Parameter Estimation of Bilinear Processes using Approximate bayesian computation (ABC)

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Resumo: The class of bilinear models (see [1]) plays an important role in modeling nonlinearity for various reasons, such as the fact that it is an obvious generalization of ARMA models. However, bilinear models are not frequently used in practice due to inference problems. The conditions of stationarity and invertibility cannot be written in terms of the model parameters in an easy form and the likelihood is difficult to handle. Particularly for heavy-tailed data, conditional least squares and quasi-likelihood methods do not seem to give good results. ABC algorithms arise as ways to deal with likelihood functions difficult to handle or even intractable (see [2]). In this framework, establishing an ABC protocol for such nonlinear systems seems to be a good idea. The major challenge is to find a set of statistics capable of representing the nonlinear dynamics of the system. In this work, we suggest seven statistics, namely a portmanteau statistic that captures the linear time dynamics through the empirical autocorrelations, an estimator of the tail index, which quantifies the tail heaviness and the extremal index that measures the degree of clustering of large values. The implemented method is based on the recently proposed method by [3] which used k-nearest neighbor techniques. We apply these strategies to a simple first order bilinear model for different i.i.d. innovation processes.

palavras-chave: Bayesian computation; Bilinear Models.

Referências

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