Econometric Theory II: NonLinear Models
EC 828
Spring 1998

Professor Bruce Hansen
Course Time: WF 10:30-11:45, Carney 11
Office Hours: T 10:30-12:00
Office: Carney 127
phone: 552-3678
email: bruce.hansen@bc.edu

This course is intended for advanced (2nd year) graduate students in economics. The design is to give a foundation for modern econometric theory. Prerequisites are ECO 727 and 728.

Grades for the course will be based on assignments (40%) and final (60%). The assignments will be a mix of theory and application. The applications will require some computer programming in the GAUSS language. GAUSS is available on the economics department FM-RISC computer (UNIX).

The book whose material most closely matches the subject matter of the course is

Russell Davidson and James MacKinnon, (1993) *Estimation and Inference in Econometrics*, Oxford University Press.

For the central asymptotic theory, the following books are very useful:

Amemiya, Takeshi, (1985) *Advanced Econometrics*, Harvard University Press.

Gallant, A. Ronald and Halbert White, (1988) *A Unified Theory of Estimation and Inference for Nonlinear Dynamic Models*, Basil Blackwell.

White, Halbert (1984) *Asymptotic Theory for Econometricians*, Academic Press.

The following syllabus outlines the subject matter for the course.

Recommended readings are starred (*).

1: Asymptotic Theory and Linear Models

Amemiya, chapter 3.

Andrews (1988) "Laws of large numbers for dependent non-identically distributed random variables," *Econometric Theory*, 458-467.

* Davidson and MacKinnon, Chapter 4

MacKinnon and White (1985) "Some heteroskedasticity consistent covariance matrix estimators with improved finite sample properties," *Journal of Econometrics*, 53-70.

* White (1980) "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity," *Econometrica*, 48, 817-838.

* White (1984)

2: The Bootstrap

Efron, B. (1982) *The Jackknife, the Bootstrap and Other Resampling Plans*, SIAM.

* Efron (1985) "Bootstrap confidence intervals for a class of parametric problems, *Biometrika*, 72, 45-58.

* Efron and Gong (1983) "A leisurely look at the bootstrap, the jackknife and cross-validation," *The American Statistician*, 37, 36-48.

• Efron and Tibshirani (1986) "Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy," *Statistical Science*, 1, 54-77.

Efron and Tibshirani (1993) *An Introduction to the Bootstrap*

Peter Hall (1992) *The Bootstrap and Edgeworth Expansion*

3: Non-Linear Models

3.1 Maximum Likelihood Estimation

Davidson and MacKinnon, Chapters 8, 9

3.2 Non-Linear Optimization

Quant (1983) "Computation problems and methods," Chapter 12 in *Handbook of Econometrics*, vol I.

3.3 Asymptotic Theory

* Amemiya, chapter 4.

Amemiya (1983) "Non-linear regression models," Chapter 6 in *Handbook of Econometrics*, vol I.

* Davidson and MacKinnon, Chapters 4, 5.

Gallant and White (1988)

3.4 Non-Linear Least Squares

Davidson and MacKinnon, Chapters 2, 3, 4, 5.

3.5 Quasi-MLE

Gourieroux, C., A. Monfort, and A. Trognon (1984) "Pseudo-maximum likelihood methods: theory," *Econometrica*, 52, 681-700.

* White (1982) "Maximum likelihood estimation of misspecified models," *Econometrica*, 50, 1-26.

3.6 Least Absolute Deviations

* Bassett and Koenker (1978) "Asymptotic theory of least absolute error regression," *Journal of the American Statistical Association*, 83, 618-622.

Pollard (1991) "Asymptotics for least absolute deviation regression estimators," *Econometric Theory*, 7, 186-199.

Weiss (1991) "Estimating nonlinear dynamic models using least absolute error estimation," *Econometric Theory*, 7, 46-68.

3.7 Generalized Method of Moments

* Davidson and MacKinnon, Chapter 17.

* Hansen, L. (1982) "Large sample properties of generalized method of moments estimators," *Econometrica*, 50, 1029-1054.

* Hansen, L. and Singleton (1982) "Generalized instrumental variables estimators of nonlinear rational expectations models," *Econometrica,* 50, 1269-1286.

Sargan (1958) "The estimation of economic relationships using instrumental variables," *Econometrica,* 26, 393-415.

3.8 Two-Step Estimators

Andrews and Fair (1988) "Inference in non-linear econometric models with structural change" *Review of Economic Studies,* 615-639.

Pagan, *International Economic Review* (1984): "Econometric issues in the analysis of regressions with generated regressors," p. 221-247.

* Pagan, *Review of Economic Studies* (1986): "Two stage and related estimators and their applications," p. 517-538.

4: Testing

4.1 Classical Tests: Wald, LR and LM

Breusch and Pagan, *Review of Economic Studies* (1979): "The Lagrange multiplier test and its applications to model specification in econometrics," p. 239-253.

* Engle (1983) "Wald, likelihood ratio and Lagrange multiplier tests in econometrics", Chapter 13 in *Handbook of Econometrics*, volume 2.

* Davidson and MacKinnon, Chapters 11, 12,13.

4.2 Hausman Tests

* Hausman (1978) "Specification tests in econometrics," *Econometrica*, 46, 1251-1271.

4.3 Conditional Moment Tests

Newey, *Econometrica* (1985): "Maximum likelihood specification testing and conditional moment tests," p. 1047-1070.

* Newey, *Journal of Econometrics* (1985): "Generalized method of moments specification testing," p. 229-256.

Tauchen (1985) "Diagnostic testing and evaluation of maximum likelihood models," *Journal of Econometrics*, 30, 415-443.

4.4 Chi-Square Tests

Andrews, *Journal of Econometrics* (1988): "Chi-Square diagnostic tests for econometric models: Introduction and applications," p. 135-156.

Andrews, *Econometrica* (1988): "hi-Square diagnostic tests for econometric models: Theory," p. 1419-1453.

* Heckman, *Econometrica* (1984): "The ^{2} goodness of fit statistic for models with parameters estimated from microdata," p. 1543-1547.