The content of the course in Advanced Econometrics will be discussed with the students and adjusted to their needs during the first lecture. A possible topic is the following, which is in line with the SOFIE Summer School 2016.

Non causal processes with applications to bubbles modelling and impulse response functions

Objective

A recent statistical and econometric literature highlights the importance of mixed causal/noncausal ARMA processes for the modeling of macroeconomic and financial time series. Indeed the nonlinear causal dynamic of such processes can capture unit roots, asymmetric cycles, and bubbles features.
The objective of this lecture is to present the notions and concepts of the literature on noncausal processes and to explain how they can be used for the modeling and analysis of speculative bubbles. The focus will be both on the modelling and statistical aspects.

Outline

- **Noncausal ARMA processes** Review on nonlinear processes, conditions for the existence and uniqueness of an infinite moving average representation when innovations have fat tails, interpretation of trajectories as random linear combinations of deterministic paths and the creation of bubbles.
- **Noncausal AR(1)** Process with stable errors Properties of errors with stable distributions, stationary distribution of the noncausal AR(1) process, analysis of its conditional moments, aggregation of noncausal processes. Estimation and validity checks.
- **State-space Representation of Noncausal Processes** The causal and noncausal "innovations" of a mixed one-dimensional process, the state space representation, application to maximum likelihood estimation, prediction and filtering, extension to mixed VAR(1) process. Application to the exchange rates, prediction of future bubbles and of bubble crash.
- **Test procedures** Standard tests for unit root and random walk hypotheses, behavior of these testing procedures for a noncausal Cauchy process, stationary versus nonstationary martingales, robust tests of the martingale hypothesis.
- **Modelling speculative bubbles** The modeling of speculative bubbles in the economic literature. The role of martingales in linear rational expectation models, the multiplicity of solutions in a RE model, how to construct the impulse response functions.

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