London School of Economics **Vassilis Hajivassiliou**
Department of Economics **2009-2010**

Quantitative Economics (Ec475) Part I: Microeconomics

1 Introduction

This course discusses econometric and numerical methods necessary for quantitative economic analysis. The first part (given in the Michaelmas Term) focusses on microeconomic issues, while the second part (in the Lent term) studies macroeconomic methods, techniques and applications. Home work assignments designed to be solved using computers will be discussed in the weekly classes.

1.1 Final Assessment:

There is a 3-hour examination during the usual final exam period in June. For students in the MSc in E&ME programme, the final exam counts as 100% of the final course grade. For students in the MSc in E&ME (Research) degree, the final June exam counts for 50% of their final course grade, while the other 50% is obtained through an extended essay Students will be encouraged to present their preliminary work towards the extended essay in student workshops to be organized later in the year.

1.2 Administrative Info:

Lectures:	Mondays, 14.00-16.00 (A247)	weeks 1-10 of MT
Instructor:	Vassilis Hajivassiliou (S564)	
	Web: http://econ.lse.ac.uk/staff/vassilis/	
	email: vassilis@econ.lse.ac.uk	
	Secretary: Sue Kirkbride (S683)	
Course:	Web1: http://econ.lse.ac.uk/courses/ec475/	[qemstudent::parti]
	Web2: http://moodle.lse.ac.uk/, select ec475	[LSE username:password]

2 Reading List

Background Texts:

- Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*. Boston: MIT Press (hereafter referred to as *Wooldridge*).
- Hajivassiliou, V. (2009). *Topics in Panel Data Econometrics*. Oxford: Oxford U Press (hereafter referred to as *Hajivassiliou*).
- Baltagi, Badi 1995. *Econometric Analysis of Panel Data*. New York: Wiley (hereafter referred to as *Baltagi*.
- G.S. Maddala 1983. *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press. (hereafter referred to as *Maddala*)
- Judd, K. 1998. *Numerical Methods in Economics*. Cambridge: MIT Press. (hereafter referred to as *Judd*)

2.1 Linear and Nonlinear Regression Methods: The Key Assumptions

- LINK: Handout Meth1: Multiple Linear Regression and Extensions;
- LINK: Handout Meth2: A Synthesis of the Five Classic Assumptions;
- LINK: Handout Meth3.A: Summary of Large Sample or "Asymptotic" Results
- LINK: Handout Meth3.B: Hypothesis Testing in Regression Models
- LINK: Handout Meth4: Instrumental Variables Estimation.

2.2 Linear Panel Data Modelling

- LINK: Handout Meth5;
- LINK: Handout Meth6 "Event Studies and Differences-in-Differences Estimation"
- Wooldridge

2.2.1 Static Models

- **Baltagi: Chapters 2-4, 9.

2.2.2 Dynamic Models

- **Baltagi: Sections 5.2, 8.1-8.3.
- *Arellano, M. and S. Bond (1991): "Test of Specification for Panel Data: Monte-Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies* 58, 277-297.
- *Bhargava, A. and D. Sargan (1982): "Estimating Dynamic Random Effects Models from Panel Data Covering Short Time Periods," *Econometrica* 51, 1635-1660.

2.3 Limited Dependent Variable Models

- LINK: Handout Meth7

2.3.1 Discrete Response Models

- *Maddala, Sections 14.1-14.3.

2.3.2 Censoring and Truncation

- **Maddala, Chapters 5, 7, 8

2.3.3 Selectivity and Discrete-Continuous Models

2.4 Non-Linear Panel Data Models

2.4.1 Static and Dynamic Panel LDV Models

- **Baltagi: Sections 10.4-10.5.
- *Baltagi: Chapters 2-4, 5.2, 8.1-8.3, and 9.
- *Hausman, J. and D. Wise 1979. "Attrition Bias in Experimental and Panel Data: The Gary Negative Income Maintenance Experiment," *Econometrica* 47, 445-473.

- **Heckman, J. 1981. "Dynamic Discrete Models." *Pages 114–178 of:* Manski, C., and McFadden, D. (eds), *Structural Analysis of Discrete Data with Econometric Applications.* M.I.T. Press.

- *Chamberlain, G. 1980. "Analysis of Covariance with Qualitative Data," *Review of Economic Studies* 47, 225-238.

- Avery, R., L. Hansen, and V.Joseph Hotz 1983. "Multi-period Probit Models and Orthogonality Conditions," *International Economic Review*, 24, 21-35.

- **Hajivassiliou, V. 1994. "A Simulation Estimation Analysis of the External Debt Crises of Developing Countries" *Journal of Applied Econometrics.* 9:2, 109-132.

2.5 Numerical Optimization

- LINK: Handout Meth8: "Numerical Optimization Methods "

2.6 Simulation-Based Inference

- LINK: Handout Meth9 "An Introduction to Simulation-Based Inference"

2.6.1 Basic Principles of Simulation

- Hajivassiliou, V., McFadden, D., and Ruud, P. 1996. Simulation of Multivariate Normal Rectangle Probabilities and Their Derivatives: Theoretical and Computational Results. *Journal of Econometrics*, **72(1&2)**, 85–134.

- *Hajivassiliou, V.A. and A. Börsch-Supan 1993. "Smooth Unbiased Multivariate Probability Simulators for Maximum Likelihood Estimation of Limited Dependent Variable Models," *Journal of Econometrics*, Vol.58(3), 1993, pp.347–368.

