

Stochastic Models for Sums and Maxima of iid Exponential Random Variables: Modeling Growth and Decline Episodes

Anna K. Panorska
Department of Mathematics and Statistics
University of Nevada, Reno, Nevada, USA

E-mail : ania@unr.edu

Abstract

We consider the problem of modeling the joint distribution of the duration, maximum and magnitude of stochastic episodes (events). An event is defined as consecutive observations of a process above (or below) a threshold. Examples of events include growth (or decline) periods of a financial series or many hydroclimatic episodes. Let N , X , and Y describe episodes, as their duration (N), magnitude (X) and maximum/peak (Y). We present exact joint distributions of the vectors (N, X) and (N, Y) , where N has a geometric distribution, X is the random sum and Y is the random maximum of N iid exponential random variables. We also present the exact joint distribution of the sum and maximum of exponential random variables (X, Y) , when $N=n$ is non random (deterministic). We illustrate these models using currency exchange and hydroclimatic data.