
Econometrics III Time Series Syllabus

D.Sc. in Business Economics

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Objective

The main goal of the course is to make the student familiar with and able to implement univariate and multivariate time series models by using both frequentist and Bayesian approaches. All classroom examples and implementations as well as projects will be carried out by the open-source statistical software R.

Course description

Brief review of frequentist inference followed by the introduction of key ingredients of Bayesian inference, model selection and criticism. An introduction to the main Monte Carlo methods for Bayesian inference: MC integration, resampling, MCMC and sequential MC. Univariate time series models, including AR(F)IMA models, state-space models, Markov switching models, GARCH and stochastic volatility models. Multivariate time series models, including Bayesian VARs and factor-augmented VARs, dynamic factor models, time-varying covariance models.

Required bibliography

- Gamerman and Lopes (2006) *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference*. Chapman and Hall/CRC. <http://www.dme.ufrj.br/mcmc>
 - Tsay (2010) *Analysis of Financial Time Series, Third Edition*. Wiley-Interscience, Probability and Statistics. <http://faculty.chicagobooth.edu/ruey.tsay/teaching/fts3>
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Additional bibliography

Time series & state-space modeling

- Brockwell and Davis (1991) *Times Series: Theory and Methods (2nd edition)*. Springer.
- Hamilton (1994) *Time Series Analysis*. Princeton University Press.
- Harvey (1991) *Forecasting, Structural Time Series Models and the Kalman Filter*. MIT Press.
- Harvey (1993) *Time Series Models*. MIT Press.
- Prado and West (2010) *Time Series: Modeling, Computation, and Inference*. Chapman and Hall/CRC.
- Shumway and Stoffer (2006) *Times Series Analysis and Its Applications*. Springer.
- Tsay (2014) *Multivariate Time Series Analysis with R and Financial Applications*. Wiley.
- West and Harrison (1997) *Bayesian Forecasting and Dynamic Models, 2nd edition*. Springer.

Bayesian time series & econometrics modeling

- Bauwens, Lubrano and Richard (1999) *Bayesian Inference in Dynamic Econometric Models*. Oxford University Press.
- Berry, Chaloner and Geweke (1996) *Bayesian Analysis in Statistics and Econometrics, Essays in Honor of Arnold Zellner*. Wiley.
- Geweke (2005) *Contemporary Bayesian Econometrics and Statistics*. Wiley.
- Greenberg (2008) *Introduction to Bayesian Econometrics*. Cambridge University Press.
- Koop (2003) *Bayesian Econometrics*. Wiley.
- Koop, Poirier and Tobias (2007) *Bayesian Econometric Methods*. Cambridge University Press.
- Lancaster (2004) *An Introduction to Modern Bayesian Econometrics*. Blackwell Publishing.

Program

- 18/04 - 10:30-12:00 - Likelihood and Bayesian ingredients
20/04 - 10:30-12:00 - Model selection and model criticism
25/04 - 10:30-12:00 - Monte Carlo integration and sampling
27/04 - 10:30-12:00 - Gibbs and Metropolis-Hastings algorithms
28/04 - 13:00-16:00 - Characteristics of time series
02/05 - 10:30-12:00 - Autoregressive (AR) and moving average (MA) models
04/05 - 10:30-12:00 - ARMA and ARIMA models
09/05 - 10:30-12:00 - Trend-stationarity and difference-stationarity
11/05 - 10:30-12:00 - ARCH and GARCH models
- 16/05 - 10:30-12:00 - **Midterm exam**
- 18/05 - 10:30-12:00 - State-space models and the Kalman filter
23/05 - 10:30-12:00 - Kalman smoother and other filters
25/05 - 10:30-12:00 - Stochastic volatility (SV) models
26/05 - 13:00-14:30 - Reduced form vector autoregressive (VAR) models
30/05 - 10:30-12:00 - Bayesian VAR modeling
01/06 - 10:30-12:00 - Structural form VAR models
06/06 - 10:30-12:00 - Co-integrated VAR models
08/06 - 10:30-12:00 - Factor models
13/06 - 10:30-12:00 - Factor-augmented VAR models
20/06 - 10:30-12:00 - Dynamic factor models
- 22/06 - 10:30-12:00 - **Final exam**
- 27/06 - 10:30-12:00 - Factor SV models
29/06 - 10:30-12:00 - Cholesky SV models
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