- *McFadden, D. 1996. "Lectures on Simulation-Assisted Statistical Inference." Presented at the 1996 EC-squared Conference, Florence, Italy. Sections 3-4 (pp.23-46).

- Keane, M. 1994. A Computationally Efficient Practical Simulation Estimator for Panel Data. *Econometrica*, **62(1)**, 95–116.

- Geweke, J. 1989. *Efficient Simulation from the Multivariate Normal Distribution Subject to Linear Inequality Constraints and the Evaluation of Constraint Probabilities*. Duke University working paper.

2.6.2 General Theory of Simulation-Based Inference

- **Hajivassiliou, V.A. 1994. "Simulation Estimation Methods for Limited Dependent Variable Models," in the *Handbook of Statistics: Econometrics Volume*, G.S. Maddala, C.R. Rao and H. Vinod (eds.). Amsterdam: North-Holland.

- *Hajivassiliou, V. 1994. A Simulation Estimation Analysis of External Repayments Problems of Developing Countries. *Journal of Applied Econometrics*, **9(2)**, 109–132.

- *Hajivassiliou, V.A. and P.A. Ruud 1995. "Classical Estimation of LDV Models by Simulation," in the *Handbook of Econometrics, Volume IV*, R. Engle and D. McFadden (eds.). Amsterdam: North-Holland.

- Hajivassiliou, V.A. and D.L. McFadden 1997. "The Method of Simulated Scores for the Estimation of LDV Models," *Econometrica*, to appear.

- Laroque, G., and Salanié, B. 1989. Estimation of Multi-Market Disequilibrium Fix-Price Models: An Application of Pseudo Maximum Likelihood Methods. *Econometrica*, **57**, 831–860.

- Lerman, S., and Manski, C. 1981. On the Use of Simulated Frequencies to Approximate Choice Probabilities. *Pages 305–319 of:* Manski, C., and McFadden, D. (eds), *Structural Analysis of Discrete Data with Econometric Applications*. MIT Press.

- McCulloch, R., and Rossi, P. 1994. An Exact Likelihood Analysis of the Multinomial Probit Model. *Journal of Econometrics*, **64**.

- McFadden, D.L. 1989. "A Method of Simulated Moments for Estimation of Discrete Response Models without Numerical Integration," *Econometrica* 57, 995-1026.

- Pakes, A. and D. Pollard 1989. "Simulation and the Asymptotics of Optimization Estimators," *Econometrica* 57, 1027-1058.

2.6.3 Empirical Process Theory

- Dudley, R. 1978. Central Limit Theorems for Empirical Measures. *Annals of Probability*, **6**, 899–929. (Correction, *ibid* 7 (1979), 909–911).

- Ossiander, M. 1987. A Central Limit Theorem under Metric Entropy with Bracketing. *Annals of Probability*, **15**, 897–919.

2.6.4 Markov-Chain Monte-Carlo Methods

- McFadden, D. 1996. "Lectures on Simulation-Assisted Statistical Inference." Presented at the 1996 EC-squared Conference, Florence, Italy. Section 5 (pp.47-51).

- Chib, Sid. 1995. An Introduction to Markov-Chain Monte-Carlo Methods. *American Statistician*, **55(5)**, 777–789.

- Geman, S., and Geman, D. 1984. Stochastic Relaxation, Gibbs Distributions, and the Bayesian Restoration of Images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, **6**, 721–741.

- Roberts, G.O., and Polson, N.G. 1994. On the Geometric Convergence of the Gibbs Sampler. *Journal of the Royal Statistical Society, Series B*, **56**.

- Gelfand, A., and Smith, A.F.M. 1990. Sampling Based Approaches to Calculating Marginal Densities. *Journal of the American Statistical Association*, **85**, 398–409.

2.6.5 Variance-Reduction Methods

- *Hajivassiliou, V. 2000. Simulation-Based Inference and Diagnostic Tests: Some Practical Issues. Cambridge University Press.

- Hajivassiliou, McFadden, and Ruud 1996. *op.cit.*

2.7 Microeconometric Analysis of Consumptions Decisions

- Deaton, A. 1992. *Understanding Consumption.* Princeton: Princeton University Press: Chapter 2.

2.7.1 Intertemporal Optimization in the Presence of Consumer Durables — Euler Equations

- **Hansen, L. and K. Singleton. 1982. "Generalized Instrumental Variables Estimation of Non-linear Rational Expectation Models." *Econometrica*, 50, 1269-86.

- Epstein, L. and S. Zin. 1991. "Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: An Empirical Analysis." *Journal of Political Economy.* 99:2, 263-286.

2.7.2 Choice in the Presence of Liquidity Constraints

- **Zeldes, S. 1989. "Consumption and Liquidity Constraints: An Empirical Investigation." *Journal of Political Economy* 97: 305-346.

- *LINK: Appl8: Hajivassiliou, V., Ioannides, I. (2007): "Unemployment and Liquidity Constraints," *Journal of Applied Econometrics*, April/May 22, 479-510.

- *Deaton, A. 1991. "Saving and Liquidity Constraints." *Econometrica* 59:5., 1221-48.

- Gross, D. and N. Souleles. 2002. "Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data." *Quarterly Journal of Economics.* pp.149-185.

2.8 Firm Decisions and Financial Constraints

- *LINK: Appl7: Hajivassiliou, V.A. and Savignac, F. 2008, "Financing Constraints and a Firm's Decision and Ability to Innovate: Establishing Direct and Reverse Effects," LSE Dept of Econ mimeo.