COMPOUNDED GENERALIZED WEIBULL DISTRIBUTIONS - A UNIFIED APPROACH

Shovan Chowdhury[1]

A unified approach is proposed in this paper to study a family of lifetime distributions of a system consisting of random number of components in series and in parallel. While the lifetimes of the components are assumed to follow generalized (exponentiated) Weibull distribution, a zero-truncated Poisson is assigned to model the random number of components in the system. The resulting family of compounded distributions describes several well-known distributions as well as some new models with some of their statistical and reliability properties. Various ageing classes of life distributions including increasing, decreasing, bath-tub, upside-down-bathtub and roller coaster shaped failure rates are covered by the family of compounded distributions. The simplest algorithm for maximum likelihood method of estimation of the model parameters is discussed. Some numerical results are obtained via Monte-Carlo Simulation. The asymptotic variance-covariance matrices of the estimators are also obtained. Five different real data sets are used to validate the distributions and the results demonstrate that the family of distributions can be considered as a suitable model under several real situations.

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[1]Indian Institute of Management Kozhikode, IIMK Campus PO, Kozhikode- 673570,
email: shovanc@iimk.ac.in