

Estimation and Evaluation of DSGE Models

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Summary: The lecture notes focus on the estimation and evaluation of dynamic stochastic equilibrium (DSGE) models. Using a New Keynesian DSGE Model as example, we study solution techniques and the computation of autocovariances and impulse responses, as well as the likelihood function. The likelihood function is combined with a prior to conduct Bayesian inference. The Bayesian analysis of DSGE models is compared to alternative approaches such as calibration, method of moments estimation, and impulse response function matching. Finally, the DSGE model is used to construct prior distributions for vector autoregressions (VARs).

Prerequisites: While the notes are self-contained, it is assumed that the readers have been exposed to introductory graduate-level econometrics and macroeconomics courses. Readers should have prior knowledge of maximum likelihood estimation of autoregressive models (Hamilton, 1994, Chapter 5), vector autoregressions (Hamilton, 1994, Chapters 10 and 11), the Kalman Filter (Hamilton, 1994, Chapter 13), GMM estimation (Hamilton, 1994, Chapter 14), and optimizing DSGE models with nominal rigidities (Woodford, 2003, Chapters 3 and 4). No prior knowledge of Bayesian econometrics is assumed.

Goals: Readers will acquire the technical skills to critically follow and contribute to the growing literature on empirical work with DSGE models.

Outline

Part 1

1. A Prototypical New-Keynesian DSGE Model
2. Solving Rational Expectations Models
3. Autocovariances and Impulse Response Functions of a DSGE Model
4. The Likelihood Function of a Linearized DSGE Model

Part 2

1. Why is Empirical Work with DSGE Models Difficult?
2. How Do Existing Empirical Approaches Address the Challenges?
3. Bayesian Analysis of a Linear Regression Model
4. Simulation-Based Approaches to Bayesian Inference

Part 3

1. Implementation of Bayesian Inference for DSGE Models
2. Prior and Posterior Predictive Checks
3. Marginal Likelihoods and Posterior Odds

Part 4

1. An Application of Bayesian Analysis
2. Alternative Empirical Strategies Revisited
3. The Likelihood Function of a VAR
4. Structural VARs
5. Bayesian Estimation of VARs

Part 5

1. Constructing Priors from DSGE models for VARs
2. Model Evaluation with DSGE-VARs
3. Using DSGE-VARs for Forecasting
4. Policy Analysis with DSGE-VARs

Readings

An, Sungbae and Frank Schorfheide (2005): “Bayesian Analysis of DSGE Models,” *Manuscript*, University of Pennsylvania.

Christiano, Lawrence J., Martin Eichenbaum, and Charles Evans (2005): “Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy,” *Journal of Political Economy*, **113**, 1-45.

Geweke, John (2005): *Contemporary Bayesian Econometrics and Statistics*, John Wiley & Sons, Hoboken.

Hamilton, James (1994): *Time Series Analysis*, Princeton University Press.

Woodford, Michael (2003): *Interest and Prices*, Princeton University Press.