Very Tentative Syllabus – Winter Quarter, 2014

Lecture: Monday, Wednesday   2:30PM - 4:00PM   1210 Weill
Section: Friday   10:00AM - 11:30AM   1110 Weill
Office Hours: by appointment (typically afternoons). Email dinardo.schedule@gmail.com to setup an appointment.

> "As soon as questions of will or decision or reason or choice of action arise, human science is at a loss."   Noam Chomsky

> If you think . . . that anything like a romance is preparing you, reader, you were never more mistaken. Do you anticipate sentiment, and poetry, and reverie? Do you expect passion, and stimulus, and melodrama? Calm your expectations, reduce them to a lowly standard. Something real, cool and solid lies before you; something unromantic as Monday morning, when all who work wake with the consciousness that they must rise and betake themselves thereto.

> Charlotte Brontë

> Prelude to *Shirley*

This is a mathematical course in the basics of non–experimental inference with a focus on questions and problems that are interesting to economists and public policy analysts. This is a an *applied* course – the focus will be on developing the tools necessary to be able to evaluate contemporary research – basic familiarity with elementary calculus and statistics is required. Matrix algebra would be helpful, but we will cover the little bit of matrix algebra we use in the course. *STATA* will be used extensively. Homework, problem sets and exams for example, will all make use of *STATA* output.

Grading

I hope to have something definitive *soon.* As soon as Guodong and I have a chance to talk this will be revised. This is SUBJECT TO CHANGE. At the moment (January 7, 2015) I imagine the course will have the following requirements:

1. Class participation (10%)

2. Eight or more problem sets. (30%)

3. Two midterms. (30 %) each

"Class participation" will be assessed by the performance on random quizzes at the *start* of class. These quizzes will be short in duration, and quite superficial. They are not intended to be traumatizing – if you have done the reading ahead of time they should be trivial to accomplish. I will announce the readings in class and at coursetools.

I am also contemplating at least one "empirical" assignment, where you will do your own empirical research on a specified topic.

Exams

We will have two midterm exams in class (arrive promptly!) on

First Midterm: Feb 25th (Wednesday)
Second Midterm: April 28st (Monday)

Readings

1. Principal Text Books

    J. Johnston and J. DiNardo, *Econometric Methods*, Fourth Edition. You shouldn't be surprised if a lot of what I say jibes with what is in this book, but as a solo artist I have a much more micro–econometric bent. Introduces the matrix algebra as you go along.

    In what is a bit of tangle, the English language edition book has been discontinued in the U.S. but *not* in the rest of the world (and not in French, Portuguese, Chinese, or Spanish). Therefore, I am making a (slightly rough and slightly) version of the book available as a pdf file free (for personal use only) in this class. Please do not redistribute the book or the pdf file.

    Selections from:

    This book is out of print (but still available). I make available the relevant sections of this book:

    Orley Ashenfelter, Phil Levine, and Dave Zimmerman, *Statistics and Econometrics: Methods and Applications* This book is nice because of its distinctly "empirical" (instead of "mathematical") perspective. The first half of the book is a discussion of statistics and the second half takes up the multiple regression model and extensions.

2. Computer Assignments We will be using STATA in this course. It's advantages for this course are that it is (relatively) cheap, it is widely used, relatively easy to learn, and what you used in SPP 529. This is not intended as an endorsement – in some contexts other software may be or are superior.

    There are several places on the web to learn about STATA. Consider a non-privacy violating search engine like `https://duckduckgo.com` (duckduckgo search terms in parentheses) will also get you to the desired site[1]

    (a) Once you open STATA type the command (`help gs`) and the chose Windows, Mac, or Unix as appropriate.

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[1]To use the duckduckgo method, go to `https://duckduckgo.com/` and type the words in parentheses (but not the parentheses themselves).

    (b) Princeton has a nice tutorial at: (`stata tutorial princeton !`) `http://data.princeton.edu/stata/` by Germám Rodrìguez

    (c) UCLA Academic Technology Services has a page with links to tons of STATA (`ucla stata !`) `http://statistics.ats.ucla.edu/stat/stata/`

    (d) You can also try YouTube which has tons of STATA tutorials. One place to start is (stata.com video tutorials !) `http://www.stata.com/links/video-tutorials/` You can also just search around in youtube.

You will be expected to learn STATA on your own (or remember what you learned in 529), although occasionally I will discuss some aspects of STATA in Class. Guodong will be able to help with STATA and use of the labs as her time permits.

