World Academy of Science, Engineering and Technology
International Journal of Industrial and Systems Engineering
Vol:10, No:08, 2016

Progressive Type-I Interval Censoring with Binomial Removal-Estimation and Its Properties

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Abstract : This work considers statistical inference based on progressive Type-I interval censored data with random removal. The scheme of progressive Type-I interval censoring with random removal can be described as follows. Suppose n identical items are placed on a test at time T0 = 0 under k pre-fixed inspection times at pre-specified times T1 < T2 < . . . < Tk, where Tk is the scheduled termination time of the experiment. At inspection time Ti, Ri of the remaining surviving units Si, are randomly removed from the experiment. The removal follows a binomial distribution with parameters Si and pi for i = 1, . . . , k, with pk = 1. In this censoring scheme, the number of failures in different inspection intervals and the number of randomly removed items at pre-specified inspection times are observed. Asymptotic properties of the maximum likelihood estimators (MLEs) are established under some regularity conditions. A β-content γ-level tolerance interval (TI) is determined for two parameters Weibull lifetime model using the asymptotic properties of MLEs. The minimum sample size required to achieve the desired β-content γ-level TI is determined. The performance of the MLEs and TI is studied via simulation.

Keywords : asymptotic normality, consistency, regularity conditions, simulation study, tolerance interval
Conference Title : ICRM 2016 : International Conference on Reliability and Maintainability
Conference Location : Barcelona, Spain
Conference Dates : August 11-12, 2016

Open Science Index, Industrial and Systems Engineering Vol:10, No:08, 2016 publications.waset.org/abstracts/47981/pdf