Why Bayesian Econometrics?(1/2)

- Bases on the simple rules of probability (Bayes Theorem)
- Bayesians treat $\theta$, the parameter of interest, as a random variable
- Frequentists, the competitors to Bayesian Statistic, treat $\theta$ as an unknown constant. Remember: Only $\hat{\theta}$ is random
- Bayesians ask: Given the data, what do we know about $\theta$?
- Frequentists ask: Given $\theta$, what do we know about the data?
Frequentist probability vs Subjective probabilities

- **Frequentist probability:**
  - Probability statements are only possible for random experiments
  - Random experiments can be repeated arbitrarily often
  - Examples: dice, coins, random samples
  - For a frequentist, it is not possible to make a probability statement about the event: “It will be snowing on 1/3/2019”

- **Subjective probabilities:**
  - Probability statements are always possible if there is uncertainty
  - Random experiments need not be repeatable
  - Subjective probabilities must satisfy the probability axioms
Why Bayesian Econometrics?(2/2)

It allows...

▶ to incorporate prior information about $\theta$
▶ for probability statements about $\theta$
▶ for probability statements about competing models
▶ for probability statements about future outcomes
▶ Bayesian estimators often have better frequentist properties than frequentist estimators (e.g. results due to Stein show MLE is inadmissible but Bayes estimators are admissible)
▶ But one of the prime reasons to adopt a Bayesian approach is that it may allow feasible inference in situations where frequentist approaches are difficult
Objectives

- To get to know the basics of Bayesian statistics
- To implement Bayesian methods on a computer
Topics

- Bayesian Theory
- Markov Chain Monte Carlo
- Linear Regression
- Linear Regression with $t$ Errors
- Linear Regression with MA Errors
- Bayesian Model Comparison
- Stochastic Search Variable Selection
- Bayesian LASSO
- Global-Local Priors
- Probit and Ordered Probit Model
- Model with time-varying Parameters
- Stochastic Volatility Model
- Markov-Switching Model
The course takes place in the first half of the semester
After this course students will have the opportunity to take a Seminar in Bayesian Econometrics
and to deepen their knowledge in a particular field of Bayesian Econometrics of their choice
Organisation

Lecture

- Wednesday, 2-6 pm, CDI 120
- Jan Prüser: prueser@statistik.tu-dortmund.de

Exercises

- Tuesday, 2-4 pm, CDI 120
- Niklas Benner: benner@statistik.tu-dortmund.de
Assumed prior knowledge

- Some background knowledge of econometrics (e.g. linear Regression)
- Basic knowledge of probability theory
- Knowledge of basic matrix algebra
- Knowledge of R
- Prior knowledge of Bayesian Econometrics is not necessary