

AAEC 5946: Microeconometrics
Hutcheson #310 Tuesday, Thursday 11:00-12:15

Nick Kuminoff

Fall 2008

Office: Hutcheson #316
Email: kuminoff@vt.edu
Office Hours: Tuesday, Thursday: 12:15-1:30, or by appointment
Web Site: <http://filebox.vt.edu/users/kuminoff/aaecon5946.html>

Required textbooks:

Cameron and Trividi, *Microeconometrics: Methods and Applications*
Train, *Discrete Choice Methods with Simulation*

Other useful references:

Davidson & MacKinnon, *Econometric Theory and Methods*
Hall, *Generalized Method of Moments*
Higham & Higham, *Matlab Guide*
Judd, *Numerical Methods in Economics*
Miranda and Fackler, *Applied Computational Economics and Finance*
Wooldridge, *Econometric Analysis of Cross-Section and Panel Data*

Course Objectives:

The objective of this course is to help students develop a working knowledge of the theory and methods that are widely used for microeconomic analysis. Topics will include panel data, instrumental variables, nonlinear estimators, numerical methods for maximization and integration, discrete choice models, simulation methods, selection models, and treatment evaluation.

Prerequisites: AAEC/ECON 5125-5126. Most importantly, students must be comfortable with a first-year Ph.D. level treatment of matrix algebra, probability theory, and the multivariate linear regression model. Experience with statistical software and programming is useful, but not required.

Grading:

There will be a midterm, a final exam, problem sets, and a term paper. They will be weighted as follows:

Midterm:	20%
Final exam:	20%
Problem sets:	30%
Term paper:	30%

Exams:

The midterm and final exam will be “take-home” format. All work must be done independently.

Problem Sets:

There will be 5 or 6 problem sets. You are encouraged to form study groups to work on the problem sets together. However, each student must turn in assignments in their own words, as well as original computer code, when applicable. Violations of this rule and cooperation on exams will be treated as violations of the Graduate Honor System and handled according to University policy.

Software:

Throughout the course, we will be using MATLAB software to simulate and estimate econometric models. You will need access to MATLAB (or an equivalent program) to complete the homework assignments, take-home exams, and term paper. While there are alternative software packages that contain matrix languages (GAUSS, R, SAS, STATA, etc...) I find that MATLAB is the most accessible, the most widely used for microeconomic analysis, and one of the most affordable. Student access is available at the Torgerson computer labs, the Math Emporium, or your department graduate labs. If you prefer to work from a personal computer, you can buy a permanent license for \$99 (http://www.mathworks.com/academia/student_version/). Alternatively, students working as research assistants can purchase a 1-year license through Virginia Tech for \$50 (<http://www.ita.vt.edu/studentsoftware/website/>).

Note: we will be using the *statistics* and *optimization* “toolboxes”. Unfortunately, the *optimization* toolbox is not included in the \$33 1-year license available to all Virginia Tech students.

Guidelines for the Term Paper:

The term paper should be a well written description of your efforts to replicate and extend the results from a published microeconomic study.¹ Possible extensions include (but are not limited to) alternate model specifications, alternate estimation strategies, robustness checks, and estimation following additional data collection. I would encourage you to view this paper as an opportunity to begin exploring possibilities for your dissertation research.

The text, equations, tables, and figures should be presented in the format and style used in economics journals such as the *Review of Economics and Statistics* or the *Journal of Econometrics*. The paper should be clearly organized into sections. At a minimum, your paper should include:

1. Introduction. Clear statement of the question being asked in the original paper and why it is of interest, followed by a clear description of your extensions and why they are of interest.
2. Model Specification. Formal description of the key economic and statistical properties of the original model and your extensions to it. If you have specific hypotheses you seek to test (other than statistical significance of the explanatory variables), this would be a good place to describe the hypotheses and the restrictions they imply for your model.
3. Data. Brief summary of where the data come from, how they were collected, variable definitions, and summary statistics.
4. Results. Brief summary of your efforts to replicate the authors' original results, followed by a detailed description of the results from your extensions to their study, including tables of the estimated parameters and your interpretation of them.
5. Conclusions. Your assessment of the economic implications of your econometric extensions and, perhaps, what further analysis or data collection is suggested by your results.

