Bayesian Econometrics with applications to Portfolio Choice

Course Outline
Academic Semester: 2025/26

1. General

School	**School of Finance and Statistics**		
Academic Unit	**Department of Banking and Financial Management**		
Level of Studies	**Undergraduate**		
Course Code	**ΧΡΗΜΠΕ**		
Semester	**5th or 7th**		
Course Title	**Bayesian Econometrics with applications to Portfolio Choice**		
Idependent Teaching Activities		Weekly Teaching Hours	Credits
	Lectures	**4**	**7,5**
Course Type	**Special background**		
Prerequite Courses			
Language of Instruction and Examinations	**Gree**		
Is the course offered to Erasmus Students?	**Yes (in Greek, with some material in English)**		
Url (Eclass)	**https://eclass.unipi.gr/modules/auth/courses.php?fc=64**		

2. Learning Outcomes

Learning Outcomes

The aim of the course is to introduce students to the Bayesian approach to inference and apply it in a Financial Economics context to tackle portfolio choice problems. Upon successful completion of the course, students should be able to:

- understand the differences between the classical (frequenist) and Bayesian approaches to inference.
- derive the posterior distributions and conduct statistical inference in analytically tractable models (e.g., models with conjugate priors).
- develop code for simulating from posterior distributions for more complex models (using, e.g., Gibbs sampling).
- use the Bayesian methodology to solve static portfolio choice problems with a single or multiple risky assets.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Working in an interdisciplinary environment
- Production of new research ideas

3. Syllabus

The course offers an introduction to the Bayesian methodology employed in econometrics and statistics with increasing popularity in recent years. The Bayesian approach is applied in a Financial Economics context to tackle portfolio choice problems. We will cover the following topics.

1. Brief review of Probability Theory basics and Bayes' rule.
2. Discussion of the contrast between the classical (frequentist) and Bayesian approaches to statistical inference and how the prior distribution combines with the likelihood to generate the posterior distribution.
3. Bayesian inference for several standard statistical distributions, such as Binomial, Normal, Poisson, and Negative-Binomial.
4. Conjugate families of prior distributions.
5. Along the way, we will address the choice of prior, with emphasis on Jeffreys' prior, and discuss different modes of inference, that is, point estimation, interval estimation, and hypothesis testing.
6. Within the Gaussian framework, we will cover univariate linear regression models (with an application to beta estimation through shrinkage), univariate autoregressive models, multivariate linear regression models, and Vector AutoRegression models.
7. As we proceed, the course will also cover Monte Carlo simulation techniques that are used in posterior calculations, such as Acceptance-Rejection method and Gibbs sampling.
8. Applications of the Bayesian approach to portfolio choice problems. Within the Gaussian framework, we will cover the static portfolio choice problem with (a) a single risky asset and IID returns, (b) multiple risky assets and IID normal returns, (c) a single risky asset and predictable returns. Further, we will cover the Black-Litterman model from the Bayesian perspective.
9. Time permitting, we will discuss the dynamic portfolio choice problem with a single risky asset with Normal IID returns and unknown mean and variance.

4. Teaching and Learning Methods - Evaluation

Delivery	**Face-to-face, with the possibility for part of the teaching to take place remotely (in case of emergency).**
Use of Information and Communications Technology	• **Presentation slides in PDF format.** • **Distribution of slides through the E-class**
Teaching Methods	**Activity** / **Semester Workload** Lectures: 52 Independent Study: 60 Homework: 75,5 **Course total: 187,5**
Student Performance Evaluation	Assessment will be based on (a) homework assignments (50%) and (b) a final exam (50%). The homework will involve both theoretical and empirical work and will be assigned every 2 weeks on average during the semester. For the empirical part of the homework assignments students will be asked to analyze data and develop code in MatLab, R, or a similar programming language.

5. Attached Bibliography

Suggested Bibliography

- Geweke, J. (2005), Contemporary Bayesian Econometrics and Statistics, Wiley.
- Greenberg, E. (2007), Introduction to Bayesian Econometrics, Cambridge University Press.

- Bolstad, W.M. and J.M. Curran (2016), Introduction to Bayesian Statistics, Wiley.
- Reich, B.J. and S.K. Ghosh (2019), Bayesian Statistical Methods, CRC Press.

Related Academic Journals