

# Model Uncertainty and Bayesian Econometrics

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## Outline

The course provides a thorough introduction to Bayesian Econometrics. The first part of the course is mostly concerned with the issue of model uncertainty in economics and presents solutions in the spirit of Bayesian statistics. The second part of the course introduces the students to the Bayesian paradigm applied to standard settings: linear regression model under conjugate- and non-conjugate priors, limited dependent variable models, as well as univariate and multivariate time series models.

## Grading

Grading will be based on an empirical seminar paper.

## Content

### PART I: MODEL UNCERTAINTY AND BAYESIAN MODEL AVERAGING

- **Model uncertainty in regression analysis:** Model selection, model averaging.
- **Extreme Bounds Analysis**
  - Leamer, E.E., Let's take the con out of econometrics, *The American Economic Review* 73, 31-43; 1983
  - Levine, R., and D. Renelt, A sensitivity analysis of cross-country growth regressions, *The American Economic Review* 82, 942-63; 1992
  - Sala-i-Martin, X., I just ran two million regressions, *The American Economic Review* 87, 178-83; 1997
- **Bayesian Model Averaging**
  - Koop, G., Bayesian Econometrics Chapter 11, Wiley-Interscience; 2003
  - Fernandez, C., Ley, E., and M.F. Steel, Model uncertainty in cross-country growth regressions. *Journal of Applied Econometrics*, 16, 563-76; 2001
  - Fernandez, C., Ley, E., and M.F. Steel, Benchmark priors for Bayesian model averaging. *Journal of Econometrics*, 100, 381-427; 2001
  - Ley, E., and M.F. Steel, On the effect of prior assumptions in Bayesian model averaging with applications to growth regression. *Journal of Applied Econometrics*, 24, 651-674; 2009.
  - Sala-i-Martin, X., Doppelhofer, G. and R.I. Miller, Determinants of long-term growth: A Bayesian averaging of classical estimates (BACE) approach. *The American Economic Review*, 94, 813-835. 2004.

### PART II: BAYESIAN ECONOMETRICS: AN INTRODUCTION

- **Introduction to Bayesian inference in econometrics:** Models, likelihoods and priors. Bayes theorem and posterior inference.
  - Koop, G., Bayesian Econometrics Chapter 1, Wiley-Interscience; 2003

- **The normal linear regression Model with a Natural Conjugate Prior:** Prior specification; Analytical posterior solutions; Predictive inference; Selected Examples
  - Koop, G., Bayesian Econometrics Chapter 2 and 3, Wiley-Interscience; 2003
- **Non-conjugate priors for the normal linear regression model:** Prior specification; Posterior solutions; Gibbs sampling
  - Koop, G., Bayesian Econometrics Chapter 4, Wiley-Interscience; 2003
- **The non-linear regression model:** An illustrating example, prior specification, posterior simulation: The Metropolis Hastings algorithm
  - Koop, G., Bayesian Econometrics Chapter 4, Wiley-Interscience; 2003
- **Limited dependent variable models:** Logit models, Probit models; Prior specification; Posterior simulation: Data augmentation
  - Koop, G., Bayesian Econometrics Chapter 9, Wiley-Interscience; 2003
- **Introduction to time series models:** Brief introduction to univariate models and review of important concepts. Introduction to state space modeling
  - Koop, G., Bayesian Econometrics Chapter 9, Wiley-Interscience; 2003
- **Introduction to VAR models:** Brief introduction to univariate models and review of important concepts. Introduction to state space modeling
  - Hamilton, James Douglas. Time series analysis. Vol. 2. Princeton: Princeton university press, 1994. Chapter 10, 11, 12
- **The linear VAR model:** Basic concepts, estimation and interpretation. Impulse responses (including identification), variance decompositions. Bayesian estimation: shrinkage priors
  - Hamilton, James Douglas. Time series analysis. Vol. 2. Princeton: Princeton university press, 1994. Chapter 10, 11, 12
  - Karlsson, Sune. "Forecasting with Bayesian vector autoregressions." Handbook of Economic Forecasting 2 (2013): 791-897. Chapters 2-3
  - Doan, Litterman & Sims (1984)
  - Sims & Zha (1998)
  - Huber & Feldkircher (2016)
- **Time varying parameter models:** Basic concepts, univariate- & multivariate unobserved component models, the time-varying parameter regression model, specification issues & the time-varying parameter VAR model, stochastic volatility models
  - Primiceri, G., (2006); Cogley & Sargent (2005)
  - Stock & Watson, (1999, 2007, 2010); Stella & Stock (2012)
  - Jacquier, Polson, Rossi (1995)
  - Frühwirth-Schnatter & Wagner (2010)