SYLLABUS

The first half of the course will be taught by Marco Del Negro, the second half by Chris Sims. The initial estimate is that the first half will cover through section 9 below. There will be a mid-term and a final exam. Problem sets will count toward the grade. Collaboration on problem sets is encouraged, but each student must write up results individually. Problem sets will be graded 0, 3, 4, or 5. 5 is for unexpected excellence, 4 is for getting nearly everything right, 3 is for some substantial error or incompleteness, and 0 for not handing it in or for trivial effort. The idea is that problem set grades usually don't vary enough to affect letter grades, unless the problem sets are not handed in.

(1) Basic notions of Bayesian econometrics
   - Bayes theorem; testing and model selection; the linear regression model; an introduction to MC methods; differences between Bayesian and Frequentist approaches: some examples.

(2) Reduced form VARs
   - Properties; the likelihood; estimation; Minnesota priors; applications.

(3) Structural VARs
   - The MA representation, identification; variance decomposition; short run and long run identification schemes; sign restrictions; applications.

(4) State-Space models
   - State-space models; the Kalman filter and the likelihood computation; Bayesian estimation; Kalman smoothing and shock decomposition.

(5) An introduction to MCMC methods
   - Metropolis-Hastings; Gibbs sampler.

(6) DSGEs
   - A simple workhorse DSGE model; estimation; forecasting; impulse response function and variance decomposition; priors elicitation, prior sensitivity, and identification.

(7) DSGE models evaluation
   - Model comparison; predictive checks; DSGE-VARs.

(8) Factor models
   - Identification; estimation.

(9) Non-Gaussianities
   - Stochastic volatility, Student's t-distributed shocks.

(10) Time-variation
   - Regime switching; continuously varying parameters.

(11) Bayesian approaches to panel data

(12) Mixed models; Bayesian interpretations of clustered covariance matrices

(13) Frontiers of posterior simulation
   - Particle filtering

- Sequential MCMC
- Bridge and contour sampling

Main references:

- Del Negro and Schorfheide "Bayesian Macroeconometrics", Chapter 7 of the "Oxford Handbook of Bayesian Econometrics", Gary Koop, Herman Van Dyk and John Geweke eds., 2011 (also available at *http://economics.sas.upenn.edu/schorf/papers*)
- John Geweke, *Contemporary Bayesian econometrics and statistics*. Wiley & Sons 2005
- Sims, "Using a Likelihood Perspective to Sharpen Econometric Discourse: Three Examples", *Journal of Econometrics*, 95(2) April 2000, 443-462
- Ed Herbst and Frank Schorfheide, "Sequential Monte Carlo for DSGE Models", September 2013 University of Pennsylvania working paper.