ADVANCED ECONOMETRICS

Spring Term, 2010

(Instructors: Juan Mora, Matteo Ciccarelli and Jan Kiviet)

OBJECTIVE OF THE COURSE, TEACHING METHODOLOGY AND GRADING

The aim of the course is to introduce the students into some modern techniques in Econometrics and show how they work in practice. The first part of the course deals with Bootstrap, Nonparametric and Semiparametric Econometrics and Quantile Regression; the second part of the course is an introduction on Bayesian inference, starting from first principles and covering topics for applied econometricians.

The topics will be presented in lectures by the instructors. Since all the topics that are covered in the course are computer-intensive techniques, next to the necessary theoretical background substantial attention will be paid in the lectures to actual illustrations on the computer. All theoretical material is also discussed in practice, with several examples of computer calculations and problem sets to complement the learning process.

The final grade of the course will be based on assignments, paper presentations and a written final exam.

FIRST PART OF THE COURSE

A) Syllabus

1. Bootstrap Techniques in Econometrics

1.1. Monte Carlo Tests and Parametric Bootstrap Inference (Topics: Exact inference, Pivotal test statistics, Resampling sample size. Illustrations: testing for serial correlation in fixed regressions, testing in probit models).

1.2. Semi-Parametric Bootstrap (Topics: Pairs-bootstrap, Wild-bootstrap, Block-bootstrap. Illustrations: inference in dynamic regressions, ARCH and GARCH regressions).

2. Nonparametric and Semiparametric Methods: Procedures and Properties

2.1. Nonparametric Density Estimation (Topics: Kernel density estimation, Asymptotic properties, Bandwidth selection, Higher order kernels, Curse of dimensionality, Other approaches).

2.2. Nonparametric Estimation of Conditional Functions (Topics: The Nadaraya-Watson estimator, Asymptotic properties, Bandwidth selection, Local-linear estimator, Estimation of conditional pdf's and cdf's).

2.3. Partly Linear Regression Model (Topics: Identification, Robinson's Estimator, Semiparametric Efficiency Bounds).

2.4. Semiparametric Binary Choice Model and Extensions (Topics: Identification, Maximum score estimators, Pseudo maximum likelihood estimators, Minimum distance estimators, Other latent variable models).

2.5. Model Specification Tests (Topics: Tests for parametric regression models, Tests for pdf's and cdf's, Tests of significance, Test for two samples).

3. Quantile Regression

3.1. Fundamentals of Quantile Regression (Topics: Interpreting quantile regression models, Inference, Nonlinear and nonparametric models, Quantile regression models for latent variables).

3.2. Economic Applications of Quantile Regression (Topics: Wage analysis, Returns to schooling, Gender gap, Asymmetries in labor supply, Conditional value-at-risk).

B) Bibliography (Books)

Davidson, R., MacKinnon, J.G., 2004. Econometric Theory and Methods. Oxford University Press.

Fitzenberger, B., Koenker, R. and Machado, J.A. (Eds.), 2002. Economic Applications of Quantile Regression, Physica-Verlag.

Horowitz, J., 1998. Semiparametric Methods in Econometrics, Lecture Notes in Statistics 131, Springer-Verlag.

Koenker, R., 2005. Quantile Regression, Econometric Society Monographs, Cambridge University Press.

Li, Q. and Racine, J.L., 2007. Nonparametric Econometrics: Theory and Practice, Princeton University Press.

Mills, T.C. and Patterson, K.D. (Eds), 2007. Palgrave Handbook of Econometrics, Volume 1: Econometric Theory, Palgrave MacMillan.

SECOND PART OF THE COURSE

A) Background

The focus of the classes will be on application more than theory. The course is therefore more useful for applied economist than for theoretical econometricians. Students are required to have previous courses in calculus, matrix algebra, probability and statistics, and prior introductory training in econometrics (The course can be scheduled e.g. after the first Econometrics course at a Master or PhD level). Each session will be complemented with concrete examples and applications. Therefore students will find basic programming skills useful in the sense that their previous experience in probability, statistics, linear algebra and econometrics should have included computational aspects and basic knowledge of statistics and econometrics packages. MATLAB programs for performing Bayesian analysis in several models will be provided and discussed. The material covered in class draws upon the (selected) list of

references below. Handouts and additional technical material can be distributed during the lectures.

B) Syllabus

1. Fundamentals of Bayesian statistics and econometrics

a. Bayes' Theorem, Uncertainty, Prediction
b. Components of Bayes' Theorem: Likelihood, Priors and Posteriors, Inference
c. Model Checking and Sensitivity analysis
d. Presentation of results
e. Extensions: Hierarchical models, Normal approximation, Objective priors

2. Posterior simulators and Monte Carlo strategies

a. Non-iterative methods:
    i. Direct sampling
    ii. Sampling in parts and sampling by inversion
    iii. Importance sampling
b. Iterative Methods: Markov Chain Monte Carlo (MCMC)
    i. Gibbs Sampling
    ii. Metropolis
c. Computation of the marginal likelihood and model comparison

3. Regression Models

a. The Normal Linear Regression Model
b. Introduction to Panel Data Models
c. Chib's method for calculating marginal likelihood using Gibbs output

C) Bibliography (Books)

• Bauwens, L., M. Lubrano and J.F. Richard (1999) Bayesian Inference in Dynamics Econometric Models, Oxford University Press.

• Berger, J. and Wolpert, R. (1998), The Likelihood Principle (2nd edition), Institute of Mathematical Statistics, Hayward, Ca.

• Canova, F. (2009), Methods for Applied Macroeconomic Research, Princeton University Press.

• Carlin, B.P., and T.A. Louis (1996), Bayes and Empirical Bayes Methods for Data Analysis, New York: Chapman & Hall.

• Gelman, A., J. B. Carlin, H.S. Stern and D.B. Rubin (1995), Bayesian Data Analysis, Chapman and Hall, London.

• Geweke, J (2005), Contemporary Bayesian Econometrics and Statistics, Wiley.

• Gilks, W.R, S. Richardson and D. Spiegelhalter, (1996), MCMC in practice, NY: Chapman & Hall.

• Greenberg, E. (2008), Introduction to Bayesian Econometrics, Cambridge:Cambridge University Press.

• Hamilton J. D. (1994), Time Series Analysis, Princeton N.J., Princeton University Press.

• Koop, G. (2003), Bayesian Econometrics, J. Wiley.

• Lancaster, T. (2004), An Introduction to Modern Bayesian Econometrics, Blackwell.

• Leamer, E. E. (1978), Specification Searches, J. Wiley.

• Poirier, D. Intermediate Statistics and Econometrics, MIT Press (1995)

• Robert, C.P. (2001), The Bayesian Choice, Springer Verlag.

• Robert, C.P. and G. Casella (2004), Monte Carlo Statistical Methods (2nd edition), Springer Verlag.

• Zellner, A. (1971) Introduction to Bayesian Inference in Econometrics, Wiley and Sons