Outline for
A Course in Bayesian Econometrics

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Overview

This is a course in Bayesian econometrics at the graduate level. The course will be divided in two. The first part (approximately 6 lecture hours) will be based on my textbook, Koop (2003), and introduce the basic ideas and tools of Bayesian econometrics. It will cover Bayesian theory, Bayesian analysis of the linear regression model and extensions of the regression model. These models are important in their own right, but also offer a convenient framework for learning about posterior simulation. Modern Bayesian econometrics relies heavily on computational algorithms and, hence, part of the course will be focussed on posterior simulation. Different posterior simulators such as Monte Carlo integration, Gibbs sampling and Markov Chain Monte Carlo (MCMC) will be introduced. The second part of the course (approximately 6 lecture hours) will consider some macroeconomic applications. It will begin with a survey of Bayesian approaches to univariate time series analysis including state space models. Finally, we will discuss extensions of these which are popular in the recent macroeconomic literature (i.e. models with regime-switching or structural breaks and time varying VARs). These extensions will be discussed through some research papers.

The book Koop, Poirier and Tobias (2007) is composed of theoretical and computational exercises which contain solutions (Matlab code containing solutions to the computer problems is available on the book's website). By choosing appropriate questions, the reader can develop theoretical and/or computational skills in their area of particular interest. I will recommend some particular questions relating to the lecture material and be available in office hours to discuss them.

Reading List

My lectures will be based on my textbooks and research papers (the latter being available at http://personal.strath.ac.uk/gary.koop/):

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

Koop, G., Poirier, D. and Tobias, J. (2007). *Bayesian Econometric Methods*, Cambridge University Press, (Volume 7 in the *Econometrics Exercises* Series edited by Karim Abadir, Jan Magnus and P.C.B Phillips)

Other books for the reader interested in learning more about Bayesian econometrics include:

Lancaster, T. (2004). *An Introduction to Modern Bayesian Econometrics*, published by Blackwell.

Poirier, D. (1995). *Intermediate Statistics and Econometrics: A Comparative Approach*, published by The MIT Press.

Bauwens, L., Lubrano, M. and Richard, J.-F. (1999). *Bayesian Inference in Dynamic Econometric Models*, published by Oxford University Press.

Geweke, J. (2005). *Contemporary Bayesian Econometrics and Statistics*, published by Wiley.

Prerequisites

The course 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 multivariate Normal and t-distributions). In addition, the participant should have a knowledge of basic matrix algebra and some familiarity with the computer program Matlab. The Appendices to Koop (2003) provide a summary of the probability theory and matrix algebra used in this course and the participant with an inadequate background in these topics should read these before the course begins.

Course Content

References to readings are from my textbook, Bayesian Econometrics, unless otherwise specified.

Topic 1: An Overview of Bayesian Econometrics.
Reading: Chapter 1.

Topic 2: The Normal Linear Regression Model with Conjugate Prior
Computational topic: Monte Carlo integration.
Reading: Chapters 2 and 3.

Topic 3: The Regression Model with General Error Covariance Matrices (including autocorrelation and the SUR model)
Computational topic: Gibbs sampling
Reading: pages 62-64 and Chapter 6.

Topic 4: Bayesian Model Averaging in Univariate Time Series Models
This is an empirical topic which illustrates many of the previous Bayesian methods for regression models and introduce Bayesian methods for autoregressive models.
It will be based on my paper:
"Forecasting in Dynamic Factor Models using Bayesian Model Averaging" (*Econometrics Journal,* 2004, co-authored with Simon Potter).

Topic 5: Bayesian State Space Modeling
This topic will be based on: Chapter 8 of Koop (2003).

Topic 6: Bayesian Analysis of Extensions of AR and VAR Models
Reading: This lecture will draw on parts of Koop, Poirier and Tobias (2007), chapters 17 and 18 and aspects of research papers with the following one being of particular relevance:
Primiceri. G. (2005). "Time varying structural vector autoregressions and monetary policy," *Review of Economic Studies.*