Hamilton Institute

Multivariable zero-free transfer functions and spectra, and their application in economic modelling

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Abstract:
Central banks and funds investment managers work with mathematical models. In recent years, a new class of model has come into prominence - generalized dynamic factor models. These are characterized by having a modest number of inputs, corresponding to key economic variables and industry-sector-wide variables for central banks and funds managers respectively, and a large number of outputs, economic time series data or individual stock price movements for example. It is common to postulate that the input variables are linked to the output variables by a finite-dimensional linear time-invariant discrete-time dynamic model, the outputs of which are corrupted by noise to yield the measured data. The key problems faced by central banks or funds managers are model fitting given the output data (but not the input data), and using the model for prediction purposes.

These are essentially tasks usually considered by those practicing identification and time series modelling. Nevertheless there is considerable underlying linear system theory. This flows from the fact that the underlying transfer function matrix is tall.This presentation will describe a number of consequences of this seemingly trivial fact. For example, a tall transfer function of known McMillan degree but otherwise generic has no zeros, finite or infinite. A finite sequence of output data in the discrete time case allows recovery of a finite sequence of input data, without knowledge of the initial state. Canonical state-variable forms take on a special structure, with the number of real parameters growing linearly with the number of outputs, rather than, as usual, quadratically. And given knowledge of a spectrum of a process obtained by passing white noise through such a system, the system can generically be recovered by a finite number of rational calculations from the spectrum, to within an inessential constant matrix multiplier.

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Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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