Asymptotic and pre-asymptotic tail behaviour of a power max-autoregressive model

Marta Ferreira, msferreira@math.uminho.pt

Department of Mathematics of School of Sciences . Campus de Gualtar. University of Minho. 4710-057 Braga Portugal.

Keywords: Markov Chains. Extreme value theory. Stationary sequence. Dependence conditions. Tail index. Extremal index. Tail dependence index. Asymptotic independence.

AMS: 60G70

Abstract

Nowadays we can not ignore the demand of various areas like hydrology, geophysics or finances, on modeling extreme data or exceedance data above certain high levels. The assumption of independent observations gave place to a more realistic statement: the temporal dependence. Phenomenon therein are often associated with markovian sequences for which we claim simple ways of modeling in what concerns the extremes topic, like for instance, *max-autoregressive* processes (Alpuim [1] and Canto e Castro [3]). Here we present a max-autoregressive process involving a power transformation - $ARMAX_p$ - whose parameter $c \in (0,1)$ relates directly with the coefficient of tail dependence (η) of Ledford and Tawn [4]. This index characterizes the penultimate tail dependence of a process and can be related with a threshold-dependent extremal index, which assumes an important role when extending discussions of extreme values from independent and identically distributed (i.i.d.) sequences to stationary ones (Bortot and Tawn, [2]). In this paper, we analyze some asymptotic extremal features, we study the local dependence structure and we state the threshold-dependent extremal index connection with parameter η, for the $ARMAX_p$ process.

References

[1] Alpuim, M.T. (1989). *Contribuições à teoria de extremos em sucessões dependentes.* Ph. D. Thesis, FCUL.

[2] Bortot, P. and Tawn, J. (1998). Models for the extremes of Markov Chains. *Biometrika* **85**, 851-867.

[3] Canto e Castro, L. (1992). *Sobre a Teoria Assintótica de Extremos.* Ph. D. Thesis, FCUL.

[4] Ledford, A. and Tawn, J.A. (1997). Modelling Dependence within joint tail regions. *J. Royal Statist. Soc.Ser. B* **59** 475-499.