



Wageningen Summer School on Econometrics

Week 2: The Bayesian Approach in Theory and Practice

PhD-course, Mansholt Graduate School

WAGENINGEN UNIVERSITY

***by Professor Gary Koop
(supported by Geerte Cotteleer, AEP)***

September 1-5, 2008

**Week 1 “*Spatial Econometrics*” of the summer school is provided by
*Professor Raymond Florax, June 30 – July 4, 2008***

The Bayesian Approach in Theory and Practice

Overview

This is a course in Bayesian methods at the graduate level. It will cover Bayesian theory, Bayesian analysis of the linear regression model and extensions of the regression model (e.g. heteroskedasticity). Additional topics, including models for qualitative choice and panel data will be covered. These models are important in their own right, but also offer a convenient framework for learning about posterior simulation. Modern Bayesian methods rely heavily on such computational algorithms and, hence, a substantial part of the course will be focused on posterior simulation. Different posterior simulators such as Monte Carlo integration, Gibbs sampling and the Metropolis-Hastings algorithm will be introduced. Students will develop practical experience with posterior simulation through problem sets which involve computer programming using Matlab. The course will involve both lectures and practical sessions where the students learn to implement Bayesian methods.

Readings

My lectures will be based on my textbook:

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

and exercises will be taken from my book:

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)

Prerequisites

The course will assume that students 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 student should have a knowledge of basic matrix algebra and some familiarity with the computer program Matlab. The Appendices to my textbook provide a summary of the probability theory and matrix algebra used in this course and the student with an inadequate background in these topics should read these before the course begins.

Hence, students are assumed to be familiar with statistics and basic applied econometrics. If they have done the course Advanced Econometrics, this will be an excellent preparation: see <http://www.sls.wau.nl/mi/mgs/courses/07%20Adv%20Econometrics%20MGS.doc>

Course Content

References to readings are from *Bayesian Econometrics* (BE) and exercises are taken from *Bayesian Econometric Methods* (BEM)

Topic 1: An Overview of Bayesian Econometrics.

Reading: Chapter 1, BE.

Exercises: Chapter 2, BEM.

Topic 2: The Normal Linear Regression Model

Reading: Chapters 2, 3 and 4, BE.

Exercises: Chapter 10 and Chapter 11 (Exercises 11.1 through 11.8), BEM.

Computational topics: Monte Carlo integration, importance sampling and Gibbs sampling.

Topic 3: The Regression Model with General Error Covariance Matrix

Reading: pages 92-99 and Chapter 6, BE.

Exercises: Chapter 11 (Exercises 11.9 and 11.10) and Chapter 13, BEM.

Computational topics: the Metropolis-Hastings algorithm and more Gibbs sampling.

Topic 4: Models for Panel data.

Reading: Chapter 7, BE.

Exercises: Chapter 12 (Exercises 12.2 through 12.5) and Chapter 14, Exercise 14.4, BEM.

Computational topic: more Gibbs sampling.

Topic 5: Qualitative Choice Models

Computational topic: the Gibbs sampler with data augmentation.

Exercises: Chapter 14 (Exercises 14.1 through 14.7), BEM.

Reading: Chapter 8, BE.

Topic 6: Bayesian Model Averaging and Selection

Reading: Chapter 11, BE.

Exercises: Chapter 16 (Exercises 16.1 through 16.4), BEM.

Computational topics: Markov Chain Monte Carlo Model Composition and stochastic search variable selection

Exercises

The book, *Bayesian Econometric Methods*, is a book of solved exercises. Many of the exercises are computational and MATLAB computer code is available on the website associated with the book. The purpose of the practical sessions will (largely) be for the student to learn how to do Bayesian inference in practice using MATLAB code taken

from the website. Then, when writing a short paper, the student will be expected to extend or adapt this code in an application of relevance for their own research.

Lecturer

Prof. Gary Koop is Professor of Economics at the University of Strathclyde at Glasgow, Scotland. He has a wide experience in Bayesian approaches (both in theory and in practice), which is illustrated by his journal articles and textbooks. He stayed in the Netherlands and Belgium for extended academic visits at Erasmus University (Tinbergen Institute), Tilburg University (CentER) and Center for Operations Research and Econometrics, Louvain-la-neuve, Belgium.

Full CV at <http://personal.strath.ac.uk/gary.koop/CVWWW.pdf>

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Organizer:

Prof.dr.ir. Arie J. Oskam, Professor of Agricultural Economics and Rural Policy, Hollandseweg 1, building 201, NL-6706 KN Wageningen, room 2113, Tel +31-317-482950 Email: Arie.Oskam@wur.nl, Website <http://www.aep.wur.nl/UK/staff/Oskam/>

Target Group: Research Masters and PhD students, Postdocs and University Faculty, Specialists in business, government and organisations

Course duration: 5 full days. Lectures on theoretical background in mornings and computer-assisted problem solving in the afternoons

Group size: Minimum 10 participants, maximum 28 participants.

