Living to 100 and Beyond: An Extreme Value Study

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Abstract

Extreme value theory has recently emerged as a newly developed statistical modeling tool for the analysis of extreme observations. This research paper focuses on parametric modeling of mortality rate for the elderly and the oldest population, together with the limiting age.

A classic threshold model is fitted to the data of each year using maximum likelihood methodology, separated by categories of year and sex. Then a model with transformed generalized Pareto distribution is fitted using a hyperbolic transformation, where the limiting age is introduced as a new parameter. The third model, a transformed exponential distribution, fits the data best and has good explanation. Log-likelihood functions for all models are given to find parameter estimations together with their confidence intervals. Last-k-years thresholds are specifically used to do a time series analysis of the limiting age in the 20th century. As a direct application, continuous mortality rates functions above the threshold can be derived from the model.