Econ 525a
Yale University
Fall 2014
Prof. Tony Smith

Syllabus for Econ 525a
Macroeconomics and Inequality: Models and Methods

Course Objectives: The purpose of this course is twofold: first, to introduce students to macroeconomic models of inequality; second, to introduce students to computational tools for conducting numerical analysis and statistical estimation of such models.

Contact Information
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Office hours: Mondays from 9AM to 11AM

Course Meetings: The course meets on Fridays from 9AM to noon in Room 106 at 28 Hillhouse.

Prerequisites: This course is designed for graduate students in economics who have taken first-year graduate courses in microeconomics, macroeconomics, and econometrics. No prior knowledge of either numerical methods or computer programming is assumed, but some familiarity with a programming language would prove helpful.

Course Requirements: Students will be asked to complete a small number of problem sets (including some with exercises in computation), to present to the class a published article (or working paper) to be chosen in consultation with me, and to write a term paper. The term paper could be a step towards independent research on macroeconomics and inequality, or it could be a replication of the numerical analysis in an existing article or working paper.

Texts: The lectures will be largely self-contained, but there are several good texts that provide useful complements to the material on numerical analysis taught in the lectures. Two especially valuable books are *Numerical Recipes in Fortran 77: The Art of Scientific Computing, Second Edition* (Volume 1 of Fortran Numerical Recipes), by William

H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery, and its companion, *Numerical Recipes in Fortran 90: The Art of* Parallel *Scientific Computing, Second Edition* (Volume 2 of Fortran Numerical Recipes), both available online (for free) at: apps.nrbook.com/fortran/index.html. (Note: The third edition of *Numerical Recipes*, with code available entirely in *C++*, is available online too—with a paid subscription—at www.nr.com. The third edition covers a few more topics than the second edition, but its text overlaps substantially with the second edition.)

Other useful books on numerical analysis of economic models include:

- *Applied Computational Economics and Finance* by Mario J. Miranda and Paul L. Fackler (MIT Press, 2002).
- *Numerical Methods in Economics* by Kenneth L. Judd (MIT Press, 1998).
- *Dynamic Economics: Quantitative Methods and Applications* by Jérôme Adda and Russell Cooper (MIT Press, 2003).
- *Computational Methods for the Study of Dynamic Economies*, edited by Ramon Marimon and Andrew Scott (Oxford University Press, 1999).
- *Handbook of Computational Economics (Volume 1)*, edited by Hans M. Amman, David A. Kendrick, and John Rust (North-Holland, 1996).
- *Dynamic General Equilibrium Modelling: Computational Methods and Applications*, by Burkhard Heer and Alfred Maussner (Springer, 2005).

For the theory underlying macroeconomic models of inequality, students will find Chapters 8, 17, and 18 in *Recursive Macroeconomic Theory, Third Edition* by Lars Ljungqvist and Thomas J. Sargent (MIT Press, 2012) useful.

APPROXIMATE SCHEDULE

Week 1:
- *Cross-sectional facts on inequality* (Díaz-Giménez et al, "Facts on the Distributions of Earnings, Income, and Wealth in the United States: 2007 Update", *Federal Reserve Bank of Minneapolis Quarterly Review*, 2011; Krueger et al, "Cross-Sectional Facts for Macroeconomists", *Review of Economic Dynamics*, 2009; Heathcote et al, "Unequal We Stand: An Empirical Analysis of Economic Inequality in the United States, 1967-2006", *Review of Economic Dynamics*, 2010).
- *Long-run trends in inequality* (Piketty, *Capital in the Twenty-First Century*).
- *Complete-markets models of inequality* (Chatterjee, "Transitional Dynamics and the Distribution of Wealth in a Neoclassical Growth Model," *Journal of Public Economics*, 1994; Caselli and Ventura, "A Representative Consumer Theory of Distribution," *AER*, 2000; Maliar and Maliar, "The Representative Consumer in the Neoclassical Growth Model with Idiosyncratic Shocks," *Review of Economic Dynamics*, 2003; Chapter 8.1–8.6 in Ljungqvist and Sargent).

Week 2: *Incomplete markets: Bewley-Huggett-Aiyagari models* (Bewley, "The Permanent Income Hypothesis: A Theoretical Formulation", *Journal of Economic Theory*, 1977; Bewley, "A Difficulty with the Optimum Quantity of Money", *Econometrica*, 1983; Huggett, "The Risk-Free Rate in Heterogeneous-Agent Incomplete-Insurance Economies", *Journal of Economic Dynamics and Control*, 1993; Aiyagari, "Uninsured Idiosyncratic Risk and Aggregate Saving", *Quarterly Journal of Economics*, 1994).

Week 3: *Numerical methods: root finding* (Chapters 1, 5.7, and 9 in *Numerical Recipes*; Appendix 2A, Chapter 3, and Chapter 5.6 in Miranda and Fackler; Chapters 1, 2, 5, and 7.7 in Judd); *minimization in one or more dimensions* (Chapter 10 in *Numerical Recipes*; Chapter 5 in Miranda and Fackler; Chapter 4 in Judd).

Week 4: *Numerical methods: interpolation and approximation of functions* (Chapters 3 and 6 in *Numerical Recipes*; Chapter 5 in Miranda and Fackler; Chapter 6 in Judd).

Week 5: *Numerical methods: numerical integration* (Chapters 4 and 7 in *Numerical Recipes*; Chapter 5 in Miranda and Fackler; Chapters 7 and 8 in Judd).

Week 6: *Numerical methods: numerical dynamic programming* (Chapters 7, 8, and 9 in Miranda and Fackler; Chapters 12, 13, 16, and 17 in Judd).

Week 7: *Computing the Aiyagari model. The Krusell-Smith model and its computation* (Krusell and Smith, "Income and Wealth Heterogeneity in the Macroeconomy," *Journal of Po-*

litical Economy, 1998; Krusell and Smith, "Income and Wealth Heterogeneity, Portfolio Choice, and Equilibrium Asset Returns," *Macroeconomic Dynamics*, 2007).

Week 8: *Policy analysis* (Heathcote, Aiyagari and McGrattan, Krusell et al, McKay and Reis, Guerrieri and Lorenzoni).

Week 9: *Inequality and power laws* (Gabaix, Benhabib, Nirei, Piketty).

Week 10: *Structural estimation of models of inequality* (Guvenen and Smith).

Week 11: *Student presentations*.

Week 12: *Student presentations*.