A Course in:
Bayesian Methods for Empirical Macroeconomics

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Overview

Bayesian methods are increasingly used in econometrics, particularly in the field of macroeconomics. This is a course in Bayesian econometrics with a focus on the models used in empirical macroeconomics. It begins with a brief introduction to Bayesian econometrics, describing the main concepts underlying Bayesian theory and seeing how Bayesian methods work in the familiar context of the regression model. Computational methods are of great importance in modern Bayesian econometrics and these are covered. In light of the Big Data revolution, applied economists often face the situation where the number of variables under consideration is large relative to the number of observations and conventional econometric methods do not work well. We describe various methods that can be used with Big Data in the context of the regression model and emphasize the wider applicability of these methods in other modelling contexts. Subsequently, the course shows how Bayesian methods are used with models which are currently popular in macroeconomics such as Vector Autoregressions (VARs), state space models and time-varying parameter VARs (TVP-VARs). Empirical illustrations that show how these models can be used to address macroeconomic questions will be provided throughout the course.

Information about me is available at https://sites.google.com/site/garykoop/

Course materials also available on this website (click on Teaching tab and then click on link for Bayesian Methods for Empirical Macroeconomics)

Readings

Koop, G. (2003). Bayesian Econometrics, published by Wiley.

Koop, G. and Korobilis, D. (2009). Bayesian Multivariate Time Series Methods for Empirical Macroeconomics, monograph in the Foundations and Trends in Econometrics series available on Gary Koop's website.

Koop, G. (2016a). Bayesian Methods for Fat Data, manuscript available on the course website.

Koop, G. (2016b). Bayesian Methods for Empirical Macroeconomics with Big Data, available on the course website.

I also have a book of solved exercises which contains proofs and derivations for most of the results used in the course:

Koop, G., Poirier, D. and Tobias, J. (2007). Bayesian Econometric Methods, Cambridge University Press.

Background

The course assumes that participants have some background knowledge of econometrics from previous coursework, but will assume no prior knowledge of Bayesian methods. I will assume that participants have a basic knowledge of probability (i.e. definitions and rules relating to conditional, marginal and joint probabilities and definitions and properties of common distributions such as the Normal and t-distributions). In addition, the participant should have a knowledge of basic matrix algebra. The Appendices to Koop (2003) provide a summary of the probability theory and matrix algebra used in this course.

Course Content

Code for references: K2003 = Koop (2003), K2016a = Koop (2016a),K2016b = Koop (2016b), KK = Koop and Korobilis (2009).

Topic 1: **Bayesian Basics**
Reading: K2003, chapters 1, 2 and 3
i) An overview of Bayesian methods
ii) The regression model under the classical assumptions

Topic 2: Bayesian Methods for Regression Models with Fat Data
Reading: K2016a
i) Bayesian model averaging with Fat Data
ii) Variable selection and shrinkage using hierarchical priors
iii) Stochastic search variable selection (SSVS)
iv) Least absolute shrinkage and selection operator (LASSO)

Topic 3: Bayesian VARs and TVP-VARs
Reading: KK, K2003, chapter 8, K2016b
i) Unrestricted VARs: Shrinkage and the Minnesota Prior
ii) Other priors for VARs
iii) The Normal linear state space model
iv) Stochastic volatility
v) The homoskedastic TVP-VAR
vi) The TVP-VAR with multivariate stochastic volatility