

Introduction to DSGE Model Estimation

Instructor:

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Topic:

This lecture series provides an introduction to the estimation of dynamic stochastic general equilibrium (DSGE) models.

The term DSGE model encompasses a broad class of macroeconomic models that spans the standard neoclassical growth model discussed in King, Plosser, and Rebelo (1988, JME) as well as New Keynesian monetary models with numerous real and nominal frictions along the lines of Christiano, Eichenbaum, and Evans (2005, JPE) and Smets and Wouters (2003, JEEA). A common feature of these models is that decision rules of economic agents are derived from assumptions about preferences, technologies, information, and the prevailing fiscal and monetary policy regime by solving intertemporal optimization problems. As a consequence, the DSGE model paradigm delivers empirical models with a strong degree of theoretical coherence that are attractive as a laboratory for policy experiments. Modern DSGE models are flexible enough to accurately track and forecast macroeconomic time series fairly well. They have become one of the workhorses of monetary policy analysis in central banks.

Unfortunately, the barriers to entry into the DSGE literature are quite high. The solution of DSGE models demands familiarity with numerical approximation techniques and the estimation of the models is nonstandard for a variety of reasons, including a state-space representation that requires the use of sophisticated filtering techniques to evaluate the likelihood function, a likelihood function that depends

in a misspecification that renders traditional econometric techniques based on the “axiom of correct specification” inappropriate.

The goal of this lecture series is to lower the barriers to entry into this field by providing an overview of what have become the “standard” methods of solving and estimating DSGE models in the past decade. The lectures cover both methods and some substantive applications.

Readings:

The main readings for this lecture series are a handbook chapter and a book that I have written with several co-authors. I will refer to these documents as HS and FVRRS, respectively.

Herbst, Edward and Schorfheide, Frank (2015): *Bayesian Estimation of DSGE Models*, Princeton University Press, Princeton. See [Link]

Fernandez-Villaverde, Jesus, Juan Rubio-Ramirez, and Frank Schorfheide (2016) “Solution and Estimation Methods for DSGE Models,” in: H. Uhlig and J. Taylor (eds.): *Handbook of Macroeconomics*, Vol 2., p.527-724, Elsevier, New York. See [Link]

In addition, I will discuss parts of the following papers (in order of appearance):

Leeper, Eric M. and Christopher A. Sims (1994): “Toward a Modern Macroeconomic Model Usable for Policy Analysis,” NBER Macroeconomics Annual, also available as NBER Working Paper 4761.

Rotemberg, Julio J. and Michael Woodford (1998): “An Optimization-Based Framework for the Evaluation of Monetary Policy,” NBER Macroeconomics Annual, also available as NBER Technical Working Paper 233.

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

Smets, Frank and Raf Wouters (2003): “An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area,” *Journal of the European Economic Association*, **1(5)**, 1123-1175.

Aruoba, Boragan and Frank Schorfheide (2011): “Sticky Prices versus Monetary Frictions: An Estimation of Policy Trade-offs,” *American Economic Journal*, **3(1)**, 60-90.

Lubik, Thomas and Frank Schorfheide (2004): “Testing for Indeterminacy: An Application to US Monetary Policy,” *American Economic Review*, **94(1)**, 190-217.

Aruoba, Boragan and Frank Schorfheide (2016): “Inflation During and After the Zero Lower Bound,” *Inflation Dynamics and Monetary Policy*, Proceedings of the Jackson Hole Economic Policy Symposium, FRB Kansas City, 359-436.

Aruoba, Boragan, Pablo Cuba-Borda, and Frank Schorfheide (2018): “Macroeconomic Dynamics Near the ZLB: A Tale of Two Countries,” *Review of Economic Studies*, **85(1)**, 87-118.

You can find all of my papers as well as replication code on my academic website [\[Link\]](#).

Schedule and Outline

The lecture series will be offered online. *** provide link ***

All times below are Korea Standard Time.

Table 1: Timetable for Real-Time Video Conferencing Sessions

Date/Time	Contents
Mon Oct 25, 16:00-18:00	Introduction to DSGE Modeling: model specification, steady state, log-linearization, solving linear rational expectation systems, state-space representation. Overview of frequentist and Bayesian inference.
Wed Oct 27, 16:00-18:00	Frequentist Inference: minimum distance estimation, maximum likelihood estimation. Bayesian Inference: from priors to posteriors, Metropolis-Hastings algorithm for DSGE Models, applied Bayesian inference.
Fri Oct 29, 16:00-18:00	Applications to the analysis of monetary and fiscal policy: optimal target inflation, suppressing sunspot fluctuations with active monetary policy, effects of zero lower bound, estimation of government spending multipliers.

Course materials will be available at *** provide link ***