NATIONAL TAIWAN UNIVERSITY

Department of Finance

ECONOMETRIC THEORY I

and

Departments of Economics and International Business

ECONOMETRIC THEORY III

Prof. C.-M. Kuan **Fall 2010**
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This is the first course in econometric theory for Ph.D. students; well prepared Master students are also welcome to take this course. This course requires knowledge of probability theory, multivariate statistics, and linear (matrix) algebra; econometrics at master level is *not* a prerequisite, however. In this course, I will follow my own lecture notes, with some textbooks assigned as complementary reading. Unlike most econometrics textbooks that are organized according to *models*, my notes are arranged by *theories* (*methods*), with applications to various models. What I hope is that, by introducing econometric theory in this way, students will learn *how* an econometric method is derived and *why* it works.

The lectures will be in *English*; classroom discussion may be in Mandrin if so desired. Students are also required to be familiar with at least one programming language. A senior student will introduce basic programming in R in the beginning lectures; some basic materials about R installation and introduction can be found in the class website (see below). You may choose to program in matlab or other languages.

Required Reading

R1. Kuan, C.-M., *Introduction to Econometric Theory*, Slides and Notes, available at:
ceiba.ntu.edu.tw/991econometrics (for finance students)
ceiba.ntu.edu.tw/991econometrics3 (for economics and IB students)
homepage.ntu.edu.tw/~ckuan

R2. White, H., *Asymptotic Theory for Econometricians*, revised ed., Academic Press, 1999.

R3. White, H., *Estimation, Inference and Specification Analysis*, Cambridge University Press, 1994.

Supplemental Reading

S1. Davidson, R. and J. G. MacKinnon, *Estimation and Inference in Econometrics*, Oxford University Press, 1993.

S2. Greene, W. H., *Econometric Analysis*, 6th ed., Pearson Prentice Hall, 2008.

S3. Hamilton, J., *Time Series Analysis*, Princeton University Press, 1994.

S4. Kuan, C.-M., *Elements of Matrix Algebra*, Lecture Notes.

Office Hours: Tuesday 4–6 or by appointment (3366.1072)

Course Outline

Part I: Review of Classical and Generalized Least Squares Theory (Chapters 3–4 of R1; S2; S4)

Part II: Asymptotic Least Squares Theory (Chapters 5–7 of R1; R2; R3)

- II.1 Elements of Probability Theory
- II.2 Asymptotic Properties of the OLS Estimator
- II.3 Consistent Estimation of Covariance Matrix
- II.4 Large Sample Tests
- II.5 Autoregression of an $I(1)$ Variable and Unit-Root Tests
- II.6 Tests of Stationarity against $I(1)$
- II.7 Regressions of $I(1)$ Variables and Cointegration

Part III: Nonlinear Least Squares (NLS) Theory (Chapter 8 of R1; S1)

- III.1 Nonlinear specifications
- III.2 NLS estimator
- III.3 Asymptotic properties of the NLS estimator
- III.4 Large sample tests

Part IV: Quasi-Maximum Likelihood (QML) Theory (Chapters 9–10 of R1; R3; S3)

- IV.1 Kullback-Leibler information criterion
- IV.2 Asymptotic properties of the QML estimator
- IV.3 Information matrix equality
- IV.4 Large sample tests – Nested models
- IV.5 Large sample tests – Non-nested models
- IV.7 Applications: ARMA models
- IV.8 Applications: Volatility models

Grading: One midterm (40%), one final (45%), Homework (15%).