WWS 507c: Quantitative Analysis
Tue Thu 9:00 - 10:30 AM, Room: Robertson 002

Instructor: Eduardo Morales, 291 Julis Romo Rabinowitz Building, ecmorale@princeton.edu
Office Hours: Tue 4:00 - 6:00 PM

Preceptor: Charly Porcher, cporcher@princeton.edu
Precepts: Wed 6:00 - 7:30 PM, Room: Robertson 015
Office Hours: Mon 2:30 - 4:00 PM, Room: Robertson 411

Stata Instructor: Robin Gomila, rgomila@princeton.edu
Stata Meetings: announced by email

Course Website: We will use the Blackboard website for posting announcements, materials, assignments, and solutions. The url for the site is:

> https://blackboard.princeton.edu/pucourse/WWS507C_F2018

Course Objectives: WWS 507c is divided into two parts. During the first half of the semester, WWS 507c does an introduction to probability and statistics. This is an introductory course in the sense that there is no presumption that you have taken a probability/statistics course before (although many of you may have). In this part of the course, among other topics, we will study the concepts of random variables, probability distributions, estimators, confidence intervals, and hypothesis tests. We will also discover the importance of the sample mean, the Law of Large Numbers and Central Limit Theorem, and learn how to use a random sample to obtain information about a population.

During the second half of the semester, WWS 507c does an introduction to regression. We will focus on the concept of causality and explain how we can estimate causal relationships both from randomized controlled experiments and observational data. The aim of this part of the course is to be able to estimate the effect of counterfactual policies.

Important Dates:

Thursday, October 25	Midterm exam distributed at 9:00am in Robertson 002
Tuesday, October 30	No class: Fall recess
Thursday, November 1	No class: Fall recess
Thursday, November 22	No class: Thanksgiving recess
Tuesday, December 4	Projects 1 and 2 are distributed
Thursday, December 6	3-hours class and discussion of policy exercise
Tuesday, December 11	No class: break for WWS 501 policy simulation
Friday, January 18	Projects 1 and 2 and discussion of newspaper article are due
Tuesday, January 22	Final Exam

Reading List:

There are two recommended texts for the course:

1. Morin, David, *Probability: For the Enthusiastic Beginner*, 2016.

2. Stock, James H., and Mark W. Watson, *Introduction to Econometrics*, Addison Wesley Publishing, 3rd edition, 2011.

Morin (2016) will be useful during the first half of the semester and Stock and Watson (2011) during the second half of the semester. Stock and Watson (2011) also contains a discussion of some of the material that we will cover in the first half of the course.

Additionally, for the first half of the semester, you might find it useful to consult a book on mathematical statistics. All of the following books cover the material we will study in class:

1. Blitzstein, Joseph K., and Jessica Hwang, *Introduction to Probability*, Chapman & Hall/CRC Texts in Statistical Science, 1st edition, 2014.

2. Freedman, David, Robert Pisani, and Roger Purves, *Statistics*, Norton, 4th edition, 2007.

3. Hogg, Robert V., Joseph McKean, and Allen T. Craig, *Introduction to Mathematical Statistics*, Pearson, 7th edition, 2012.

4. Larsen, Richard J., and Morris L. Marx, *Introduction to Mathematical Statistics and its Applications*, Pearson, 5th edition, 2011.

5. Miller, Irwin, and Marylees Miller, *John E. Freund's Mathematical Statistics*, Pearson, 8th edition, 2012.

6. Moore, David S., George P. McCabe, and Bruce A. Craig, *Introduction to the Practice of Statistics*, W.H. Freeman and Company, 8th edition, 2014.

7. Wackerly, Dennis D., William Mendenhall, and Richard Scheaffer, *Mathematical Statistics with Applications*, Cengage Learning, 7th edition, 2007.

8. Wasserman, Larry, *All of Statistics: A Concise Course in Statistical Inference*, Springer, 1st edition, 2004.

For the second half of the semester, in addition to the assigned text for the course, you might find helpful to consult one of the following books:

1. Angrist, Joshua D., and Jörn-Steffen Pischke, *Mastering 'Metrics*, Princeton University Press, 1st edition, 2015.

2. Rosenbaum, Paul R., *Observation and Experiment: An Introduction to Causal Inference*, Harvard University Press, 1st edition, 2017.

3. Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, South-Western College Pub, 5th edition, 2012.

Some additional books on causal analysis that will help you go beyond what we will cover in class are:

1. Angrist, Joshua D., and Jörn-Steffen Pischke, *Mostly Harmless Econometrics*, Princeton University Press, 1st edition, 2008.

2. Pearl, Judea, Madelyn Glymour, and Nicholas P. Jewell, *Causal Inference in Statistics: A Primer*, Willey, 1st edition, 2016.

Finally, some non-technical books about probability and statistics are:

1. Hand, David J., *The Improbability Principle: Why Coincidences, Miracles, and Rare Events Happen Every Day*, Scientific American/Farrar, Strauss, and Giroux, 2014.

2. McGrayne, Sharon B., *The Theory That Would Not Die: How Bayes' Rule Cracked the Enigma Code, Hunted Down Russian Submarines, and Emerged Triumphant from Two Centuries of Controversy*, Yale University Press, 2012.

3. Mlodinow, Leonard, *The Drunkard's Walk: How Randomness Rules Our Lives*, Vintage, 2009.

4. Pearl, Judea, and Dana Mackenzie, *The Book of Why: The New Science of Cause and Effect*, Basic Books, 2018.

5. Stigler, Stephen M., *The Seven Pillars of Statistical Wisdom*, Harvard University Press, 2016.

6. Wheelan, Charles, *Naked Statistics: Stripping the Dread from the Data*, W. W. Norton & Company, 2013.

Grading:

Your grade in this class will be based on your performance on a midterm exam (15%), a final exam (40%), two projects (20%), a series of problem sets (10%), a discussion/presentation of a newspaper article or scientific report (5%), and a policy exercise (10%).

Both the midterm and the final examinations will be in-class examinations. The midterm will be a 1.5-hours exam. The final will be a 3-hour exam.

You may work in teams on the problem sets, the discussion of the newspaper article or scientific report, and the projects. However, each of you must turn in your own problem set, discussion and project write-up.

You must work in teams for the policy exercise.

You may turn in problem sets and projects early, but we will not accept late assignments. Please, hand in your problem sets at the beginning of class the day they are due. Assignments handed in after 10:30 AM receive no credit.

Problem Sets:

Problem Set	Distributed	Due
1	September 25th	October 2nd
2	October 2nd	October 9th
3	October 9th	October 16th
4	October 16th	October 23rd
5	November 13th	November 20th
6	November 27th	December 4th
7	December 4th	December 13th