

# Time Series and Dynamic Models

## SSC 389 Fall 2015

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### Course Description

This is a graduate course on the general class of state-space models or Dynamic Models. Emphasis will be placed on the implementation and use of the models presented. Applications will focus on the social sciences but an effort will be made to keep students from the physical sciences engaged in the topics. Knowledge on mathematical statistics at a graduate level is required as well as basic coding skills (R, Matlab or Stata).

### Text/Notes

All the class notes and course materials will be available in the course website at

<http://faculty.mcombs.utexas.edu/carlos.carvalho/teaching/>

There is no required textbook, however the class will be heavily based on the following books:

1. *Bayesian Forecasting and Dynamic Models* (Springer) by West and Harrison.
2. *Time Series* (CRC Press) by Prado and West.
3. *Dynamic Linear Models with R* by Petris, Petrone and Campagnoli.

### Evaluation

The final grade will be based on a class presentation and a final project. The final project can be done in pairs. Students are required to write a one page project proposal by October 21. Students will have to present their work

to the class. Project presentations will take place during the final month of class.

## Schedule of Topics

The main topics covered in the class are:

- **Week 1:** Intro and Regression models
- **Week 2:** Posterior Simulation and the AR(1) model
- **Week 3:** Mixtures, Latent Variable Models and The AR(1) model + noise
- **Week 4:** Dynamic Linear Models
  - Dynamic Regression Models
  - The Kalman Filter
  - FFBS
- **Week 5:** Stochastic Volatility Models
- **Week 6:** Markov-Switching Models and HMMs
- **Week 7:** Sequential Monte Carlo
- **Week 8:** Non-Gaussian Models (Probit, Logit, Poisson)
- **Week 9:** Multivariate Models (Dynamic Factor Models, Cholesky SV)
- **Week 10:** Other topics (Spatial, Gaussian Processes, etc...)
- **Week 11-14:** Project Presentations

## Office Hours

By appointment.