Commemoration Day
In Honour of Professor Maurice Priestley 1933-2013

18th December 2013

Programme

Venue: Frank Adams Rooms, Alan Turing Building (opposite Citroën dealer), Upper Brook Street, University of Manchester, Manchester M13 9PL.

09:30–11:00 Coffee on the Atrium Bridge

Opening session

10:00–10:20 Unveiling of Professor Priestley's Portrait by **Peter Duck**, *Head of the School of Mathematics*. **Venue for this session only:** Maurice Priestley Room (G.108 on the ground floor).

Brief Talks by Colleagues of Maurice Priestley

10:20–11:00 **T. Subba Rao**, *University of Manchester*

Patrick Laycock, *University of Manchester*.

Session I

Chair: Richard Chandler, UCL, London

11:00–12:00 **Granville Tunnicliffe Wilson** *Continuous Time Spectral Analysis for Systems Response Estimation*

Peter Young *The Direct Estimation of Continuous-Time Models From Sampled Data*

Tony Lawrance *ARMA and GARCH Connections*

Session II

Chair: P.J. Laycock, University of Manchester

12:00–13:00 **Jingsong Yuan** *The Bartlett-Priestley Window*

Valderio Anselmo Reisen *On robust estimation of the spectral density of the stationary process based on M-estimators*

Richard Chandler *Inference without likelihoods*

13:00–14:00 Lunch Break

Session III

Chair: Granville Tunnicliffe Wilson, University of Lancaster

14:00- 15:30 **Guy Nason** *Nonstationary Time Series, Priestley's Evolutionary Spectra and Wavelets*

Andrew Harvey *Heavy tails and conditional volatility*

Peter M Robinson *On Non-parametric function fitting*

15:30–16:00 Tea Break

Session IV

Chair: A.J. Lawrance, University of Warwick

16:00–17:00 **R. J. Bhansali** *Rational spectral density function models for spatial data*

Jens-Peter Kreiss *Bootstrap Method in Time Series*

17:00–18:00 Wine Reception

Abstracts

Rational spectral density function models for spatial data.

R. J. Bhansali, University of Liverpool and Imperial College, London

TBA

Inference without likelihoods

Richard Chandler, UCL, London

The concept of likelihood is fundamental to much of modern statistical inference. However, there are situations where one may be unable or unwilling to formulate a likelihood function. The theory of estimating functions (EFs) provides an alternative inference framework in such settings. Although this theory is perhaps well known as 'folklore' within the statistical community, it is often overlooked in both applied and theoretical work: much of the statistical literature on EFs is focused primarily on optimality in specific settings, whereas the corresponding body of econometrics literature (under the guise of the generalized method of moments or GMM) tends to focus on regression-type models. In this talk I will provide a brief overview of the area, focusing on the potential for inference in generic applied settings. In recognition of Maurice Priestley's lifelong interest in spectral analysis, I will also discuss the application of the theory to study the properties of the Whittle likelihood estimator, highlighting in particular the ability to carry out inference without calculating the (often intractable) fourth-order properties of a process. The theory will be illustrated using a class of stochastic rainfall models based on clustered point processes, for which Whittle and GMM estimators will be compared.
This is joint work with Joao Jesus.
Reference: Jesus, J. and R.E. Chandler (2011). Estimating functions and the generalized method of moments. *Interface Focus*, 1(6), 871-885, DOI.

Heavy tails and conditional volatility

Andrew Harvey, Faculty of Economics, Cambridge University

Dynamic Conditional Score (DCS) models provide a uni.ed framework for constructing nonlinear time series models that can deal with dynamic dis- tributions. The emphasis is on models in which the conditional distribution of an observation may be heavy-tailed and the location and/or scale changes over time. In a multivariate context, correlation may change over time and, more generally, the parameters of a copula may change. The de.ning feature of DCS models is that the dynamics are driven by the score of the conditional distribution. When a suitable link function is employed for the changing pa- rameter, analytic expressions may be derived for unconditional moments, autocorrelations and moments of multi-step forecasts. Furthermore a full asymptotic distribution theory for maximum likelihood estimators can be developed, including analytic expressions for asymptotic covariance matrices of the estimators.
The talk in Manchester will give an introduction to DCS models. Further details, including a link to the new CUP monograph on the topic, can be found on the website `http://www.econ.cam.ac.uk/DCS`.

