DEPARTMENT OF ECONOMICS
UNIVERSITY OF CALIFORNIA

D. McFadden, T. Rothenberg
Fall 2000

Economics 241B
Econometrics

This course will cover statistical models for the analysis of economic time series data, with applications in macroeconomics and finance. It is intended both for students specializing in econometric theory and for students interested in applying time series methods to economic data. Economics 240A-B (or equivalent) is prerequisite. Economics 241A is not required for Economics 241B this semester, though, of course, it wouldn't hurt.

The class will meet Monday and Wednesday 4-5:30. Grading will be based on performance on the (approximately biweekly) problem sets and midterm and final exams. The first half of the semester will primarily be devoted to analysis of stationary time series data, while the second half will address nonstationarity and nonlinearity/nonnormality in time series.

The principal texts for the class are:

Harvey, A., *Time Series Models*, Second Edition, MIT Press, 1993 (Cited as "Harvey").

Hamilton, J., *Time Series Analysis*, Princeton University Press, 1994 (Cited as "Hamilton").

Banerjee, A., J. Dolado, J. Galbraith, and D. Hendry, *Co-Integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data*, Oxford University Press, 1993.

Other useful references are:

Sargent, T., *Macroeconomic Theory*, Second Edition, Academic Press, 1987 (Cited as "Sargent").

Granger, C. and Newbold, P., *Forecasting Economic Time Series*, Academic Press, 1977 (Cited as "Granger and Newbold").

Gourieroux, C. and Monfort, A., *Time Series and Dynamic Models*, Cambridge University Press, 1997. (Cited as "Gourieroux-Monfort")

More advanced treatments of some of the topics covered can be found in:

Harvey, A.C., *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge University Press, 1989.

Anderson, T.W., *The Statistical Analysis of Time Series*, Wiley, 1971.

REFERENCE LIST FOR 241B

1. **Discrete Time Stochastic Processes**: stationarity and ergodicity; limit theorems; ARMA and ARIMA models; linear projections and forecasting; Wold decomposition theorem.

Wooldridge, J. "Estimation and Inference for Dependent Processes," in R. Engle and D. McFadden (eds) *Handbook of Econometrics*, North Holland: Amsterdam, Vol. 4, 2641-701.

Harvey, chapters 1 and 2.

Hamilton, chapters 1 through 3.

Sargent, chapter 10; sections 11.1-11.3, 11.13-11.21.

Granger and Newbold, chapter 1.

Gourieroux and Monfort, chapters 5, 8, 9.

2. **Univariate ARIMA Models**: Single-equation identification, estimation, and forecasting**.**

Harvey, chapters 3 and 5.

Hamilton, chapters 4 and 5, 7.

Sargent, sections 11.22-11.26.

Granger and Newbold, chapters 3-5, sections 6.3-7.3.

3. **Vector Processes**: vector AR and ARMA processes; Granger-Sims causality.

Harvey, chapter 7.

Hamilton, chapters 10 and 11.

Sims, C.A., "Money, Income, and Causality," *American Economic Review*, September 1972.

Gourieroux and Monfort, chapter 10.

4. **Frequency Domain Analysis**: spectra, filters, transforms, nonparametric estimation.

Harvey, chapter 6.

Hamilton, chapter 6.

Sargent, sections 11.4-11.12.

Granger and Newbold, chapter 2.

Geweke, J., "Measurement of Linear Dependence and Feedback Between Multiple Time Series," *Journal of the American Statistical Association*, June 1982.

5. **State-space Models and the Kalman Filter**

Harvey, Chapter 4

Hamilton, Chapter 13

Gourieroux and Monfort, Chapters 15-16

Hamilton, J. "State-Space Models," in R. Engle and D. McFadden (eds) *Handbook of Econometrics*, North Holland: Amsterdam, Vol. 4, 3041-80.

6. **Nonstationary Time Series: Introduction**

Hamilton, Chapter 15-16

Banerjee, Chapters 1-2

Gourieroux and Monfort, Chapter 11 and Sections 14.1 and 14.2

7. **Univariate Intergated Processes: Testing for Unit Roots**

Hamilton, Chapter 17

Banerjee, Chapter 3-4

Gourieroux and Monfort, Section 14.3

8. **Cointegrated Time Series and Common Trends**

Harvey, Chapter 7, Sections 7.6-7.7

Hamilton, Chapter 18-20

Banerjee, Chapters 5-8

Gourieroux and Monfort, Section 14.5

9. **Nonlinear Models, Conditional Heteroscedasticity and Structural Breaks**

Harvey, Chapter 8

Hamilton, Chapter 21-22

Engel, R.F., "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation," *Econometrica*, July 1982.

Terasvirta, T., Tjostheim, D. Granger, C. "Aspects of Modelling Nonlinear Time Series," in R. Engle and D. McFadden (eds) *Handbook of Econometrics*, North Holland: Amsterdam, Vol. 4, 2919-57.

Bollerslev, T., Engle, R., Nelson, D. "ARCH Models," in R. Engle and D. McFadden (eds) *Handbook of Econometrics*, North Holland: Amsterdam, Vol. 4, 2961-3038.