Course Syllabus
ECON 6130: Macroeconomics I (2^{nd} half)
Fall 2024

Course Homepage

Time and Place:
Monday and Wednesday (first meeting October 21)
10:10am - 11:25am
Rockefeller Hall 112

Professor:
Ryan Chahrour
Email: ryan.chahrour@cornell.edu
Office hours: Tue @ 9:00am-10:00am and by online appointment (Uris 428)

Teaching Assistants:

Zheyang Zhu
zz792@cornell.edu
Office Hours: Thur, 5:00-7:00pm (Uris 429)

Ekaterina Zubova
ez268@cornell.edu
Office Hours: Tue, 5:00-7:00pm (Uris 451)

Course Overview:

This course focuses on the computational issues involved in solving and evaluating macroeconomic models. While the applications are in macroeconomics, the tools should be useful to any applied quantitative researcher.

The course begins with a general introduction to numerical computing, including root finding, numerical optimization, numerical differentiation, numerical integration, and functional approximation. We then introduce and implement four computational strategies that have wide application in macroeconomics: linearization, the shooting method, the value function iteration, and the projection technique. Numerical stability, quality of approximation, and speed are assessed for these methods in the context of an aggregate macroeconomic model with labor market search frictions.

Time-permitting, we will look at how these tools can be applied to a variety of other contexts, including models of forward economic news, models of the interaction between the macroeconomy and the climate, and macro models of heterogenous agents.

Course grade will consist of four problem sets (40%) and a final exam (60%). To complete the problems sets, you should have access to a computer and a recent version of Matlab.

Optional Text:

- Mario J Miranda and Paul L Fackler. *Applied computational economics and finance*. MIT press, 2004

Useful background material on computation:
https://www.chahrour.net/teaching/numerical-methods-for-economists

Tentative Topic/Lecture Outline

Topic 1: A labor search model (with numerical introductions)

- Robert Shimer. The Cyclical Behavior of Equilibrium Unemployment and Vacancies. *The American Economic Review*, 95(1):pp. 25–49, 2005

- Robert E. Hall. Employment Fluctuations With Equilibrium Wage Stickiness. *The American Economic Review*, 95(1):50–65, 2005

- Marcus Hagedorn and Iourii Manovskii. The Cyclical Behavior of Equilibrium Unemployment and Vacancies Revisited. *American Economic Review*, 98(4):1692–1706, September 2008

- Ryan Chahrour, Sanjay K Chugh, and Tristan Potter. Anticipated productivity and the labor market. *Quantitative Economics*, 2023. Forthcoming

Topic 2: Perturbation techniques

- Paul Klein. Using the Generalized Schur Form to Solve a Multivariate Linear Rational Expectations Model. *Journal of Economic Dynamics and Control*, 24:1405–1423, 2000

- Stephanie Schmitt-Grohé and Martín Uribe. Solving Dynamic General Equilibrium Models Using a Second-Order Approximation to the Policy Function. *Journal of Economic Dynamics and Control*, 28(4):755 – 775, 2004

- Dario Caldara, Jesus Fernandez-Villaverde, Juan F Rubio-Ramirez, and Wen Yao. Computing dsge models with recursive preferences and stochastic volatility. *Review of Economic Dynamics*, 15(2):188–206, 2012

Topic 3: The perfect-foresight shooting method

- Jeremy Greenwood and Ricardo Marto. Numerical methods for macroeconomists (with julia and matlab codes). Manuscript, 2022

Topic 4: Interpolation and extrapolation

- Mario J Miranda and Paul L Fackler. *Applied computational economics and finance*. MIT press, 2004

Topic 5: The value function iteration

- S. Boragan Aruoba, Jesús Fernández-Villaverde, and Juan F. Rubio-Ramírez. Comparing Solution Methods For Dynamic Equilibrium Economies. *Journal of Economic Dynamics and Control*, 30(12):2477 – 2508, 2006

Topic 6: Projection methods

- Alexander W. Richter, Nathaniel A. Throckmorton, and Todd B. Walker. Accuracy, Speed and Robustness of Policy Function Iteration. *Computational Economics*, pages 1–32, 2013

Topic 7: Business cycles and macroeconomic news

- Robert J. Barro and Robert G. King. Time-Separable Prefrences and Intertemporal-Substitution Models of Business Cycles. *Quarterly Journal of Economics*, 99(4):817 – 839, 1984

- John H Cochrane. Shocks. In *Carnegie-Rochester Conference series on public policy*, volume 41, pages 295–364. Elsevier, 1994

- Paul Beaudry and Franck Portier. Stock Prices, News, and Economic Fluctuations. *The American Economic Review*, 96(4):pp. 1293–1307, 2006

- Nir Jaimovich and Sergio Rebelo. Can News About the Future Drive the Business Cycle? *American Economic Review*, 99(4):1097 – 1118, 2009

- Ryan Chahrour, Sanjay K Chugh, and Tristan Potter. Anticipated productivity and the labor market. *Quantitative Economics*, 2023. Forthcoming

Topic 8: Climate change in macroeconomics

- Mikhail Golosov, John Hassler, Per Krusell, and Aleh Tsyvinski. Optimal taxes on fossil fuel in general equilibrium. *Econometrica*, 82(1):41–88, 2014

Topic 9: Neural Networks and Machine Learning in Macro

- Lilia Maliar, Serguei Maliar, and Pablo Winant. Deep learning for solving dynamic economic models. *Journal of Monetary Economics*, 122:76–101, 2021

- Mahdi Ebrahimi Kahou, Jesús Fernández-Villaverde, Sebastian Gomez Cardona, Jesse Perla, and Jan Rosa. Spooky boundaries at a distance: Inductive bias, dynamic models, and behavioral macro. Technical report, CEPR Discussion Papers, 2024

Topic 10: Heterogeneous agent macroeconomics

- S. Rao Aiyagari. Uninsured Idiosyncratic Risk and Aggregate Saving*. *The Quarterly Journal of Economics*, 109(3):659–684, 08 1994

- P. Krusell and A.A. Smith, Jr. Income and Wealth Heterogeneity in the Macroeconomy. *Journal of Political Economy*, 106(5):867–896, 1998

- Sushant Acharya and Keshav Dogra. Understanding hank: Insights from a prank. *Econometrica*, 88(3):1113–1158, 2020