Econ. 553a
Yale University

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Econometrics IV: Time Series Econometrics

Take Home Examination

Answer ONE Question: Any reference material allowed.
Time Allowed: Six weeks
Due Date & Time: Friday 26 January 2007.
Electronic Filing: Submit your papers by email to peter.phillips@yale.edu

Question A (Unit Root Model Selection)

Part 1: In the simple autoregression

$$X_t = \theta X_{t-1} + u_t \quad (1)$$
$$u_t \equiv iid\ N\left(0, \sigma^2\right), \quad X_0 = 0, \quad (2)$$

it is proposed to test for the presence of a unit autoregressive root ($\theta = 1$) against stationary alternatives ($|\theta| < 1$) by using model selection methods. The following information criteria are considered: PIC, BIC, HQ (Hannan Quinn), and AIC.

1. Which of the criteria (PIC, BIC, HQ and AIC) provide consistent model selection choices as $n \to \infty$.

2. What minimal penalty is needed to ensure consistency in such information criteria?

3. Suppose an investigator uses the above model and criteria to assess evidence for the presence of a unit root in X_t when the true generating mechanism for X_t has innovations with time varying volatility of the form $u_t = g\left(\frac{t}{n}\right)\varepsilon_t$, with $\varepsilon_t \equiv iid\ N\left(0, \sigma^2\right)$ and where $g(r)$ is a deterministic continuously differentiable function for $r \in [0, 1]$. How are your conclusions in parts 1 and 2 affected by the presence of this misspecification?

4. Perform a simulation experiment to show the performance of the criteria in finite samples. Discuss your findings.

Question B (Your Own Empirical Project)

Choose your own empirical project. Carry out an empirical application of time series or panel econometric methods. Write up your project as a scientific paper, paying attention to the quality of your presentation, including graphics of the data and results as necessary. Be sure to provide a full discussion of the methods being used and indicate limitations of the approach you are using wherever you think it is appropriate.