Syllabus

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Course: Bayesian Econometrics
Professor:

FIRST SEMESTER, 2018

OBJECTIVE

The development of the so-called *Bayesian Econometrics* was mainly motivated by problems which usually appear in the classical econometrics but now were reinterpreted under the Bayesian Statistics optics. The advance of the computational power during the last decades enabled some well-established Bayesian techniques to be deployed in complex real-world econometric problems. Which fed into the surge of new methodologies in Bayesian Econometrics. This virtue cycle resulted in a vast and rich literature, not only in empirical application but also in theory. The objective of this course is two-fold. First, to develop a compelling and alternative way to interpret probability using the conditional as the main building block. Second to familiarize the students with consolidated Bayesian techniques of estimation and, whenever possible, to present some new advance in the applied field.

METHODOLOGY & PREREQUISITES

Throughout the course we will discuss both theory and applications. The theory will be presented in lectures where I will try to include some examples in order to give some sense of concreteness to abstract results. Here, I expect the student to have previous knowledge of probability and statistics at an introductory level (Summer course in Statistics is enough). In particular, concepts such as joint, marginal, conditional distribution, independence, maximum likelihood and efficient will be used often. In the application, it will be necessary that the student has some practice in coding in at least one computer language (MatLab, R, Python, Java, etc.), once the estimators will be implemented via an algorithm including the required empirical work.

PROGRAM

Basic Principles of Bayesian Statistics

- Subjective Probability
- Paradigm “Frequentist vs. Bayesian”
- Bayes’ Rule

The Classical Linear Regression Model (CLRM) under the Bayesian Optics

- A Priori, Likelihood and Posteriori Distributions
- Bayesian Conjugate Distributions Pairs
- Bayesian Inference

Computational Methods to Draw from the Posteriori

- Generating Pseudo-random numbers
- Monte Carlo Integration
- Gibb Sampler and Markov Chain Monte Carlo (MCMC)
- Metropolis-Hasting Algorithm

Comparison/Combination of Models

- Savage & Dickey
- Importance Sampling

Generalization of CLRM under the Bayesian Optics

- Heterogeneity/Autocorrelation
- Panel Data/SUR
- Non-linear models (Tobit, Probit)

State-Space Models

- Bayesian Techniques for Time Series
- Bayesian VAR
- Filtering/Smoothing
- Forecast/Inference.

Semi/Non-parametric Models (If time allows)

- Semi/Non-parametric
- Partially linear models
- Identification

BIBLIOGRAPHY

Since the Bayesian literature is relatively recent and fragmented, we are not going to follow any specific textbook. Below, however, I list some references that cover most, if not all, topics that we will discuss in class. I will try to point to the students some of those references for specific topics when they come along

1. Koop (2003) *Bayesian Econometrics*, John Wiley & Sons Inc.
2. Koop, Poirier & Tobias (2007) *Bayesian Econometrics Methods*, Cambridge University Press.
3. Robert (2007) *The Bayesian Choice: From Decision-Theoretic Foundations to Computational Implementation*, Springer.
4. Gelman (2014) Bayesian Data Analysis, 3rd Edition, Chapman & Hall.
5. Marin & Robert (2007) *Bayesian Core: A Practical Approach to Computational Bayesian Statistics*, Springer.
6. Barber, Cemgil & Chiappa (2000) *Bayesian Time Series Models*, Cambridge University Press.
7. Gamerman & Lopes (2006) *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference*, Chapman & Hall.
8. Geweke, Koop & van Dijk (2011) *The Oxford Handbook of Bayesian Econometrics*, Oxford University Press.

GRADING*

Empirical Work 1 (50%)

Empirical Work 2 (50%)

CONTACT

DETAILED PROGRAM**

Lecture	Topic
1	Basic Principles of Bayesian Statistics
2	The Classical Linear Regression Model (CLRM) under the Bayesian Optics
3	Computational Methods to Draw from the Posteriori
4	Information to Priors
5	Comparison/Combination of Models
6	Heterogeneity
7	Panel and SUR
8	Non-linear models
9	State-Space Models 1
10	State-Space Models 2
11	Semi/Non-parametric Models 1
12	Semi/Non-parametric Models 2

* Grading is subject to change (possible inclusion of exam and/or weights rebalance)
** The program is preliminary and might be subject to change at the professor's discretion due to pace or time constrains