You are also required to submit electronic copies of your data and the code used to generate the results described in the paper. Make sure to label the results in your code so that I can match them with the results reported in the original paper's tables, as well as the tables in your paper. This requirement mirrors the replication policy for articles submitted to general journals such as the *American Economic Review*, *Econometrica*, and the *Journal of Political Economy*, as well as top field journals such as the *American Journal of Agricultural Economics* and the *Journal of Environmental Economics and Management*.

Deadlines

A one-page proposal is due on Tuesday, October 28th. It should describe the paper you intend to replicate and your proposed extensions to the econometric analysis.

The term paper is due on Tuesday, December 9th.

¹ Many economic journals have online data archives or "supplemental material" archives that will allow you to download the data used in published papers from the journal webpage. Examples include the *Journal of Business and Economic Statistics*, the *Journal of Applied Econometrics*, *Econometrica* and the *American Economic Review*. Another useful source of data used in published studies is the University of Michigan Data Archive: <http://www.icpsr.umich.edu/citations/index.html>. While you are also welcome to write an entirely original paper, I would caution against doing so due to the time typically required for data collection and model development.

Tentative Course Outline

TOPIC	READING	LECTURE
I. INTRODUCTION		
i. What is microeconometrics?	CT ch. 1	lec. 1
ii. Causality, identification, structure, randomization	CT ch. 2-3	lec. 2-3
II. LINEAR ESTIMATION WITH INSTRUMENTS AND PANEL DATA		
i. Instruments and 2SLS	CT ch. 4	lec. 4-5
ii. Intro to matrix programming & simulation	notes	lec. 6
iii. Panel data methods	CT ch. 21-22	lec. 7-8
III. NONLINEAR ESTIMATION		
i. Intro to nonlinear estimation	CT ch. 5	lec. 9
ii. Numerical optimization	notes	lec. 10
iii. Maximum likelihood	CT ch. 5	lec. 11
iv. Nonlinear least squares	CT ch. 5	lec. 12
v. Generalized method of moments	CT ch. 6	lec. 13-15
vi. Quantile regression	notes	lec. 16-17
IV. DISCRETE CHOICE AND HETEROGENEITY		
i. Properties of discrete choice models	Train ch. 2	lec. 18
ii. Numerical integration	Train ch. 9	lec. 19
iii. Multinomial logit & probit	Train ch. 3-5	lec. 20-21
iv. Mixed logit	Train ch. 6	lec. 22
v. Bayesian methods	Train ch. 12	lec. 23
vi. Pure characteristics models	notes	lec. 24
V. SELECTION AND TREATMENT EVALUATION		
i. Censoring, truncation, and selection	CT ch.16	lec. 25-26
ii. Treatment evaluation	CT ch. 25	lec. 27-28

Note: additional readings from the list below will be assigned prior to individual lectures

Tentative Reading List

(note: all papers will be posted on Blackboard)

I. INTRODUCTION (Aug. 26st – Sept. 2nd)

Cameron and Trivedi, chapters 1-3.

Burtless, Gary. 1995. "The Case for Randomized Field Trials in Economic and Policy Research." *Journal of Economic Perspectives*. Vol. 9 (2): 63-84.

Heckman, James J., and Jeffrey A. Smith. 1995. "Assessing the Case for Social Experiments." *Journal of Economic Perspectives*. Vol. 9 (2): 85-110.

Heckman, James J. 2000. "Causal Parameters and Policy Analysis in Economics: A Twentieth Century Retrospective." *Quarterly Journal of Economics*. Vol. 115 (1): 45-97.

Heckman, James J. 2001. "Micro Data, Heterogeneity, and the Evaluation of Public Policy: Nobel Lecture." *Journal of Political Economy*. Vol. 109 (4): 673-748.

Keane, Michael P. Forthcoming. "Structural vs. Atheoretic Approaches to Econometrics." *Journal of Econometrics*.

II. LINEAR ESTIMATION: INSTRUMENTS & PANEL DATA (Sept. 4th – Sept. 18th)

Cameron and Trivedi, chapters 4, 21, 22

Angrist, Joshua D., and Alan B. Krueger. 2001. "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments." *Journal of Economic Perspectives*. Vol. 15 (4): 69-85.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*. Vol. 119 (1): 249-275.

Davis, Lucas. 2004. "The Effect of Health Risk on Housing Values: Evidence from a Cancer Cluster." *American Economic Review*. Vol. 94 (5): 1693-704.

Donald, Stephen G. and Kevin Lang. 2007. "Inference with Difference-in-Differences and Other Panel Data." *Review of Economics and Statistics*. Vol. 89 (2): 221-233.

