

## Public Policy 42000: Applied Econometrics I

This course is the first in a three part doctoral introduction to econometrics. The focus of this course is the nature of statistical models of socioeconomic data with a primary focus on linear systems. The course is concerned with the construction and interpretation of models, not estimation. At the same time, the teaching assistants will teach the software package Stata and there will be homework assignments involving actual estimation.

### Lectures:

In-person lectures will be given 10:30-11:50.

Lectures are Mondays and Wednesdays with exception of week 1; there will a lecture on Friday October 6.

**TA sessions:** TBD

**Readings:** The course is based on lecture notes. William Greene *Econometrics* is assigned as a required text as it is a good compendium of econometric results. Robert Ash and Melvin Gardner, *Topics in Stochastic Processes*, is a deep discussion of the underlying mathematics for many of topics of this course. Other readings will involve scholarly articles.

**Grading:** We base grades on homework assignments, a midterm exam, and a final exam. The weights are as follows: Final 50% Homework 30% Midterm 20%.

There will be 7 homework assignments. The assignments will be due 10/08, 10/15, 10/22, 10/29, 11/12, 11/19, 12/03 (all Sundays).

**Homework:** All assignments will receive equal weight. Assignments should be submitted on-line on Canvas and are due at 23:59 pm on Sundays. No late assignments will be accepted.

### Exams:

Midterm: October 30

Final: Week of December 4-8 TBA

**Office Hours**

**Professor:** Mondays 6:00pm-7pm Central Time, 3035 Keller

**TAs:** TBD

## Topics

### Topic 1: Probability Theory

Lecture Notes 1: Probability Theory

Ash and Gardner, Chapter 3

Greene, Appendix B.1-B.6

### Topic 2: Statistical Decision Theory

Lecture Notes 2: Decisions and Data

Greene Sections 16.1-16.2

Brock, W., S. Durlauf, And K. West. 2003. "Policy Analysis in Uncertain Economic Environments (with discussion)." *Brookings Papers on Economic Activity* 1: 235-322.

Draper, D. 1995. "Assessment and Propagation of Model Uncertainty." *Journal of the Royal Statistical Society series B* 57: 45-97.

Gustafson, P. and B. Clarke. 2004. "Decomposing Posterior Variance." *Journal of Statistical Planning and Inference* 119: 311-327.

Heckman, J. and B. Singer. "Abducting Economics." *American Economic Review* 107: 298-302.

Katz, Rebecca, and Burton Singer. 2007. "Can an Attribution Assessment Be Made for Yellow Rain?" *Politics and the Life Sciences* 26: 24-42.

Lindley, D. 2000. "The Philosophy of Statistics." *Journal of the Royal Statistical Society, Series D* 49: 293-337.

Marschak, J. 1953. "Economic Measurements for Policy and Prediction." *Studies in Econometric Method*. W. Hood and T. Koopmans, ed. New Haven: Yale University Press.

Sims, C. 1982. "Policy Evaluation with Econometric Models (with discussion)." *Brookings Papers on Economic Activity* 1: 107-164.

### **Topic 3: Models and Identification**

Lecture Notes 3: Identification

Gustafson, P. 2005. "On Model Expansion, Model Contraction, Identifiability and Prior Information: Two Illustrative Examples Involving Mismeasured Variables." *Statistical Science* 20: 111-140.

Heckman, J. 2000. "Causal Parameters and Policy Analysis in Economics: A Twentieth Century Perspective." *Quarterly Journal of Economics* 115: 45-97.

Koopmans, T. 1949. "Identification Problems in Economic Model Construction." *Econometrica* 17: 125-144.

Lewbel, A. 2019. "The Identification Zoo: Meanings of Identification in Econometrics." *Journal of Economic Literature* 57: 835-903.

### **Topic 4: Linear System Theory**

Lecture Notes 4: Linear System Theory

Greene, Appendix A.1-A.4

### **Topic 5: Linear Statistical Models/Regression**

Lecture Notes 5: Linear Regression

Greene, Chapters 2, 3

Buja, A., L. Brown, R. Berk, E. George, E. Pitkin, M. Traskin, K. Zhang, and L. Zhao. 2019. "Models as Approximations I: Consequences Illustrated with Linear Regression." *Statistical Science* 34: 523-544.

White, H. 1980. "Using Least Squares to Approximate Unknown Regression Functions." *International Economic Review* 21: 149-170.

### **Topic 6: Time Series**

Lecture Notes 6: Linear Structure of Time Series

Lecture Notes 7: Frequency Domain Approach to Time Series

Lecture Notes 8: Vector Autoregressions

## Lecture Notes 9: Unit Roots

Ash and Gardner, Chapters 1-3.

Greene, Chapters 20-21.

Engle, R. and C. Granger. 1987. "Co-Integration and Error Correction: Representation, Estimation and Testing." *Econometrica* 55: 251-276.

Granger, C. and P. Newbold. 1974. "Spurious Regressions in Econometrics." *Journal of Econometrics* 2: 111-120.

Hansen, L. and T. Sargent. 1981. "A Note on Wiener-Kolmogorov Prediction Formulas for Rational Expectations Models." *Economics Letters* 8: 255-260.

Phillips, P. 1986. "Understanding Spurious Regressions in Econometrics." *Journal of Econometrics* 33: 311-340.

Sims, C. 1980. "Macroeconomics and Reality." *Econometrica* 48: 1-48.

## Topic 7. Deep Roots

### Lecture Notes 10: Deep Roots

Bisin, A. and A. Moro. 2021. "LATE for History." *Handbook of Historical Economics*. A. Bisin and G. Federico, eds. volume 1. London: Academic Press.

Durlauf, S. 2023. "The Journey of Humanity by Oded Galor: A Review Essay." *Population and Development Review* 49: 403-421.

Durlauf, S. 2023. "*How the World Became Rich* by Mark Koyama and Jared Rubin and *Slouching Towards Utopia*, by J. Bradford DeLong: A Review Essay." *Journal of Economic Literature*, forthcoming.

Kelly, M. 2019. "Understanding Persistence." Working Paper.

Voth, H.-J. 2021. "Persistence-Myth and Mystery." *Handbook of Historical Economics*. A. Bisin and G. Federico, eds. volume 1. London: Academic Press.

## Topic 8. Simultaneous Systems, Endogeneity, Instrumental Variables

### Lecture Notes 11: Linear Simultaneous Equations Systems

Greene, Sections 8.4, 10.4.

Angrist, J. and A. Krueger. 2001. "Instrumental Variables and the Search for Identification" From Supply and Demand to Natural Experiments." *Journal of Economic Perspectives* 15: 69-85.

Blume, L., W. Brock, S. Durlauf, and R. Jayaraman. 2015. "Linear Social Interactions Models." *Journal of Political Economy* 123: 444-496.

Imbens, G. 2014. "Instrumental Variables: An Econometrician's Perspective." *Statistical Science* 29: 323-358.

Manski, C. 1989. "Anatomy of the Selection Problem." *Journal of Human Resources* 24: 343-360.

## **Topic 9. Functional Data Analysis**

Lecture Notes 12: Functional Data Analysis

Chang, Y., S. Durlauf, S. Lee, and J. Park. 2022. "A Trajectories-Based Approach to Measuring Intergenerational Mobility." Mimeo.

Morris, J. 2015. "Functional Regression." *Annual Review of Statistics and Its Application* 2015 2: 321-359.

Wang, J.-L. J.-M. Chiou, and H.-G. Müller. 2016. "Functional Data Analysis. *Annual Review of Statistics and Its Application* 3: 257-295.