(The organisers may cancel the course 4 weeks in advance in case the number of registrations did not reach the minimum).

Language: English

Location: Wageningen University (exact location will be announced later)

Programme

Lectures/theory during the morning session and 'hands on' applications during the afternoon. Morning sessions (with break) are from 09.00 – 12.00. Afternoon sessions from 13.30-16.00.

Credits and Examination:

This is a 4-ECTS credit course, which will be finished by a short paper (about 10 pages) that later can be transferred into a chapter in the dissertation. The paper should be handed in within six months and will be graded. Attendance and active participation to the course reward 1.5 ECTS.

Course fee:

The course fee is **€600**. For PhD students of Mansholt Graduate School with an approved TSP the course fee is subsidised with 50%.

The course fee includes additional study and training materials, coffee / tea, lunches and workshop dinner.

Registration Procedure:

Register via the website

http://www.sls.wau.nl/mi/mgs/procedures_and_forms/Course_registration_form.htm



Deadline for registration is July 4, 2008. Please make sure you provide the most recent contact details so that in case of any changes you will be notified promptly. After your internet registration you will receive a short notification that your name has been registered. At least 6 weeks before the course you will receive a confirmation about the location and the schedule. MGS will also send a bill to your address indicated in the registration form.

Please e-mail to Marcella.haan@wur.nl in case you have not received the second confirmation five weeks before the course.

Cancellations:

The participants can cancel their registration without any fee 6 weeks before the course starts. Cancellation fee of 100% applies if participant cancels the course less than 6 weeks prior to the course.

The organisers have a right to cancel the course not later than 1 month before the course starts in case the number of registrations did not reach the minimum of 10. All payments will be reimbursed.

The participants will be notified of any changes at their e-mail addresses.

Further Information

On course content: Gary.Koop@strath.ac.uk

On the Computer Lab / Hands on Data: More information will follow

For details about the logistics, accommodation, registration, fees, study materials, etc. please contact

Marcella Haan

Tel +31 317 484126

Marcella.haan@wur.nl

Further information on Mansholt Graduate School and its educational activities:

<http://www.sls.wau.nl/mi/mgs/courses/index.htm>

Useful information for participants from outside Wageningen

For more information about the accommodation at the Wageningen International Centre, go to <http://www.wicc-wir.nl>

From Schiphol Airport Amsterdam to Wageningen

At the Airport you can buy a train ticket in the baggage claim area. You will see the sign "Train tickets" near the exit. Then follow the signs 'Nederlandse Spoorwegen' (www.ns.nl) or 'Trains and busses' to the railway station. Purchase a one-way ticket to station Ede-Wageningen, this will cost € 12,50 and € 0,50 service charge if you buy the ticket at the ticket counter. It is also possible to buy the ticket from the ticket vending machines in the station. There will be a train leaving every 30 minutes from Schiphol, in the direction of Hilversum from rail track number 1. On the platform, you will see signs hanging from the ceiling with all names of the different stations where the train will stop. Check for the name Duivendrecht and board the train. The train arrives at Duivendrecht where you will need to transfer to another train, in the direction of Utrecht. Make sure it says "Ede-Wageningen" on the information-board at the rail track, otherwise you will have to transfer again at Utrecht. The train will leave from rail track number 8 and will arrive at railway station Ede-Wageningen after about 25 minutes.

For Dutch train connections use www.ns.nl, www.thalys.com, www.db.de



Wageningen has no railway station. This lack is fully compensated by accurate means of buses and taxis, as described next.

For information about tickets to some 1400 European destinations and to order them, call Teleservice NS Internationaal: +31 (0)900 92 96 (0.35 euro per minute). You can pay by credit card (EuroCard, MasterCard, VISA or American Express), or by remittance. [On-line booking](#) for NS trains (choose station Ede-Wageningen): pre-registration with NS electronic system is required. Prices are mentioned there as well.

From railway station Ede-Wageningen you can take a taxi (approx. 15 min.). Taxis leave at the north side of the station. The bus 83 (direction Wageningen) or 86 (direction Arnhem) can be also used. The buses are at the north side of the station. You have to purchase a bus "strippenkaart" at the railroad ticket office (in the bus itself the "strippenkaart" is more expensive). Those coming to the Wageningen International Centre have to get off the bus at the bus stop "Busstation". The WIR hotel is situated next to the bus terminal and the WICC hotel approximately 250 meters to the west. [Will be updated]