A Two-Day Course on Bayesian Macroeconometrics at the ECB

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Syllabus

Course Description: Bayesian econometric methods are increasingly popular in empirical macroeconomics. In particular, nonlinear models that allow for time variation in coefficients and volatility are now routinely used among macroeconomists. The overarching purpose of this short course is to quickly bring the participants to the research frontier so that they are prepared to do research in Bayesian macroeconometrics and empirical macroeconomics.

This course will cover both Bayesian theory and computations. We will also discuss various empirical applications to illustrate the models and estimation techniques. Since large scale models—which are inherently computationally intensive—are now commonly used, we will introduce a range of strategies and algorithms to speed up computations.

We will first provide an overview of Bayesian theory and computations. We will then give a brief review of the linear regression and the Gibbs sampler. Some flexible variations of the linear regression will then be introduced, along with various more sophisticated MCMC algorithms. We will then dive into a few state-of-the-art macroeconometric models, including unobserved components models, dynamic factor models and stochastic volatility models. Lastly, we will go over a wide range of vector autoregressions, including large VARs with stochastic volatility and non-Gaussian errors.

Course notes: This course is based on the set of notes titled **Bayesian Macroeconometrics: Methods and Applications**, which will be available to the participants (as well as the data and code).

Course outline: The course is divided into four 2-hour modules. The outline of each module is given below.

Module 1: Overview of Bayesian econometrics

- Bayesian theory and computations
- standard linear regressions; Gibbs sampler
- more flexible regressions: t errors, moving average errors; independence-chain Metropolis-Hastings, Griddy-Gibbs

Module 2: Linear state space models

- unobserved components models, dynamic factor models; precision-based samplers

- applications: models for trend inflation and output gap

Module 3: Nonlinear state space models and Bayesian model comparison

- stochastic volatility model, stochastic volatility in mean; auxiliary mixture sampler
- Bayesian model comparison, marginal likelihood computation

Module 4: Vector autoregressions

- standard VARs, time-varying parameter VARs, VARs with stochastic volatility
- large Bayesian VARs, Bayesian shrinkage priors, common stochastic volatility
- recent research on large BVARs with time variation