

## Course Goals

In recent decades, Bayesian econometrics has expanded in many areas such as micro and macroeconomics, finance or marketing. Bayesian inference allows processing information from different sources, coherent uncertainty quantification and efficient model selection. The computational revolution in simulation techniques is a key driver in this expansion. The goal of the course is to gain a thorough understanding of (a) a wide range of flexible statistical models, (b) efficient estimation within a Bayesian framework using the Markov chain Monte Carlo method and (c) selected applications to problems in Bayesian econometrics including time series analysis or causal interference. After the course, students should be able to apply some of these models to data from their own research field.

## Lecturer



Sylvia Frühwirth-Schnatter is Professor of Applied Statistics and Econometrics at the Vienna University of Economics and Business. Her research focuses on flexible statistical models, their estimation in a Bayesian framework using the efficient Markov chain Monte Carlo method as well as their application to problems in Bayesian econometrics such as time series analysis in economics or finance or causal inference in micro-economics. She is Co-Chair of ESOBE (European Seminar of Bayesian Econometrics) and served as Chair of EFaB, the Section on Economics, Finance and Business of ISBA (International Society of Bayesian Analysis). Email: [sfruehwi@wu.ac.at](mailto:sfruehwi@wu.ac.at)

## Course Content

### I. Introduction to Bayesian inference

Lecture 1: First Bayes – from Bayes' rule to Bayes' theorem

Lecture 2: Try your luck with Monte Carlo – an introduction to Bayesian computing

## Course Content

### II. The foundation of Bayesian econometrics

Lecture 3: Bayesian regression analysis for Gaussian and non-Gaussian outcomes

Lecture 4: The Bayesian approach to model selection and shrinkage

Lecture 5: State space modelling, time-varying parameters and stochastic volatility

Lecture 6: Bayesian forecasting

### III. Specific topics

Lecture 7: Mixture and Markov switching models

Lecture 8: Random effects models and panel data analysis

Lecture 9: Bayesian factor analysis

Lecture 10: Dealing with endogeneity and causal effects

## Grading

Class participation (10%); take-home exam (90%). Participants taking this course for credit must attend all lectures and complete the take-home exam.

All participants must write a paper (10-15 pages) showing the application of Bayesian inference to a problem in econometrics using real data. The choice of the application field as well as the method (model formulation, estimation technique) is entirely up to the students. The papers are due two months after completing the course.

## Organisation

The course is intended for PhD students. A limited number of persons with relevant professional or academic interest may be also admitted.

Lecture hours: 25 ECTS: 4

This course is organised in the context of the *Doktoratsprogramme universitäre Hochschulen 2017-2020*.

## Timetable and Registration

The course takes place from Monday to Friday from 9.30 to 12.00 and from 13.30 to 16.00 in the Silva Casa at the World Trade Institute, University of Bern, Hallerstrasse 6, 3012 Bern. This is an intensive course. You should prepare by completing some readings before the course begins.

**Tuition fee: 500 CHF.** Financial support may be available.

For more information, please visit the doctoral programme section of our website:

<https://www.wti.org/education/doctoral-programme/>

Please send your application to:  
[phd.applications@wti.org](mailto:phd.applications@wti.org)

## Bibliography

An excellent introduction is provided in the Oxford Handbook of Bayesian Econometrics

- (Edited by John Geweke, Gary Koop, and Herman van Dijk), in particular Chapter 3 (Bayesian time series state space models), Chapter 4 (Flexible and nonparametric modelling) and Chapter 5 (Introduction to simulation and MCMC methods).

Research papers related to the more specific topics of the course are:

- Sylvia Frühwirth-Schnatter, Christoph Pamminer, Andrea Weber and Rudolf Winter-Ebmer (2012): Labor Market Entry and Earnings Dynamics: Bayesian Inference Using Mixtures-of-Experts Markov Chain Clustering. *Journal of Applied Econometrics*, 27, 1116-1137.
- Liana Jacobi, Helga Wagner and Sylvia Frühwirth-Schnatter (2016): Bayesian Treatment Effects Models with Variable Selection for Panel Outcomes with an Application to Earnings Effects of Maternity Leave. *Journal of Econometrics*, 193, 234-250.
- Angela Bitto and Sylvia Frühwirth-Schnatter (2018): Achieving Shrinkage in a Time-Varying Parameter Model Framework. To appear in *Journal of Econometrics*.