

Preface

The workshop “New Directions in Time Series Analysis” was held at the CIRM in Luminy, France from April 23rd to April 27th, 2001. The purpose of this workshop was to bring together leading and junior researchers in the field of time series.

The main speakers were Peter Bühlmann, Rainer Dahlhaus, Thomas Mikosch and Peter Robinson. Their lectures presented recent developments in nonlinear, nonstationary, strongly dependent or heavy tailed time series.

Several contributed sessions were also organised, and contributors were invited to submit their work to the present special issue of *ESAIM P&S*. The papers that have been gathered here more or less fall into one of the above category.

The papers of Francq and Zakoïan and of Surgailis and Viano illustrate two aspects of nonlinear time series. The former considers Markov switching processes and the latter deals with a broad class of stochastic volatility models. These classes of models have become extremely popular in many fields of applications and in particular in finance.

The paper by Chambaz deals with another kind of nonlinearity and non stationarity: those occurred by structural changes. Chambaz considers the problem of detecting abrupt changes in homogeneous random fields and uses new techniques based on concentration inequalities and penalized contrasts.

Three papers deal with long range dependent (or long memory) time series. Fay and Philippe present a new spectral domain goodness-of-fit test, Ould-Haye studies the empirical process of a seasonal long memory process. The already mentioned paper by Surgailis and Viano offers a deep insight in the dependence structure of some stochastic volatility models and proposes a test of short memory in volatility based on the famous *R/S* statistic. This is very important in view of the vivid debate on the eventual presence of long memory in the volatility of stock returns. As usual in the long range dependence literature, the mathematical tools used in these papers are highly sophisticated. Each of these papers offers a clear treatment of the mathematical difficulties arising in this field.

The papers of Comte and Merlevede and of Matias consider the problem of density estimation in different contexts. Comte and Merlevede apply the recent technique of model selection and adaptive estimation by penalized contrasts to density estimation for discrete time and continuous time stationary time series. The problem is notably more complex than in the i.i.d. case, because of the sophisticated tools used. The results obtained are of the same flavour as in the i.i.d. case. Matias considers the classical problem of density estimation of a noisy signal and semiparametric estimation of the variance of the noise. A very surprising result is obtained: if the dependence structure of the signal is not specified, for instance if i.i.d. sequences are included in the possible choice of models, then the best possible rate of convergence for an estimator of the variance of the noise is logarithmic in the sample size. This result opens the question of what kind of dependence structure in the signal allows estimation of the variance of the noise at a faster rate. This question will certainly trigger further research in time series analysis.

In conclusion I thank all the participants and contributors to the workshop and to this special issue, and the co-organisers Eric Moulines and Rainer von Sachs.

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