

Structural Macroeconometrics

Advanced Studies Program 2008/09
Kiel Institute
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Instructor: David N. DeJong

Texts

Primary:

DeJong, David N. with Chetan Dave. *Structural Macroeconometrics*, 2007. Princeton: Princeton University Press.

Textbook Web Site: <http://www.pitt.edu/~dejong/text.htm>

Course Web Site: <http://www.pitt.edu/~dejong/>

Secondary:

Cooley, Thomas F. and Prescott, Edward E. (1995) "Economic Growth and Business Cycles", *Frontiers of Business Cycle Research*, T. Cooley, Ed., Princeton U. Press: Princeton.

Judd, Kenneth L. *Numerical Methods in Economics*. 1998. Cambridge: MIT Press.

Stokey, Nancy L. and Robert E. Lucas. *Recursive Methods in Economic Dynamics*. 1989. Cambridge: Harvard University Press.

Textbook references in the syllabus are denoted in **bold type: DD, CP, KJ, SL**.

Overview

The focus of the course is on the empirical implementation of dynamic stochastic general equilibrium (DSGE) models. The course is organized around the following empirical exercise. Beginning with a model environment, a non-linear expectational system of difference equations is derived using Bellman's Principle of Optimality. The system is then approximated (using linear and non-linear representations), taking the form of a state-space representation. Appropriate data are then identified and aligned with their theoretical counterparts (often by removing trends and isolating cycles). Finally, the likelihood function associated with the state-space representation is evaluated using a filtering procedure.

Syllabus

I. Introduction

DD, Chapter 1, Chapter 6.1

II. Example Environments

A. Asset Pricing

DD, Chapter 5.3; Lucas, Robert E. (1978) "Asset Prices in an Exchange Economy," *Econometrica* 46:429-445.

B. Real Business Cycles

DD, Chapter 5.1; CP, Chapter 1.

III. Dynamic Programming

LS, Chapter 3; SL, Chapter 9.

IV. Solution Methods

A. Log-Linear Approximation

DD, Chapter 2; Sims, Christopher A. (2001) "Solving Linear Rational Expectations Models," *Computational Economics* 20:1-20.

B. Projection Methods

DD, Chapter 10.2; KJ, Chapter 6.

V. Data Alignment

DD, Chapter 3. CP, Chapter 1. Gorodnichenko, Yuriy, and Serena Ng (2007) "Estimation of DSGE Models When the Data are Persistent," University of Michigan Working Paper. Available online at <http://www.econ.berkeley.edu/~ygorodni/dsge-gorodnichenko-ng.pdf>
Conesa, Juan Carlos, Timothy J. Kehoe and Kim J. Ruhl (2007) "Modeling Great Depressions: The Depression in Finland in the 1990s," Federal Reserve Bank of Minneapolis *Quarterly Review*, November 2007. Available online at <http://www.minneapolisfed.org/research/QR/QR3112.pdf>

VI. Likelihood Evaluation

A. State-Space Representations

DeJong, David N., Hariharan Dharmarajan, Roman Liesenfeld, and Jean-Francois Richard (2007) "An Efficient Approach to Analyzing State-Space Representations," University of Pittsburgh Working Paper. [DDLRL], Section 2. Available online at <http://www.pitt.edu/~dejong/eisparticle.htm>

B. The Kalman Filter

DD, Chapter 4.3.

C. Efficient Importance Sampling

DD, Chapter 9.2, 9.4. Richard, Jean-Francois, and Wei Zhang (2007) “Efficient High-Dimensional Monte Carlo Importance Sampling,” *Journal of Econometrics*, forthcoming. Available online at <http://www.econ.pitt.edu/fantin/papers/efficientHD-import-sampling.pdf>

D. The Particle Filter

DD, Chapter 11.2; DDLR, Section 3.

E. The EIS Filter

DDLRL, Section 4.

Suggestions for Further Reading

IV.A. Log-Linear Approximation

Blanchard, Olivier J. and M. Kahn (1980) "The Solution of Linear Difference Models Under Rational Expectations," *Econometrica* 48: 1305-1311.

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

Uhlig, Harald (1999) "A Toolkit for Analyzing Non-linear Dynamic Stochastic Models Easily," in R. Marimon and A. Scott, Eds., *Computational Methods for the Study of Dynamic Economies*, Oxford University Press, New York: 65-78.

IV.B. Perturbation Methods

Schmitt-Grohe, Stephanie, and Martin Uribe (2004) "Solving Dynamic General Equilibrium Models using a Second-Order Approximation to the Policy Function," *Journal of Economic Dynamics and Control* 28:755-775.

IV.C. Value- and Policy-Function Iterations

Santos, Manuel S. and Jesus Vigo-Aguiar (1998) "Analysis of a Dynamic Programming Algorithm Applied to Economic Models," *Econometrica* 66:409-426.

IV. Solution Methods

Aruoba, S. Boragan, Jesus Fernandez-Villaverde, and Juan F. Rubio-Ramirez (2006) "Comparing Solution Methods for Dynamic Equilibrium Economies," *Journal of Economic Dynamics and Control* 30: 2477-2508.

VI.C. Efficient Importance Sampling

Geweke, John (1989) "Bayesian Inference in Econometric Models using Monte Carlo Integration," *Econometrica* 57:1317-1339.

Robert, C.P. and G. Casella (1999) *Monte Carlo Statistical Methods*. New York: Springer Verlag.

VI.D. The Particle Filter

Fernandez-Villaverde, Jesus, and Juan F. Rubio-Ramirez (2005) "Estimating Dynamic Equilibrium Economies: Linear Versus Non-Linear Likelihood," *Journal of Applied Econometrics* 20:891-910.

Fernandez-Villaverde, Jesus, and Juan F. Rubio-Ramirez (2007) "Estimating Macroeconomic Models: A Likelihood Approach," *Review of Economic Studies*, forthcoming. Available

online at http://www.restud.com/uploads/papers/10078-2_paper_text.pdf

Gordon, Neil J., D.J. Salmond and A.F.M. Smith (1993) "A Novel Approach to Non-Linear/Non-Gaussian Bayesian State Estimation," *IEE Proceedings-F* 140(2):107-113.

Kitagawa, Genshiro (1996) "Monte Carlo Filter and Smoother for Non-Gaussian Non-Linear State Space Models," *Journal of Computational and Graphical Statistics* 5:1-25.