

Sharif University of Technology

Time Series Analysis, PhD

Syllabus

Summary: Time series is a second-year graduate-level course in econometrics, with a primary focus on models and methods used in applied macro-econometrics research. The topics covered assume knowledge of the material taught in the econometrics (1) sequence of the master program.

Reading: The textbook for this course are

- Hamilton, James Douglas. Time series analysis. Princeton university press, 1994.
- Hayashi, Fumio Econometrics, Princeton university press, 2000
- Brockwell, Peter J., and Richard A. Davis. Time series: theory and methods. Springer Science & Business Media, 2009.
- Koop, Gary. Bayesian econometrics. Wiley, 2003.
- Geweke, John. Contemporary Bayesian econometrics and statistics. Vol. 537. John Wiley & Sons, 2005.
- Wooldridge, Jeffrey M. Econometric analysis of cross section and panel data. MIT press, 2010.

Grades: Course grades will be determined by performance on problem sets (40%), a midterm (20%), and a final exam (40%).

Problem Sets: There will be computer programming work required on most of the problem sets. You may **not** use a canned package (e.g. Stata, R, Eviews) for the computer exercises. I recommend MATLAB or Python.

Teaching Assistants: The TA's will occasionally hold office hours which will be announced

Course Outline and Readings:

Extremum Estimators: NLS, GMM, MLE

Newey and McFadden, 1994, "Large sample estimation and hypothesis testing"

Wooldridge (12.1-12.5, 13.1-13.5, 14.1, 14.6)

Hypothesis Testing and Specification Testing, **Homework 1**

Newey and McFadden, 1994, "Large sample estimation and hypothesis testing"

Wooldridge (12.6, 13.6, 13.7)

Time Series basic models: AR, MA, ARMA, estimation and specification, **Homework 2**

Hamilton (1-5)

Spectral representation

Hamilton, (6)
Brockwell and Davis

Heteroskedasticity: HAC, HAR, ARCH, **Homework 3**

Hamilton (21)
Müller, Ulrich K. "HAC corrections for strongly autocorrelated time series."
Journal of Business & Economic Statistics 32.3 (2014): 311-322.

Bayesian Estimation and DSGE Models, **Homework 4**

Koop
Gemeke
Smets, Frank, and Rafael Wouters. "Shocks and frictions in US business cycles: A Bayesian DSGE approach." American economic review 97.3 (2007): 586-606.

State Space Representation and Kalman Filter, **Homework 5**

Hamilton (13)
Harvey, Andrew. "Forecasting with unobserved components time series models." Handbook of economic forecasting 1 (2006): 327-412.

Non-stationary, Unit Roots, Breaks and Time Varying Coefficients, **Homework 6**

Hamilton (17-19)

VAR, SVAR, Cointegration, Forecasting, **Homework 7**

Hamilton (11)

Weak IV

Andrews, Isaiah, James H. Stock, and Liyang Sun. "Weak instruments in instrumental variables regression: Theory and practice." Annual Review of Economics 11 (2019): 727-753.

Dynamic Factor Models and "Big Data", **Homework 8**

Stock and Watson, "*Factor Models and Structural Vector Autoregressions in Macroeconomics*" in Handbook of Macroeconomics, Vol2A, John B. Taylor and Harald Uhlig (eds), 2016, Chapter 8, pp 415-526.

Numerical Optimization