March - April 2023

ECON 703: Advanced Research Topics:
Time Series Econometrics: Module 3

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Purpose

This course forms module #3 of a multi-module sequence of 5 courses taught over successive years that cover topics in Time Series, Panel Econometrics, and Nonparametric Regression with Applications. Each module includes a selection of topics in time series, panel, and stochastic process econometrics that are suited to Ph.D students advancing in any area of econometrics or financial econometrics. Modules #1 and #2 were taught in the last two years and are not pre-requisites for Module #3. Material covered in Modules #1-2 that is needed for Module #3 will be reviewed in the first lecture of Module #3 and as required later.

The sessions outlined below include opening review material and topics intended for module #3. The list is only approximate, not all topics will be covered, and more time will be spent on some topics than others. No text is assigned. References will be given in class. A take home examination is used for assessment, with the option of an applied paper or scientific overview of a field of current interest in econometrics.

Outline Topics

1. **Review: including material from Modules #1-2**
    a. Probability spaces, projections in function spaces, ergodic theory, various regression applications and limit theory in time series, panels, and simple nonparametric regression
    b. Orthonormal representations in L_2, Brownian motion and diffusions
    c. Weak convergence in function spaces with functional limit theory applications to unit root processes and local to unity processes

2. **Stochastic integration and applications**
    a. Special cases, Wiener integration, Ito integration
    b. Quadratic variation, empirical quadratic variation and associated limit theory
    c. Applications, including to exchange rate regimes and target zones with nonlinear autoregression

3. **Multivariate systems, cointegration, multi-cointegration**
    a. General representations and multivariate tests
    b. Related continuous time systems
    c. Estimation theory: FM-OLS, IM-OLS, TIV regressions
    d. Spurious regression limit theory including nonparametric spurious regression
    e. Multi-cointegrated systems, TIV estimation and inference