Econometrics II

Spring 2008
Jin-Lung Lin

Course: 1 semester, 3 hours per lecture.
Hours: Wed. 4,5,6
Office Hours: Wed. 15:00-17:00, Thu. 400-500pm, Room A406

Human economic behavior is recorded in data and econometrics let us dig out the relationship between people, business and government. Economic theory suggests qualitative relationships among variables but usually does not give clues about the magnitude. For example, the law of demand predicts lower quantity demanded when commodity price rises but say nothing about how much. How big is the impact of the rise in oil price on car sale? Could inflation be contained by raising interest rate? When the stock market crashed, should one buy stock or sit tight? Econometrics analyzes the data and provides full or partial answers to those questions. Sometimes, the findings of empirical analysis might lead to formation of new economic theory.

Econometrics II is the second course in undergraduate econometrics. To emphasize the usefulness and relevance of econometrics, I shall continue convering the rest chapters of the book written by J. Stock and M. Watson.

Textbook

James H. Stock and Mark W. Watson, **Introduction to Econometrics**, 2nd ed. Boston: Addison Wesley, 2007.

Both authors are well-known econometricians especially in time series analysis. I shall follow closely this book with possibly some supplements. The textbook contains five parts. The first part introduces econometrics and reviews probability and statistics. Fundamentals of regression analysis, the backbone of this course, is given in part 2. Part 3 deals with further topics in regression analysis. Regression analysis of economic time series data is given in part 4 while the econometric theory of regression analysis is treated in part 5.

One can never really master econometrics without getting his/her hand dirty. Real data using some statistic or statistic package is considered as an essential part of this course. For this, I shall teach and ask students to learn and use *R*, a powerful statistical and yet free package. It can be downloaded from

http://www.r-project.org.

A good free book on R:

John Verzani (2002), Simple R

PDF and a browsable HTML version files are available at
www.r-project.org and *http://wiener.math.csi.cuny.edu/Statistics/R/simpleR/*

I shall give empirical data analysis during the lecturing and give computer-related home work. Finally, causal analysis among economic variables lies in the heart of economic analysis and regression analysis has become the most popular tool for economists and econometricians. Hopefully, this course would equip you with the ability to *read* the data and open the window of a wonderful and exciting world for you.

Course evaluation: midterm (30%), final (40%), homework and class attendance (30%).

1 Topics for Econometrics II

1. Assessing studies based on multiple regression (chap. 9)
   2 lectures

2. Regression with panel data (chap. 10)
   2 lectures

3. Regression with binary dependent variable (chap. 11)
   two lectures

4. Instrumental variables regression (chap. 12)
   2 lectures

5. Introduction to time series regression and forecasting (chap. 14)
   2 lectures

6. Estimation of dynamic causal effects (chap. 15)
   2 lectures

7. Additional topics in times eries regerssion (chap 16).
   2 lectures

8. Econometric theory of regression analysis (chap. 17)
   2 lectures

9. Theory of multiple regression (chap 18)
   2 lectures

2 A Brief Guide to R

2.1 What is R?

- R is a objected-oriented language and environment for statistical computing and graphics.
- R is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories by John Chambers and colleagues.
- R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R.
- R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, ...) and graphical techniques, and is highly extensible. The S language is often the vehicle of choice for research in statistical methodology, and R provides an Open Source route to participation in that activity.

2.2 Why using R?

- R is free (GNU) with source codes.
- R runs on a wide variety of UNIX platforms and similar systems (including FreeBSD and Linux), Windows and MacOS.
- R is fast and can embed the Fortran or C compiler codes easily.
- R is actively maintained by the core team and the applications accumulate at an amazing fast rates, including all possible topics in econometrics, statistics and other fields.
- R can produce publication-quality plots including mathematical symbols and formulae where needed and the user retains full control.

2.3 Available econometric packages in R

Contributed Packages Mentioned in this Paper and Why

(indicates package is included by default)*

bayesm	Bayesian statistics for marketing analysis. Many useful codes on Gibbs and MCMC
car	Regression tests and robust standard errors
sem	Two stage least squares
MASS	Robust regression, ordered logit/probit
lmtest	Breusch-Pagan and Breusch-Godfrey tests
sandwich (and zoo)	Heteroskedasticity and autocorrelation robust covariance
tseries	Garch, ARIMA, and other time series functions
MNP	Multinomial probit via MCMC
Hmisc	LaTeX export
xtable	Alternative LaTeX export
systemfit	SUR and 2SLS on systems of equations
fracdiff	Fractionally integrated ARIMA models
survival	Tobit and censored regression
nlme	Nonlinear fixed and random effects models
nnet	Multinomial logit/probit
pls	Partial least squares, principal component regression
ts*	Time series manipulation functions
nls*	Nonlinear least squares
foreign*	Loading and saving data from other programs
urca	unit root and cointegration analysis
MCMCpack	Collected packages for MCMC
dse	synamic system estimation, State space, Kalman Filter, multivariate time series.
spatial	spatial statistics
zoo	required in order to have the sandwich package

2.4 Rmetrics:rare free lunch for financial economists

- Rmetrics is the premier open source solution for financial market analysis and valuation of financial instruments and is embedded in R.
- Included packages
  - fBasics - Markets, Basic Statistics, Date and Time,
  - fCalendar - management of dates, time, and calendars.
  - fSeries - The Dynamical Process Behind Financial Markets,
  - fMultivar - deals mainly with multivariate aspects of time series analysis including neural network modelling with feedforward networks.
  - fExtremes - Beyond the Sample, Dealing with Extreme Values,
  - fOptions - The Valuation of Options.
  - fBonds
  - fPortfolio.