The aim of this course is to introduce you to the modern time-series techniques that are widely used in applied economics and finance. The emphasis will be on understanding the issues involved in modelling with unit roots, cointegration, GARCH, time-varying parameters, etc and being able to apply the techniques in practice. The course will be quite technical, but it will not be a rigorous, proof-oriented, econometric theory course.

The mid-term exam will account for 40% of your final grade, computer assignments for 10%, and your applied econometric project for 40%. Your project should go beyond the material covered in the course, e.g. different applied topics, different econometric techniques etc. To ensure your project is appropriate, you should submit a one or two page proposal before Tuesday September 16. This should cover (a) The question you are going to address; (b) the data you are going to use; (c) the relevant economic model; (d) The econometric techniques you will employ.

Texts.

W. Enders, Applied Econometric Time Series, Wiley 1995, covers much of the material in the course, although my presentation will be rather different. I have not given specific references in the outline, you should read it along with the course and if you have difficulties bring them up in class. Read the first chapter on difference equations immediately.

W Greene, Econometric Analysis, (3rd Edition), Prentice Hall 1997, covers some of the material of the course in chapters 17 and 18. He provides a lot of the standard econometric results that I will use that are not given in Enders. I will give references to Greene in the lectures, when I discuss these results. Whereas Enders treats the new techniques as largely displacing the old, Greene brings out the links to more traditional techniques. I will also emphasise the links.

This area is moving very fast and some of the material I will cover is not in either Enders or Greene. In fact, because of publication lags the techniques are often implemented in statistical programs before they get published in journals.

Other useful references are:


James Hamilton, Time Series Analysis, Princteon, Princeton University Press, 1994. This is the standard reference for the econometric foundations for this area.

Handbook of Econometrics, Vol 4, Amsterdam: North Holland. Chapter 46: James Stock, "Unit roots, structural breaks and trends" and Chapter 47: Mark Watson: Vector Autoregression and Cointegration" are authoritative surveys of this area.
The appropriate approach in this area remains controversial and the areas of dispute are brought out in the papers by Pesaran, Harvey and Granger in the Controversies Section of the March 1997 Economic Journal. I will illustrate the issues using applied examples, mainly from international macro/finance. Classic papers using these techniques are:


Outline.

A. Overview and applications.

B. Review of estimation and testing procedures.
   (1) The general linear regression model and maximum likelihood estimation.
   (2) Wald, Lagrange Multiplier and Likelihood Ratio tests; Model selection criteria.
   (3) Identification, simultaneity, Instrumental Variables and Exogeneity (Strict, predetermined, weak, strong and super).

C. Univariate Stochastic Processes.
   Stationarity, lag operators. Processes: white noise, random walk, autoregressive (AR), moving average (MA), ARMA. Integrated processes, ARIMA, deterministic and stochastic trends; testing for the order or integration.

D. Multivariate Stochastic processes.
   Spurious regressions. Great ratios, cointegration with a single cointegrating vector (CV), the Engle-Granger estimators; error correction models (ECM).
   VARS (vector AR) and Granger causality. Cointegration with multiple CVs: implication for VAR and VECM (vector ECM). Testing for the number of CVs, the Johansen procedure, estimation and identification of CVs. Exogeneity, VAR and ARDL (AR Distributed Lag) representations.

E. Impulse response functions, VMA (vector MA) representation, variance decomosition, structural VARs with covariance restrictions; relation to the simultaneous equation model.

F. Non-normality and non-linearity. Other distributions, Markov switching models, smooth transition ARs.

G. Time varying volatility, ARCH GARCH etc.

H. Time varying parameters, testing for structural change and the Lucas Critique.