

Economics 408

Time Series Econometrics

This is an introduction to modeling time series data. The prerequisites are mathematical economics (or math through multivariable calculus) and econometrics or mathematical statistics.

Texts

Pindyck and Rubinfeld (P&R), *Econometric Models and Economic Forecasts* (4'th ed)
James D. Hamilton, *Time Series Analysis* (QA 280.H264 1994, on reserve)
David F. Hendry, *Dynamic Econometrics* (HB 141.H458 1995, on reserve)

Other readings are available from the Blackboard site:

Johnston and DiNardo, *Econometric Methods*, Fourth Edition (J&D).
Maddala, G.S., *Introduction to Econometrics*, Second Edition (M).

Introduction and Review

Trigonometry (Hamilton 704-711)

Complex numbers
Circular functions
DeMoivre's Theorem

Difference Equations (Hamilton ch. 1)

Dynamic multipliers (P&R 413-431)
Eigenvalues (Johnston, J. "The Eigenvalue Problem")
Stability conditions: roots inside the unit circle

Lag Operators (Hamilton ch. 2)

Lag polynomials
Stability conditions: roots outside the unit circle

Stationary Time Series Models

Univariate Time Series Models and ARMA's (P&R 463-601; Hamilton ch. 3, 4; J&D 204--215)

Stationary ARMA processes
White noise
Covariance stationarity
MA(q) processes
AR(p) processes

Digression: nonstationary processes and ARIMA

Box-Jenkins forecasting philosophy (M, 542-549; J&D 228-234)

- a. Identification
- b. Estimation
- c. Forecasting

Multi-Equation models: VAR's (P&R 399-407, 431-435; M, 578-80, 592-7; Hamilton ch. 11; J&D 287-301)

VAR's and reduced form equations
Matrix notation
Stability conditions
Impulse response functions
Hypothesis tests
Granger causality tests (P&R 216-7; M, 393-4)
Assignment: VAR (crime and punishment)

Models of Nonstationary Time Series

Unit Roots (Hamilton ch. 15, 17)

Trend Stationary vs Difference Stationary Models (M, 258-264)
Persistence of shocks
Dickey-Fuller tests (P&R 507-513; M 582-588; J&D 215-228)
Assignment: Diebold and Senhadh, "The Uncertain Unit Root in Real GNP: Comment," *American Economic Review*, 86, 1996, 1291-98.
Assignment: Lothian and Taylor "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries," *Journal of Political Economy* 104, 1996, 488-509.
Asymptotic Distribution Theory

Multivariate Time Series Models: Cointegration (Hamilton ch. 19)

Cointegration and long term equilibria

(Granger, "Introduction." from Engle, R.F. and Granger, C.W.J., *Long Run Economic Relationships*,

Oxford University Press, 1991.)

Tests for cointegration (P&R 513-516; M, 588-600; J&D 301-305)

Enders, W. "Characteristic Roots, Rank, and Cointegration." 385-405.

Estimating the cointegration vector (dynamic ordinary least squares)

Assignment: Warner, "Does world investment demand determine U.S. imports?"

American Economic Review, 84, 1994, 1409-1422.

Assignment: Demand for money in the US, Stock and Watson, "A simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems," *Econometrica*, 61, 783-820,

1993. Read section 7 (Stock&Watson.pdf).

ARCH-GARCH Models (Hamilton ch. 21)

ARCH model

Testing for ARCH

Generalized ARCH (GARCH)

ARCH in Mean

Assignment: Phillips Curve.

Modeling Time Series Data: David Hendry and the British School **(Hendry, *Dynamic Econometrics*)**

Levels of knowledge (ch 1)

Econometric Concepts (ch 2)

Nonsense regressions and spurious detrending (ch 4)

Exogeneity (ch 5)

Typology of linear dynamic models (ch 7)

Dynamic systems (ch 8)

Theory of reduction (ch 9)

Simultaneous equations (ch 11)

Encompassing (ch 14)

Modeling issues (ch 15)

Example: demand for money in the U.K.(ch 16)

Hendry and Ericsson, "An econometric analysis of U.K. money demand in monetary trends in the

United States and the United Kingdom by Milton Friedman and Anna J. Schwartz."

American Economic Review 81, March 1991, 8-49.

Granger, C.W.J. "Where are the Controversies in Econometric Methodology?"

(From Granger, C.W.J. *Modelling Economic Time Series*, Oxford: Oxford University Press, 1990.

Pagan, A.R. "Three Econometric Methodologies: A Critical Appraisal."

(From Granger, C.W.J. *Modelling Economic Time Series*, Oxford: Oxford University Press, 1990.

"Professor Hendry's Econometric Methodology."

(From Granger, C.W.J. *Modelling Economic Time Series*, Oxford: Oxford University Press, 1990.

Review and integration with mainstream econometrics: Johnston & Dinardo, 244-265.