COLLOQUIUM

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Strictly stationary ARMA processes

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Abstract

An autoregressive moving average (ARMA) process is a process $\{Y_t : t \in \mathbb{Z}\}$ which satisfies the ARMA equation

$$Y_t - a_1 Y_{t-1} - \ldots - a_p Y_{t-p} = Z_t + b_1 Z_{t-1} + \ldots + b_q Z_{t-q}, \quad t \in \mathbb{Z}.$$

Here, $a_1, \ldots, a_p, b_1, \ldots, b_q$ are complex valued coefficients and $Z = \{Z_t : t \in \mathbb{Z}\}$ is some noise sequence. Much attention has been paid to weakly stationary solutions of this equation when Z is assumed to be weak white noise, i.e. uncorrelated white noise. It is well know that a weakly stationary solution to the ARMA equation exists if and only if the rational function $z \mapsto (1 - a_1 z - \ldots - a_p z^p)^{-1}(1 + b_1 z + \ldots + b_q z^q)$ has only removable singularities on the unit circle. Much less is known about strictly stationary solutions of the ARMA equation when the noise is supposed to be independent and identically distributed, not necessarily with finite variance, as if often observed in financial data. While sufficient conditions are relatively straightforward to obtain, necessary conditions are more difficult as the spectral density argument used for weakly stationary solutions breaks down. In this talk we shall obtain a characterization for the existence of strictly stationary solutions to the ARMA equation. The talk is based on joint work with Peter Brockwell and Bernd Vollenbröker (2010, 2011).