A new extended two-parameter distribution: properties, estimation methods, and applications in medicine and geology

ABSTRACT

In this paper, a new two-parameter generalized Ramos–Louzada distribution is proposed. The proposed model provides more flexibility in modeling data with increasing, decreasing, J-shaped, and reversed-J shaped hazard rate functions. Several statistical properties of the model were derived. The unknown parameters of the new distribution were explored using eight frequentist estimation approaches. These approaches are important for developing guidelines to choose the best method of estimation for the model parameters, which would be of great interest to practitioners and applied statisticians. Detailed numerical simulations are presented to examine the bias and the mean square error of the proposed estimators. The best estimation method and ordering performance of the estimators were determined using the partial and overall ranks of all estimation methods for various parameter combinations. The performance of the proposed distribution is illustrated using two real datasets from the fields of medicine and geology, and both datasets show that the new model is more appropriate as compared to the Marshall–Olkin exponential, exponentiated exponential, beta exponential, gamma, Poisson–Lomax, Lindley geometric, generalized Lindley, and Lindley distributions, among others.

Keyword: Cramér–von Mises estimation; Maximum likelihood estimation; Maximum product of spacing estimation; Right-tail Anderson–Darling estimation