PhD Course: Fractional Time Series Models

Course Description:

The course covers a selection of major statistical and econometric work on fractional time series models – possibly with a slight bias towards my own work. Topics covered include definitions and properties of fractional time series models, e.g., the ARFIMA model, fractional Brownian motion, parametric and semiparametric estimation, fractional unit roots, fractional cointegration, and the fractionally cointegrated VAR model. Both time domain and frequency domain methods will be covered. If time permits, applications and examples in economics and finance will also be discussed briefly. The course covers only a small fraction of the vast literature on fractional time series models, and the references given below are by no means exhaustive.

Pre-requisites:

It is assumed that students have a probability/statistics/econometrics background at a level equivalent to a North American first year PhD sequence as well as a basic background in time series analysis including some unit root and cointegration analysis. Standard asymptotic theory (laws of large numbers, central limit theorems, etc.) as well as both frequency domain and time domain methods are used throughout the course.

Course Outline:

Day 1  
9:30 – 12:00 Lecture 1
12:00 – 1:00 Lunch
1:00 – 3:30 Lecture 2

Day 2  
9:30 – 12:00 Lecture 3
12:00 – 1:00 Lunch
1:00 – 3:30 Lecture 4

Specific topics and reading list (PRELIMINARY and likely to change):
(items in bold are most closely related to the material covered in class)

1. Lecture 1: Fractional integration and long memory – introduction and semiparametric methods.

Survey papers: Baillie (1996) and Robinson (2003), henceforth BR.

(a) Introduction, definitions, and properties: BR.
(b) ARFIMA processes: BR.
(c) Asymptotics and the fractional Brownian motion: BR.

2. Lecture 2: Fractional integration and long memory – parametric methods.


(a) Definitions.

(b) Non-parametric analysis of fractional cointegration: Nielsen (2010).

(c) Spectral analysis of fractional cointegration: Velasco (2003) and Nielsen (2004b).


4. Lecture 4: Fractional cointegration – parametric methods and applications.

(a) Selected parametric estimation and testing methods: Cheung & Lai (1993), Dueker & Startz (1998), and Breitung & Hassler (2002).


References


Nielsen, M. Ø. & Morin, L. (2012), ‘FCVARmodel.m: a Matlab software package for estimation and testing in the fractionally cointegrated VAR model’. QED working paper 1273, Queen’s University.


