Advanced Time-Series Econometrics

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Office Hours: just send me an email

Scheduled Class Time and Organization: Econ 722 is a half-semester (0.5 CU) course that runs from Jan 21 to March 9, 2021. We will meet twice a week Tuesdays and Thursdays from 1:30p - 2:50pm online.

The class is taught in a synchronous fashion via Zoom. The link is available through CANVAS. Although the meetings will be recorded, I expect you to attend and participate in each session - in the same way you would attend an in-person class.

Course Description:

The course is designed as a sequel to Economics 706. Broadly speaking, we will study econometric models and methods that are useful to conduct substantive empirical research in macroeconomics. It focuses on Bayesian analysis of vector autoregressions (VARs) and dynamic stochastic general equilibrium (DSGE) models.

Prerequisites: Economics 705 and 706 or equivalent graduate level econometrics.

Courseware: You can access the course materials via CANVAS. You can log-in from *http://upenn.instructure.com/*.

Course Requirements:

This is a research course! The goal is to lead students toward the current frontier in macroeconometrics and time series analysis.

- **Class Participation and Problem Sets [50%]**: There will be a sequence of problem sets, assigned during the (half) semester. Moreover, you are expected to carefully study the assigned readings and participate in classroom discussions.

- **Research Paper [50%]**: with strong econometric component (theoretical or empirical), related to one of the topics covered in class. A two page outline is due on Monday, April 1. The completed paper is due on on August 27. NO EXCEPTIONS!

  The paper does not have to constitute an original piece of research. For instance, it could be a replication of an existing empirical or Monte Carlo study; it could deviate from an existing study by using a different data set, e.g., data from a different country; it could be a Monte Carlo study that compares existing estimators or test procedures that have not been compared previously or it assesses these procedures under certain forms of misspecification (robustness analysis). The paper could also cover a topic in the area of theoretical econometrics.

- **Econometrics Workshop [extra credit]**: You are also expected the attend the econometrics workshops. The workshops are virtual this semester and usually take place Mondays from 4:30-5:30.

Students who participate in class and submit decent solutions to all problem sets will receive a B- or a B at the end of the course. To convert the B grade into an A grade, students must submit a research paper by August 27.

Course Readings: the following books are recommended:

Herbst, Edward and Frank Schorfheide (2015): *Bayesian Estimation of DSGE Models*, Princeton University Press.

Geweke, J., G. Koop, and H. van Dijk (2011, eds.): *Oxford Handbook of Bayesian Econometrics,* Oxford University Press.

In addition I will provide lecture notes and refer to a long list of published articles and working papers in our lectures.

Course Outline

- **Introduction to Bayesian Inference:** linear regression model, point estimation, interval estimation, model selection and averaging, importance sampling. Irregular cases: partial identification and unit roots.

- **Reduced-Form VARs:** direct sampling from posterior, Minnesota prior, data-driven hyperparameter selection, forecasting, extensions.

- **Structural VARs:** short-run and long-run identification schemes, sign restrictions, external instruments, implementation of Bayesian inference.

- **DSGE Models:** Introduction, structure of DSGE models, solving linear and nonlinear rational expectation systems, likelihood evaluation.

- **Metropolis-Hastings Algorithm:** Convergence results and applications to DSGE models, Hamiltonian MCMC.

- **Sequential Monte Carlo Methods:** Convergence results and applications to DSGE model estimation, particle filters, particle MCMC, SMC^2

- **DSGE Model Evaluation:** Posterior odds comparisons, computation of marginal data densities, prior and posterior predictive checks