You can also purchase a copy of STATA for your personal use, although that is not required. See the STATA home page for details on pricing.

3. **Textbook Readings**

I would like to keep the class "applied" and we will cover some real examples of applied econometric research. How much we will do will depend on how far and how fast we get on with the "mathematics." I will announce changes as early as I can. I will also include some examples of actual empirical work.

1. Introduction

2. Basic Probability Theory, Statistics Review (handout), *Ashenfelter, Levine, & Zimmerman* Chapter 2

    (a) Random Variables and Proability Distributions, *Ashenfelter, Levine, & Zimmerman* Chapter 3

    (b) Mathematics of Expectations, *Ashenfelter, Levine, & Zimmerman* Chapter 4

    (c) Multivariate Distributions, *Ashenfelter, Levine, & Zimmerman* Chapter 5

    (d) Probability, Statistics, Expectations, and all that
Johnston/DiNardo Appendix B1-B5, *Ashenfelter, Levine, & Zimmerman* Appendix A

    (e) Sampling and Sampling Distributions, *Ashenfelter, Levine, & Zimmerman* Chapter 6.

3. Interval Estimation and Hypothesis Testing of the Mean, *Ashenfelter, Levine, & Zimmerman* Chapter 8

4. Causality and the Randomized Controlled Experiment

5. Introduction to Estimation

    (a) Estimators and Estimates.(*Johnston/DiNardo* Chapter 1.4.2, *Ashenfelter, Levine, & Zimmerman* Chapter 7)

    (b) (If we have time) Simulation, or "Proof by Computer" *Johnston/DiNardo* Chapter 11.1

    (c) Finite Sample Properties of Estimators (*Johnston/DiNardo* Chapter 1, Appendix B.1-B.7, *Ashenfelter, Levine, & Zimmerman* Chapter 7)

    (d) Asymptotic Properties of Estimators and Plimming with confidence (*Johnston/DiNardo* 2.4.1 -2.4.3, *Ashenfelter, Levine, & Zimmerman* Chapter 7).

    (e) Method of Moments-I (*Johnston/DiNardo* 10.1, 10.2)

    (f) Method of Maximum Likelihood (*Johnston/DiNardo* 5.1)

    (g) Method of Least Squares-I (*Johnston/DiNardo* Chapter 1)

6. Relationships Between Two Variables, Principle of Least Squares
Johnston/DiNardo Chapter 1,

7. Some functional form issues, dummy variables as controls:
Johnston/DiNardo 2.3–2.7

8. OLS as differences in means *Johnston/DiNardo* 2.3–2.7

9. Most of What you need to know about Matrix Algebra
Johnston/DiNardo Appendix A

10. Multiple Regression

    (a) k-variable equation basics
        Johnston/DiNardo Chapter 3,

    (b) Large Sample Properties of OLS
        Johnston/DiNardo Chapter 2.4,

    (c) Turning multiple regression back into the Simple Linear Model *Johnston/DiNardo* Frisch–Waugh–Lovell (pages 101-103)

11. Specification Error

    (a) Heteroskedasticity
        Johnston/DiNardo Chapter 6, *Ashenfelter, Levine, & Zimmerman* Chapter 14

    (b) Non-normal error terms
        Johnston/DiNardo 4.1, *Ashenfelter, Levine, & Zimmerman* Chapter 14

12. GMM (again), Instrumental Variables
Johnston/DiNardo 5.5, Chapter 10, *Ashenfelter, Levine, & Zimmerman* Chapter 15

13. Special Topics (More tentative)

    (a) Causality – what makes for an "answerable" question.

    (b) Regression Discontinuity.

    (c) Limited Dependent variable models.
        Johnston/DiNardo Chapter 13, *Ashenfelter, Levine, & Zimmerman* Chapter 16

14. Revision and Prayer.

Readings.

This list will get longer, but for the first week of class we have:

A Week 1

1. Appendix B, Statistics, *Econometric Methods, Beta Electronic Version 0.1* (available at Ctools)

2. Statistics Review Handout (available at Ctools), Basics of Probability

Optional

1. "Introductory Remarks on Metastatistics for The Practically Minded NonBayesian Regression Runner" (very, very optional) (available at my web page). Has an extended discussion of the philosophical foundations of statistics. It also discusses Bayesian approaches.

2. Chapters 2 and 3 of *Ashenfelter, Levine, & Zimmerman* . Available at CTools.