Abstract

The life testing experiments are carried out to obtain the lifetime data on patients for survival analysis and to study the reliability of electrical, electronic and mechanical systems, information theory, artificial intelligence, etc. It is challenging to obtain lifetime data on all individuals or products due to breakages, time limits, and expense restrictions. Thus, the experiments are terminated before they are completed. In those situations, we get the censored data. There are various types of censoring schemes utilized in the literature for different life testing situations.

This thesis deals with the classical and Bayesian estimation methods for the censored data. We consider three distinct censoring schemes, namely, random censoring, progressive censoring, and progressive first-failure censoring schemes in this thesis. Random censoring is a popular censoring scheme in which the censoring time is set at random rather than being predetermined, and it commonly arises in survival analysis and clinical trials. The random censoring scheme is an extension of the Type-I censoring scheme in which failure and censoring times both are taken as random variables. We consider two distinct lifetime models, namely, inverse Pareto and inverse Weibull lifetime models based on randomly censored data and developed statistical inferences for the associated model parameters and reliability characteristics from both the classical and Bayesian estimation perspectives in Chapter 2 and Chapter 3, respectively.

The progressive censoring scheme is another popular censoring scheme that allows the removal of experimental units during the experiment. Because of its flexibility, the progressive censoring scheme has several applications in a variety of disciplines and received considerable attention in the literature. The stress-strength reliability (SSR) is considered as a measure of system performance. The system becomes out of control if the system stress exceeds its strength. The model of stress-strength has found applications in many statistical problems, including quality control, engineering statistics, medical statistics and biostatistics, among others. The estimation of SSR has received considerable attention in the statistical literature. In Chapter 4, we employed the progressive censoring scheme and developed classical and Bayesian estimators of stress-strength reliability for the inverse Pareto lifetime model.

The progressive first-failure censoring scheme is a cost and time-efficient censoring scheme and it is developed as the combination of progressive and first-failure censoring schemes. Also, this censoring scheme is viewed as a generalization of a progressive censoring scheme. We study the classical and Bayesian estimation of the parameters and reliability characteristics of the inverse Pareto lifetime model using the progressive first-failure censored data in Chapter 5.

The information theory provides a simple approach for measuring the uncertainty and reciprocal information of random variables as entropy measures. The applications of entropy are described in a variety of fields, including computer science, molecular biology, hydrology,

meteorology, and others. For example, in the study of trends in gene sequences, molecular biologists use the principle of Shannon's entropy. Shannon's entropy is the most widely used entropy in statistical and information theory. We study the classical and Bayesian estimation methods for the Shannon's entropy from the Maxwell lifetime models based on progressively first-failure censored data with different applications in Chapter 6.

The statistical software R is used for computation throughout the thesis. Finally, a complete list of references and other literature surveys are given at the end of the thesis as a bibliography.