

**TOOLS IN APPLIED MACRO I**  
**ECON 7300**  
**CORNELL UNIVERSITY**  
**SPRING 2016**

Professor: Kristoffer Nimark  
Class time and place: MW 10:10-11:25am URH 488.  
Office hours: Wednesdays 4-6pm  
Email Address: [pkn8@cornell.edu](mailto:pkn8@cornell.edu)  
Web site: [www.kris-nimark.net](http://www.kris-nimark.net)

**Overview**

This course aims at equipping students with the tools needed to produce applied macro economic research. Most of the material can be found in the text books listed below, but reading articles may also be required.

**Administrative matters**

Grades will be based on the final exam (60%) and 4 homework assignments ( $4 \times 10\%$ ).

**Lecture 1-3 Introduction & Linear Difference Equations.**

- Course overview
- Markov Chains
- Difference Equations
- Lag operators
- MA, AR and White Noise Processes
- Auto Covariance Function
- Conditional expectations
- Prediction and ARMA processes
- Time series as elements in Hilbert space

**Lecture 4 Estimation of Linear Models.**

- Maximum likelihood
- Least squares
- Linear projections

**Lecture 5-7 Vector Auto Regressions (VARs).**

- Estimation
  - Lag specification
  - Hypothesis testing
- Identification
  - Contemporaneous (Cholesky) restrictions
  - Long-run (Blanchard-Kahn) restrictions
  - Sign restrictions
- Variance decompositions

- Impulse response functions

### **Lecture 8 Principal Components and FAVARS.**

- Dimension reduction
- Dynamic Factor Models
- Forecasting

### **Lecture 9-10 Cointegration.**

- Cointegration: What is it?
- Representing cointegrated time series
- Estimation of cointegrating relationship

### **Lecture 11–13 State Space Models and the Kalman Filter.**

- State Space Models
- The Kalman Filter
- Smoothing
- Numerical optimization of likelihood function
- Local level/Unobserved component model
- DSGE models

### **Lecture 14 Exam.**

#### REFERENCES

- [1] Brockwell, P.J. and Davis, R.A., 2005, *Time series: theory and methods*, Springer Science & Business Media.
- [2] Cochrane, John, 2005, *Time Series for Macroeconomics and Finance*, [http://faculty.chicagobooth.edu/john.cochrane/research/Papers/Time\\_Series\\_Book.pdf](http://faculty.chicagobooth.edu/john.cochrane/research/Papers/Time_Series_Book.pdf)
- [3] Hamilton, James D., 1994, *Time Series Analysis*, Princeton University Press.
- [4] Ljungqvist, Lars, and Thomas J. Sargent. Recursive macroeconomic theory. MIT press, 2012.
- [5] Lütkepohl, H., 2005, *New introduction to multiple time series analysis*, Springer Science & Business Media.