SEQUENTIAL ANALYSIS
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Bayesian reliability estimation for Copoun distribution using type II censored step-stress accelerated life tests: methods and applications

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ABSTRACT

In this article, Bayesian approach is used to analyze the parametric inference based on tampered random variable for step-stress accelerated life tests (SSALTs) under type II censored data. The life time distribution of experimental units follows the two parameter Copoun distribution with η and φ as scale and shape parameters, respectively. The Markov chain Monte Carlo (MCMC) approach with squared error loss, GELF and LINEX loss functions are used to derive Bayes estimators. An important consideration in Bayesian estimating problems is the selection of the loss function. As a result, the Bayesian estimators for the parameters are derived using various loss functions and a comparison with the standard maximum likelihood (MLE) approach is carried out. Finally, the proposed methods are illustrated with the analysis of real data sets.

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1. INTRODUCTION

In reliability engineering and life testing scenarios, most of the manufacturing industries face a number of challenges when trying to improve the product, such as how to handle product failure (reliability estimation) within the allotted test duration. In such situation accelerated life testing technique can be used to overcome the challenges associated with standard reliability. Accelerated life tests (ALTs) have therefore been utilized to evaluate the reliability of such components, in order to obtain sufficient failure data under time and cost constraints. In order to improve the effectiveness of the testing process, engineers typically raise the stress levels (temperature, pressure, humidity, or voltage) to induce early failures.

ALT is commonly conducted through three approaches—progressive-stress, step-stress, and constant-stress to assess the product reliability and improving the quality. In constant stress ALT all units are subjected to fixed stress level throughout the experiment. While this approach yields insufficient failure data if the stress is too low or incur excessive costs and risk if the stress is too high. Step-stress ALT in which the stress levels are gradually increases at some prefixed time point to achieve an adequate number

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