limitations of theory and demonstrate the practical issues that arise in research. At the end of the course, students will be able to generate, interpret, and present models with confidence, as well as understand and critique other models.

Learning Goals

Students will learn to,

- work with real data,
- identify and evaluate model appropriateness,
- modify and manipulate real data,
- present the data: describe succinctly and utilize it for inferential purposes.

Software and Textbook

We will be using R extensively, and as such is required. All computers at IBS have R installed, and is free to download at <https://www.r-project.org/>. I recommend visiting <https://support.rstudio.com/hc/en-us/articles/201141096-Getting-Started-with-R> for getting started with R to get comfortable.

You may use other statistical software.

Recommended Textbook: Stock, James H., and Mark W. Watson. *Introduction to Econometrics*. 2nd edition. Boston: Addison-Wesley, 2011.

Prerequisites

ECON 210f (or another basic statistics). Students who have not taken ECON 210f should meet with me to ensure they are sufficiently trained.

Information

Latte will be used to post assignments, and make announcements. Handouts and external links will be posted for each class as well. Any last-minute changes will be posted on Latte and an email will be sent to your Brandeis email.

Learning Assistance

If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately. No work can be retroactively graded.

Academic Integrity

You are expected to be honest in all of your academic work. Please consult Brandeis University *Rights and Responsibilities* for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at *LTS - Library guides*.

Grading

Homework:	20%
Midterms (2):	30%
Final Paper:	50%

Homework

There will be small problem sets that will be collected at the beginning of the next class, and should be turned in independently (but you may consult with classmates). They will consist of an econometric problem accompanied by an analysis, and are designed to get you comfortable with R, output, and understanding results. *How you interpret and present the results is at least as important as the statistical correctness of your analysis.* No late assignments will be accepted. Assignments are to be emailed to me (not through Latte). Emailed assignments must be a PDF and in my inbox before the start of class, otherwise they will not be accepted.

Midterms

The midterms will be take-home exams, to be completed independently. Any suspicion of collaboration with other students will result in a grade of zero, with the burden of proof on the student to provide evidence of independent work. Midterms will be due promptly by the beginning of the stated class, and absolutely no late assignments will be accepted. The format will be like a more extensive problem set, but are geared more towards a complete analysis, which will include your own ability to do econometric modeling. A large portion of your grade for the midterms will be the defense of your model and explanation of results. Emailed assignments must be a PDF. No late work will be accepted.

Final

The final will be a cumulative report of ongoing research throughout the semester, and may be done in groups of up to six students. Each group should be composed of a well-balanced mix of students with different strengths in mathematics, writing, and analytic skills. Groups will write a report of no more than 2,500 words. You will pick a topic that interests you, develop a theory or hypothesis to test, find a dataset, and complete a report using econometric analyses learned throughout the semester. It will be up to you to determine the proper modeling technique(s), defend the choice(s) you made, and present a thorough report.

You will need to include: summary statistics, hypotheses, modeling technique, empirical assessment, and conclusion. Within the body of the report, there should be no statistics! Numerical assessments should be presented in tables and footnotes. Styling should be professional, but targeted towards a non-econometrician.

Important Dates:

September 20: group members decided. You should also have some ideas of what you want to work on.

October 18: topic decided and approved. A one paragraph description of your economic question, your hypothesis, and how you expect to test it (i.e. what data you are looking for and how you plan on using the data).

November 15: data explored, found, examined, and described. A report should be handed in describing the data you have found thus far.

These are the midterm dates; there will be no class during these dates, but I will meet with each group to discuss progress on the final.

Reports should be free of grammatical errors, typos, spelling mistakes, and poor formatting. Failure to meet professional standards of organization, composition, editing, and proofreading can result in up to a 10% grade deduction. *You must cite all external sources! Any data, numbers, or facts must be cited so that I can verify them!* Failure to do so is plagiarism, and will be penalized accordingly.

The final is due by **Monday, December 17, by 11:59 pm**, and must be a PDF emailed to my Brandeis email. No late reports will be accepted. Ensure all group members are credited on the report.

Calendar & Outline

This section serves as a guideline for the material we will be covering.

TUESDAY	THURSDAY
Aug. 28th	Aug. 30th Introduction 1
Sep. 4th 2 Ch. 2 Review of Probability Random variables, expected values, distributions	Sep. 6th <i>Brandeis Day - Monday schedule</i>
Sep. 11th <i>Rosh Hashanah - no class/office hours</i>	Sep. 13th 3 Ch. 2 Review of Probability P-values, confidence intervals, test statistics
Sep. 18th 4 Ch. 3 Review of Statistics	Sep. 20th 5 <i>Final deadline 1 - group decided</i> Ch. 4 Bivariate Regression Least squares method
Sep. 25th <i>Brandeis Day - Monday schedule</i>	Sep. 27th 6 Ch. 6 Multivariate Regression Ordinary Least Squares (OLS)
Oct. 2nd 7 Ch. 6 Multivariate Regression OLS	Oct. 4th 8 Ch. 7 Hypothesis Testing
Oct. 9th <i>Personal Conflict - no class/office hours</i>	Oct. 11th 9 Ch. 8 Nonlinear Regression OLS violations, Log-linear models
Oct. 16th 10 Ch. 8 Nonlinear Regression Heteroskedasticity	Oct. 18th 11 <i>Final deadline 2 - topic decided</i> Ch. 8 Nonlinear Regression Heteroskedasticity
Oct. 23rd 12 Ch. 9 Assessing Empirical Models Information Criterion	Oct. 25th 13 Midterm 1 due Ch. 12 Instrumental Variables Choosing instruments
Oct. 30th 14 Ch. 12 Instrumental Variables IV Regression	Nov. 1st 15 Ch. 12 Instrumental Variables IV Regression
Nov. 6th 16 Ch. 11 Binary Dependent Variable Models Logit & Probit	Nov. 8th 17 Ch. 10 Binary Dependent Variable Models Ordered Logit & Probit
Nov. 13th 18 Ch. 10 Panel Data Pooled OLS, Fixed Effects, Random Effects	Nov. 15th 19 <i>Final deadline 3 - data discussion</i> Ch. 10 Panel Data Model selection

TUESDAY		THURSDAY	
Nov. 20th Ch. 10 Panel Data Logit & Probit	20	Nov. 22nd <i>Thanksgiving Recess - no class</i>	
Nov. 27th Ch. 10 Panel Data Logit & Probit	21	Nov. 29th Midterm 2 <i>Final: Meet with groups</i>	22
Dec. 4th Ch. 14 Time Series Lag selection, Autocorrelation functions	23	Dec. 6th Ch. 14 Time Series Non-stationary models	24
Dec. 11th Ch. 14 Time Series Assessing fit	25	Dec. 13th	

Final due Monday, December 17