

Optimal Threshold Determination for the Maximum Product of Spacing Methodology with Ties for Extreme Events

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Abstract

Extreme events are defined as values of the event below or above a certain value called threshold. A well chosen threshold helps to identify the extreme levels. Several methods have been used to determine threshold so as to analyze and model extreme events. One of the most successful methods is the maximum product of spacing (MPS). However, there is a problem encountered while modeling data through this method in that the method breaks down when there is a tie in the exceedances. This study offers a solution to model data even if it contains ties. To do so, an optimal threshold that gives more optimal parameters for extreme events, was determined. The study achieved its main objective by deriving a method that improved MPS method for determining an optimal threshold for extreme values in a data set containing ties, estimated the Generalized Pareto Distribution (GPD) parameters for the optimal threshold derived and compared these GPD parameters with GPD parameters determined through the standard MPS model. The study improved maximum product of spacing method and used Generalized Pareto Distribution (GPD) and Peak over threshold (POT) methods as the basis of identifying extreme values. This study will help the statisticians in different sectors of our economy to model extreme events involving ties. To statisticians, the structure of the extreme levels which exist in the tails of the ordinary distributions is very important in analyzing, predicting and forecasting the likelihood of an occurrence of the extreme event.

Keywords

Extreme Value Theory (EVT), Maximum Product of Spacing MPS, Generalized Pareto Distribution (GPD), Peak Over Threshold (POT)