

A New Weibull–Pareto Distribution: Properties and Applications

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Abstract

Many distributions have been used as lifetime models. In this article, we propose a new three-parameter Weibull–Pareto distribution, which can produce the most important hazard rate shapes, namely, constant, increasing, decreasing, bathtub, and upsidedown bathtub. Various structural properties of the new distribution are derived including explicit expressions for the moments and incomplete moments, Bonferroni and Lorenz curves, mean deviations, mean residual life, mean waiting time, and generating and quantile functions. The Rényi and q entropies are also derived. We obtain the density function of the order statistics and their moments. The model parameters are estimated by maximum likelihood and the observed information matrix is determined. The usefulness of the new model is illustrated by means of two real datasets on Wheaton river flood and bladder cancer. In the two applications, the new model provides better fits than the Kumaraswamy–Pareto, beta-exponentiated Pareto, beta-Pareto, exponentiated Pareto, and Pareto models.

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