FRACTIONALLY INTEGRATED ARMA PROCESSES WITH CONTINUOUS PARAMETER

PETER BROCKWELL (speaker) Colorado State University, USA,
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A class of zero-mean fractionally integrated Lévy-driven CARMA processes is defined by convoluting the continuous-time ARMA kernel with a kernel corresponding to Riemann-Liouville fractional integration, and explicit expressions are derived for the kernel and autocovariance functions of these processes. They are long-memory in the sense that their kernel and autocovariance functions decay asymptotically at hyperbolic rates, depending on the order of fractional integration. Comparisons are made with discrete-time fractionally integrated ARMAQ processes. In order to introduce long-memory into non-negative Lévy driven CARMA processes, which can be used as long-memory models for volatility, we replace the fractional integration kernel with a closely related absolutely integrable kernel. This gives a class of stationary non-negative continuous-time Lévy driven processes whose autocovariance functions at lag $h$ also converge to zero at asymptotically hyperbolic rates.

RECURSIVE ESTIMATION OF SMOOTHLY TIME-VARYING AUTOREGRESSIVE PROCESSES

FRANCOIS ROUEFF (speaker) Télécom Paris, France

First we slightly revisit the definition of locally stationary time-varying autoregressive (TVAR) processes introduced by Rainer Dahlhaus. The AR parameters are equispaced samples of a multivariate function $\theta(t)$ defined over $t \in [0, 1]$. Standard assumptions on $\theta$ are imposed so that the parameters evolve smoothly along time. In contrast to the usual spectral approach, we use Markovian techniques for treating the stability issue.

Then we address the problem of estimating the unknown $\theta$ from an observed trajectory of a TVAR process in a classical non-parametric estimation framework. We will discuss the benefits of this framework in the context of recursive estimation through the particular case of the normalized least mean square estimator that we studied with Eric Moulines (Télécom Paris) and Pierre Priouret (Université Paris 6).
LONG MEMORY POINT PROCESSES
PHILIPPE SOULIER (speaker) Paris X, France

We recall the definitions and results of Daley et al. (2000) on long memory or long range dependent point processes, and give new examples of long memory processes. We present examples of Wold processes which are long range count and/or interval dependent. We conjecture a general result on the Hurst index of Wold processes.

BOOTSTRAP SPECIFICATION TESTS FOR LINEAR COVARIANCE STATIONARY PROCESSES
JENS-PETER KREISS (speaker) TU Braunschweig, Germany, JAVIER HIDALGO London School of Economics, UK

This paper discusses goodness-of-fit tests for linear covariance stationary processes based on the empirical spectral distribution function. We show that the limits of the tests are functionals of Gaussian processes, say, $\tilde{B}(\vartheta)$ with $\vartheta \in [0,1]$. Since, in general, it is not easy, if at all possible, to find a time deformation $g(\vartheta)$ such that $\tilde{B}(g(\vartheta))$ is a Brownian (bridge) process, tests based on $\tilde{B}(\vartheta)$ will have limited value for the purpose of statistical inference. To circumvent the mentioned problem, we propose to bootstrap the test showing its validity. We also provide a Monte-Carlo experiment to examine the finite sample behaviour of the bootstrap.

DOUKHAN’S CONCEPT OF WEAK DEPENDENCE – EXAMPLES AND BASIC TOOLS
MICHAEL NEUMANN (speaker) TU Braunschweig, Germany

Mixing conditions are the classical tool for restricting the dependence between time series data. It turns out, however, that some processes of interest in statistics do not fulfill such conditions.

Doukhan and Louhichi (1999) introduced an alternative concept of weak dependence which is more general than mixing and also includes important classes of processes which are not mixing. We give some examples and discuss some recent results such as a central limit theorem for triangular schemes and exponential inequalities. The talk is based on joint work with E. Paparoditis (University of Cyprus) and R. Kallabis (TU Braunschweig).
STATIONARITY OF GENERALISED ORNSTEIN-UHLENBECK PROCESSES

ALEXANDER LINDNER (speaker) TU München, Germany

Let \((\xi_t, \eta_t)\) be a bivariate Lévy process. Then the generalised Ornstein-Uhlenbeck process \((V_t)\) as defined by Carmona, Petit and Yor is given by

\[
V_t := e^{-\xi_t} V_0 + e^{-\xi_t} \int_0^t e^{\xi_s - \eta_s} d\eta_s.
\]

If \(\xi_t = t\) and \(\eta\) is a subordinator, this gives rise to the stochastic volatility model of Barndorff-Nielsen and Shephard. On the other hand, the volatility of the COGARCH processes of Klüppelberg, Lindner and Maller can be obtained when specialising to \(\eta = t\).

In this talk, we shall characterise when stationary solutions of the generalised Ornstein-Uhlenbeck process exists, describe its autocorrelation function, obtain moment conditions and investigate the tail behaviour of the stationary solution. Some special cases are considered in detail. This is joint work with Ross Maller.

EXTREME VALUE THEORY FOR SPACE-TIME PROCESSES WITH HEAVY-TAILED DISTRIBUTIONS

RICHARD A. DAVIS (speaker) Colorado State University, USA,
THOMAS MIKOSCH University of Copenhagen, Denmark

Many real-life time series often exhibit clusters of outlying observations that cannot be adequately modeled by Gaussian distributions. Heavy-tailed distributions such as the Pareto distribution have proved useful in modeling a wide range of bursty phenomena that occur in areas as diverse as finance, insurance, telecommunications, meteorology, and hydrology. Regular variation provides a convenient and unified background for studying multivariate extremes when heavy tails are present. In this paper, we study the extreme value behavior of space-time processes given by

\[
X_t(s) = \sum_{i=0}^{\infty} \psi_i(s) Z_{t-i}(s),
\]

\(s \in [0, 1]^d\), where \(\{Z_t, t = 0, \pm 1, \pm 2, \ldots\}\) is an iid sequence of random fields on \([0, 1]^d\) with values in the Skorokhod space \(D([0, 1]^d)\) of càdlàg functions equipped with the \(J_1\)-topology. The coefficients \(\psi_i's\) are deterministic continuous real-valued fields on \([0, 1]^d\). The indices \(s\) and \(t\) refer to a measurement taken at location \(s\) at time \(t\). For example \(X_t(s), t = 1, 2, \ldots\), could represent the time series of annual maxima of ozone levels at a location \(s\). The problem of interest is determining the probability that the maximum ozone level over the entire region \([0, 1]^2\) does not exceed a given standard level \(f \in D([0, 1]^2)\) in \(n\) years. By establishing a limit theory for point processes based on \(\{X_t(s), t = 1, \ldots, n\}\), we are able to provide approximations for probabilities of extremal events. The theory builds on earlier results of de Haan and Lin (2001) and Hult and Lindskog (2003) for regular variation on \(D([0, 1]^d)\) and Davis and Resnick (1985) for extremes of linear processes with heavy-tailed noise.