Statistical inferences on location parameters of bivariate exponential distributions

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Summary

In this paper we consider some statistical inferences on location parameters of Marshall and Olkin's bivariate exponential distribution. Two-stage sampling procedures are given for constructing a fixed-size confidence region and selecting the best population. Some test procedures for a structure of location parameters are proposed.

0. Introduction

Exponential distributions have been introduced in a rich literature as a simple model for statistical analysis of lifetimes. In survival analysis, the hazard function is a constant if and only if the failure time has an exponential distribution, see e.g., Cox and Oakes [11] or Kalbfleisch and Prentice [30]. Then the hazard rate is equal to the scale parameter of the exponential distribution. In reliability analysis, the location parameter is viewed as a guaranteed lifetime of a system. Bain [3] and Barlow and Proschan [5] dealt with statistical procedures in reliability theory by using exponential distributions.

There is an extensive literature on the construction of bivariate exponential models, for example, Gumbel [21], Freund [18], Downton [13], Block and Basu [8] and so on. Marshall and Olkin [36] proposed a multivariate extension of exponential distributions which is much of interest in both theoretical developments and applications. Marshall and Olkin [36] derived a bivariate exponential (BVE) distribution by supposing that failure is caused by three types of Poisson shocks on a system containing two components. The BVE distribution has three scale parameters. We note that the parameters of the BVE distribution are not scale parameters in the usual definition of scale parameters; however we call them scale parameters. Statistical inferences for scale parameters have been considered by many authors. For example, Arnold [1] and Bemis, Bain and Higgins [7] derived estimators for the scale parameters. Awad, Azzam and Hamdan [2] considered the problem of estimating $P(X > Y)$ in the BVE and Ebrahimi [17] applied the BVE to an accelerated life test. Lu and Battacharyya [35] proposed a bivariate extension of the Weibull model along the line of Marshall and Olkin [36]. However, there is no literature