

Bayesian Inference in Macroeconomic Models

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1. GENERAL DESCRIPTION OF THE COURSE

This course is an introduction to modern time series econometrics, with an emphasis on Bayesian methods to conduct inference in dynamic macroeconomic models. The two main subjects are vector autoregressions (VARs) and dynamic stochastic general equilibrium (DSGE) models, but we will touch upon several other topics, such as state-space models, Monte Carlo methods, model comparison and model choice. The focus on VARs and DSGEs is motivated by the fact that these models are placed at opposite sides of the spectrum in terms of the economic restrictions that they impose on the dynamics of macroeconomic time series.

VARs are very popular and flexible tools used for forecasting and the identification of economic shocks, representing a bridge between reduced-form and structural models. However, their flexibility comes at the cost of being very heavily parameterized. As a consequence, Bayesian inference is crucial to handle the proliferation of parameters and to improve dramatically their forecasting performance and the estimation accuracy of more structural objects (e.g. impulse responses).

The term DSGE model encompasses a broad class of macroeconomic models that spans the standard neoclassical growth model as well as New Keynesian monetary models with numerous shocks, real and nominal frictions. A common feature of these models is that decision rules of economic agents are derived from assumptions about preferences and technologies. Therefore, the DSGE paradigm delivers empirical models with a strong degree of theoretical coherence that are attractive for business cycle analysis and as laboratories for policy experiments. Bayesian techniques are widely employed for the estimation of DSGEs: prior distribution are used to add non-sample information, and posterior distributions summarize the uncertainty about model features, and can be efficiently evaluated with modern Bayesian computational tools.

The course is self-contained and does not assume prior knowledge of Bayesian inference. It is meant to be a gateway to the rapidly growing literature on modern macroeconometrics.

2. PLAN OF THE COURSE: DAY 1

Lecture 1: Introduction to Bayesian inference

Lecture 2: VARs, Bayesian VARs, and the curse of dimensionality in applied macroeconomics

Lecture 3: Bayesian VARs: unconditional, conditional forecasts, and scenario analysis

Some references for day 1: Gelman et al. (2004), Geweke (2005), Hamilton (1994), Doan et al. (1984), Kadiyala and Karlsson (1997), Sims and Zha (1998), Sims (2000) Banbura et al. (2010), Giannone et al. (2015), Banbura et al. (2015), Giannone et al. (2017).

3. PLAN OF THE COURSE: DAY 2

Lecture 4: DSGE models as restrictions on state-space models

Lecture 5: Bayesian inference in DSGE models: filtering and posterior simulation

Lecture 6: Model comparison and model choice

Some references for day 2: DeJong and Dave (2011), Herbst and Schorfheide (2015), Smets and Wouters (2007), Gelman et al. (2004), Geweke (1998).

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