Heckman, James. 1997. "Instrumental Variables: A Study of Implicit Behavioral Assumptions Used in Making Program Evaluations." *Journal of Human Resources*. Vol. 32 (3): 441-462.

Meyer, Bruce D. 1995. "Natural and Quasi-Experiments in Economics." *Journal of Business and Economic Statistics*. Vol. 13 (2): 151-161.

III. NONLINEAR ESTIMATION (Sept. 23th – Oct. 21rd)

Cameron and Trivedi, chapters 5-7, 9, 11

Angrist, Joshua D., and Alan B. Krueger. 1992. "The Effect of Age at School Entry on Educational Attainment: An Application of Instrument Variables with Moments from Two Samples." *Journal of the American Statistical Association*. Vol. 87 (418): 328-336.

Arellano, Manuel, and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies*. Vol. 58 (2): 277-297.

Chernozhukov, Victor, and Christian Hansen. 2005. "An IV Model of Quantile Treatment Effects." *Econometrica*. Vol. 73 (1): 245-261.

Chernozhukov, Victor, and Christian Hansen. 2008. "Instrumental Variable Quantile Regression: A Robust Inference Approach." *Journal of Econometrics*. Vol. 142: 379-398.

DiNardo, John, and Justin L. Tobias. 2001. "Nonparametric Density and Regression Estimation." *Journal of Economic Perspectives*. Vol. 15 (4): 11-28.

Imbens, Guido W. 2002. "Generalized Method of Moments and Empirical Likelihood." *Journal of Business and Economic Statistics*. Vol. 20 (4): 293-506.

Imbens, Guido W. and Tony Lancaster. 1994. "Combining Micro and Macro Data in Microeconomic Models." *Review of Economic Studies*. Vol. 61 (4): 655-680.

Koenker, Roger, and Kevin F. Hallock. 2001. "Quantile Regression." *Journal of Economic Perspectives*. Vol. 15 (4): 143-156.

Wooldridge, Jeffrey M. 2001. "Applications of Generalized Method of Moments Estimation." *Journal of Economic Perspectives*. Vol. 15 (4): 87-100.

IV. DISCRETE CHOICE AND HETEROGENEITY (Oct. 23th – Nov. 13th)

Cameron and Trivedi, chapters 14-15

Train chapters 2, 3-6, 9, 12

Berry, Steven and Ariel Pakes. 2007. "The Pure Characteristics Demand Model." *International Economic Review*, Vol. 48 (4): 1193-225.

Chib, Siddhartha and Edward Greenberg. 1995. "Understanding the Metropolis-Hastings Algorithm." *American Statistician*. Vol. 49 (4): 327-335.

Chib, Siddhartha and Edward Greenberg. 1996. "Markov Chain Monte Carlo Simulation Methods in Econometrics." *Econometric Theory*. Vol. 12 (3): 409-431.

Horowitz, Joel L. and N.E. Savin. 2001. "Binary Response Models: Logits, Probits, and Semiparametrics." *Journal of Economic Perspectives*. Vol. 15 (4): 43-56.

McFadden, Daniel. 2001. "Economic Choices." *American Economic Review*. Vol. 91 (3): 351-378.

Provencher, Bill, and Richard C. Bishop. 2004. "Does Accounting for Preference Heterogeneity Improve the Forecasting of a Random Utility Model? A Case Study." *Journal of Environmental Economics and Management*. Vol. 48 (1): 793-810.

Stern, Steven. 1997. "Simulation-Based Estimation." *Journal of Economic Literature*. Vol. 35 (4): 2006-2039.

V. SELECTION AND TREATMENT EVALUATION (Nov. 18th – Dec. 9th)

Cameron and Trivedi, chapters 16, 25

Chay, Kenneth Y., and James L. Powell. 2001. "Semiparametric Censored Regression Models." *Journal of Economic Perspectives*. Vol. 15 (4): 29-42.

Heckman, James, Justin L. Tobias, Edward Vytlacil. 2003. "Simple Estimators for Treatment Parameters in a Latent-Variable Framework." *Review of Economics and Statistics*. Vol. 85 (3): 748-755.

Van Der Klaauw, Wilbert. 2003. "Estimating the Effect of Financial Aid Offers on College Enrollment: A Regression-Discontinuity Approach." *International Economic Review*. Vol. 43 (4): 1249-1287.