AEA Continuing Education Course:
New Developments in Time Series Econometrics

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This course surveys some of the main developments in time series econometrics over the past decade. The primary emphasis is on tools relevant for macroeconometric applications, although many of these tools are used in financial econometrics as well. A brief description of each topic appears after it is listed below. The course emphasizes the purpose and use of these methods, not formal derivations and proofs, and each method is illustrated using several running empirical applications.

Tuesday, Jan. 5, 2010

Refresher on stationary linear time series models: the time and frequency domains, filters, inference, and forecasting (Watson). *This lecture establishes the basic vocabulary and notation of time series econometrics, reviews classical results about linear models, linear filters (including band-pass business cycle filters), and reviews inference (including information criteria for model selection) and forecasting in linear models.*

Wednesday, Jan. 6, 2010

Functional central limit theory and structural breaks (estimation and testing) (Watson). *Tests for structural breaks are now a widespread tool for detecting regime shifts in economic time series. This lecture summarizes the theory of testing for structural breaks and covers inference about the break date (estimation of confidence intervals for the break date), and discusses extensions to regime shifts.*

Heteroscedasticity- and autocorrelation-consistent standard errors (Watson). *When the error term is serially correlated in regression or GMM, the usual OLS standard errors will not provide confidence intervals with the right coverage rate. This lecture summarizes the basic ideas of HAC standard errors (such as Newey-West standard errors), then covers a number of important developments in this field over the past decade, including sources of performance problems in basic HAC standard errors, the possibility (and implications) of using very large bandwidths, and alternatives to the HAC standard error paradigm. This lecture also covers applications to panel data.*

The Kalman filter, nonlinear filtering, and Markov-chain Monte Carlo (Watson). *The Kalman filter produces the likelihood for linear Gaussian models with unobserved state variables. If the model is nonlinear or nonGaussian, the Kalman filter typically cannot be used directly so other methods are used. This lecture focuses on these other methods, with special attention to Markov Chain Monte Carlo (MCMC) methods. These methods are illustrated using several applications, such as unobserved components models with stochastic volatility.*

Weak instruments and weak identification in IV regression and GMM (Stock). *Instruments are said to be weak if the instrument has a low correlation with the included endogenous variables in instrumental variables (IV) regression. If instruments are weak, then standard IV regression output typically is unreliable. There has been a great deal of work on weak instruments over the past decade. This lecture summarizes the problem of weak instruments and works through*

various tools that have been proposed (many of which are now available in STATA) for handling weak instruments.

Thursday, Jan. 7, 2010

Recent developments in structural vector autoregression (VAR) modeling (Stock). *Structural VAR models provide a way to model multiple variables that delivers impulse responses (dynamic effects) with respect to certain variables of interest. The central question in SVAR modeling how best to identify these impulse responses. This lecture surveys significant development in SVAR identification over the past decade. In addition, the lecture covers recently raised or developed issues and tools for inference in SVARs.*

Dynamic factor models and forecasting with many predictors (Stock). *One of the most active areas in time series econometrics over the past decade has been the development of tools for handling large data sets (many series), and chief among these tools are methods for analyzing dynamic factor models (DFMs). This lecture lays out the DFM and reviews methods for estimation of the number of factors, estimation of the factors, and use of the estimated factors for subsequent purposes such as GMM or forecasting. The lecture also discusses applications of empirical DFMs to estimation of dynamic stochastic equilibrium models and to VARs (the so-called factor-augmented VAR, or FAVAR). These methods are illustrated using a 100+ variable DFM estimated on U.S. data.*

A short reading list will be sent to registered participants prior to the course.