



Course and Examination Fact Sheet: Autumn Semester 2014

9,330: Bayesian Econometrics: Applications in Economics and Finance

ECTS credits: 4

Overview examination/s

(binding regulations see below)

Decentral - Oral examination (individual examination) (70%, 15 mins.)

Decentral - Group examination paper (30%)

Attached courses

Timetable -- Language -- Lecturer

[9,330,1.00 Bayesian Econometrics: Applications in Economics and Finance](#) -- English -- [Buncic Daniel](#)

Course information

Course prerequisites

The prerequisites for the course are a solid foundation in time series econometrics, particularly VAR models. The course extends and partially builds on the material covered in the Masters course Time Series Econometrics 8,314 which is offered in the Spring semester of the year at the University of St. Gallen. It is further assumed that the students have a solid foundation in statistics and are comfortable with the manipulation of probability density functions and are competent to work independently with a (high level matrix) computer language such as Matlab, R, GAUSS or any other software program of their choice. I will use Matlab throughout the course.

Course content

The overall objective of this course is to introduce students familiar with time series econometrics, statistics and econometrics in general to Bayesian simulation methods that are widely employed in the empirical macroeconomics and finance literature. Bayesian econometric methods have become the norm for many statistical problems addressed in empirical studies particularly when no closed form solutions are available (or are difficult to obtain) and when the information content in the available data set results in a likelihood function that is uninformative (or flat) with respect to a set of parameters. Prominent examples where Bayesian methods have become the dominant estimation approach are, Markov switching and Time Varying parameter VAR models, Stochastic volatility models and also Dynamic Stochastic General Equilibrium models.

All of the above listed models can be put into a general State Space Model where simulation methods can be used to obtain draws from the posterior densities of the underlying parameters of interest as well as the latent (unobserved) states. The focus of the course is thus to introduce students to State Space Model and the Kalman filter and to teach them how to estimate state space models within a Bayesian context using sampling techniques. The course will be split into two main parts: the first part will focus on detailing the methodology, while the second part will be used to apply the models to empirical data. Students will be taught how to estimate a number of widely used Bayesian models with standard computer software packages such as Matlab or R.

Course structure

Introduction to Bayesian ideas (1-2 weeks)

- Bayesian decision theory and Bayes theorem
- Review of probability distributions and maximum likelihood estimation
- Importance of priors
- Bayesian regression model



Overview of Bayesian sampling algorithms (1-2 weeks)

- Accept-Reject sampling
- Gibbs sampling
- Metropolis-Hastings sampling
- Importance sampling
- Adaptive sampling (if time permits)

State space models (1 weeks)

- Review of state space models and the Kalman filter
- Bayesian estimation of state space models

Applications (2-3 weeks)

- Bayesian VARs (BVARs)
- Time Varying Parameter VARs (TVPVARs)
- Stochastic Volatility models
- Variable Selection and model averaging with Time Varying Parameter models
- Regime Switching VARs (if time permits)

Course literature

Albert, J. and Chib, S. (1993) 'Bayes Inference via Gibbs Sampling of Autoregressive Time Series Subject to Markov Mean and Variance Shifts', *Journal of Business and Economic Statistics*, 11, 1-16.

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

Buncic, D. and M. Melecky (2008) 'An estimated New Keynesian Policy Model for Australia' *The Economic Record*, 84 (264), 1-16.

Casella, G. and George, E. (1992) 'Explaining the Gibbs Sampler' *The American Statistician*, 46, 167-174.

Chib, S. (1996) 'Calculating Posterior Distributions and Model Estimates in Markov Mixture Models', *Journal of Econometrics*, 75, 79-98.

Chib, S. and Greenberg, E. (1995) 'Understanding the Metropolis-Hastings Algorithm', *The American Statistician*, 49, 327-335.

Chib, S. and Greenberg, E. (1996) 'Markov chain Monte Carlo Simulation methods in Econometrics', *Econometric Theory*, 12, 409-431.

Cho, S. and Moreno, A. (2006), 'A Small-Sample Study of the New-Keynesian Macro Model', *Journal of Money Credit and Banking*, 38, 1461-81.

Fruhworth-Schnatter, S (2001) 'MCMC estimation of classical and Dynamic switching and Mixture Models' *Journal of the American Statistical Association*, 96, 194-209.

Geweke, J. (1995) 'Monte Carlo Simulation and Numerical Integration' in Amman, H., Kendrick,

D. and Rust, J. (eds.) *Handbook of Computational Economics* Amsteraam, North Holland, 731-800.

Geweke, J. and Zhou, G. (1996) 'Measuring the Pricing Error of the Arbitrage Pricing Theory', *Review of Financial Studies*, 9, 557-587.

Jacquier, E., Polson N. and Rossi, P. (1994), 'Bayesian Analysis of Stochastic Volatility Models', *Journal of Business and Economic Statistics*, 12, 371-417.

Kass, R. and Raftery, A (1995), 'Empirical Bayes Factors', *Journal of the American Statistical Association*, 90, 773-795.

Kim, C. and Nelson, C. (1999), *State Space Models with Regime Switching*, MIT Press, London.

Koop, G. (2003) *Bayesian Econometrics*, Wiley and Sons.



Sims, C. and Zha T. (1998) 'Bayesian Methods for Dynamic Multivariate Models', *International Economic Review*, 39, 949-968.

Smith, A.F.M. and Roberts, G.O, (1993), 'Bayesian Computation via the Gibbs sampler and related Markov Chain Monte Carlo methods' *Journal of the Royal Statistical Society, B*, 55, 3-24.

Waggoner and T. Zha (2003) 'A Gibbs Simulator for Restricted VAR models', *Journal of Economic Dynamics and Control*, 26, 349-366.

Additional course information

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Examination information

Examination part/s

1. Examination part (1/2)

Examination time and form

Decentral - Oral examination (individual examination) (70%, 15 mins.)

Remark

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Examination-aid rule

Extended Closed Book

The use of aids is limited; any additional aids permitted are **exhaustively** listed under "Supplementary aids". Basically, the following is applicable:

- At such examinations, all the pocket calculators of the Texas Instruments **TI-30** series and bilingual dictionaries without hand-written notes are admissible. Any other pocket calculator models and any electronic dictionaries are inadmissible.
- In addition, any type of communication, as well as any electronic devices that can be programmed and are capable of communication such as notebooks, tablets, PDAs, mobile telephones and others, are inadmissible.
- Students are themselves responsible for the procurement of examination aids.

Supplementary aids

None

Examination languages

Question language: English

Answer language: English

2. Examination part (2/2)

Examination time and form

Decentral - Group examination paper (30%)

Remark

Assignments

Examination-aid rule

Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while



informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2010), Lern- und Arbeitsstrategien (11. Aufl.). Aarau: Sauerländer).

- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.
- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. und VOGT H. (2008, Juristisches Arbeiten: Eine Anleitung für Studierende (4. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids

None

Examination languages

Question language: English

Answer language: English

Examination content

See courses outline

Examination relevant literature

See course literature and lecture notes

Please note

We would like to point out to you that this fact sheet has absolute priority over other information such as StudyNet, faculty members' personal databases, information provided in lectures, etc.

When will the fact sheets become binding?

- Information about courses and examination time (central/decentral and grading form): from the start of the bidding process on 21 August 2014
- Information about decentral examinations (examination-aid rule, examination content, examination relevant literature): after the 4th semester week on 13 October 2014
- Information about central examinations (examination-aid rule, examination content, examination relevant literature): from the start of the enrolment period for the examinations on 3 November 2014

Please look at the fact sheet once more after these deadlines have expired.