Bootstrap Method in Time Series

Jens-Peter Kreiss, Institut für Mathematische Stochastik, TU Braunschweig

Bootstrap methods for stationary and locally stationary processes will be reviewed and discussed. Especially it will be focused on bootstrap methods which combine a time domain (wild) bootstrap approach with a nonparametric frequency domain approach. These methods generate pseudo-time series which mimic (asymptotically) correctly the (local) second and to the necessary extent the fourth order moment structure of the underlying process. It will be discussed to what kind of statistics such resampling proposals successfully can be applied.

ARMA and GARCH Connections

Tony Lawrance, University of Warwick

I can say that the main drivers of my time series interest, starting just after my first seminar (Manchester, February 1970) on point processes, have been around ARMA and GARCH processes. This talk will briefly examine the previously noted connections between the two and make them a little more explicit, with comments on their usefulness in constructing predictors of volatility for GARCH processes.

Nonstationary Time Series, Priestley's Evolutionary Spectra and Wavelets

Guy Nason, School of Mathematics, University of Bristol

Maurice Priestley was a giant of statistics and time series analysis. He made fundamental contributions of extraordinary depth touching almost every facet of the subject. Like many time series analysts he knew how to forecast and, in particular, he knew how to forecast the future of time series as a discipline. This talk gives an overview of some of Priestley's contributions to nonstationary time series and indicates how his predictions are being realized by recent developments in (stochastic) applied computational harmonic analysis. To illustrate this, we exhibit some recent stationarity tests based on wavelets and wavelet packets that provide powerful alternatives to Fourier-based tests, which themselves can be traced back to pioneering work by Priestley and Subba Rao.

On robust estimation of the spectral density of the stationary process based on M-estimators

Valderio Anselmo Reisen, UFES, Vittoria, Brazil

This paper proposes a robust periodogram for the spectral density function of the stationary long-memory processes contaminated with additive outliers. The robust estimator is based on the M-estimators of the parameters in spectral representation of a stationary process. The asymptotic properties of the estimator are studied with different loss functions and the empirical examples illustrate the performance of the estimator.

On Non-parametric function fitting

Peter M Robinson, LSE, London

We discuss Maurice Priestley's 1972 paper with Chao, and developments in nonparametric time series more broadly.

Continuous Time Spectral Analysis for Systems Response Estimation

Granville Tunnicliffe Wilson, University of Lancaster

Time series that are recorded continuously - or in practice at a very high frequency - are generally processed as discrete series after sub-sampling at a lower frequency. An alternative is to represent the continuous series in terms of a discrete basis of past and future observations. This gives rise to a discrete series with a spectrum derived from that of the continuous series by a frequency warp. We show how a smoothed estimate of this spectrum may be derived and factorized to estimate the impulse response of the continuous time system. The method is applied to estimate the response of the blood oxygen level of a pre-term infant to an increase in respiration rate, from 10 Hz monitoring data.

The Direct Estimation of Continuous-Time Models From Sampled Data

Peter Young

Although dynamic systems in the physical world are most often described in the continuous-time (CT) domain by ordinary or partial differential equations, most statistical estimation procedures have been based on discrete-time models, without much concern for the merits of natural continuous-time model descriptions and their direct estimation from sampled data. Amongst their numerous advantages, CT models: provide good physical insight into the system properties; preserve a priori knowledge about the nature of the physical system and identify more parsimonious models; are defined by a unique set of parameter values that are not dependent on the sampling period; can easily handle fast or non-uniformly sampled data; and can cope easily with 'stiff' systems (i.e. systems with eigenvalues and associated time constants that have very different orders of magnitude). This brief presentation will outline the main features of the 'hybrid' Box-Jenkins model and the Refined Instrumental variable method for optimally estimating the parameters in this model by iterative, maximum likelihood optimization based on a pseudo-linear regression model. An environmental example will demonstrate the advantages of this methodology.

The Bartlett-Priestley Window

Jingsong Yuan, University of Manchester

Among Professor Priestley's early work is spectral estimation by smoothing the periodogram with a window. The Bartlett-Priestley window has been generalised to 2-D and higher dimensions. This talk will pay tribute to Professor Priestley by showing the optimality of the Bartlett-Priestley window.