

CHAPTER 51

STATISTICS

Doctoral Theses

01. NANDCHAHAL (Shruti)
Some Contributions to Shrinkage Estimation.
Supervisor : Prof. Ajit Chaturvedi
Th 24093

Abstract
(Not Verified)

A family of lifetime distributions by Chaturvedi, Chauhan and Alam (2009), the Generalized Half logistic distribution (GHLD), a three parameter Burr distribution, Generalized Inverted scale family of distributions and Moore and Bilkam family of lifetime distributions, are considered. Two measures of reliability are considered, $R(t) = P(X > t)$ and $P = P(X > Y)$. Shrinkage estimators are developed for the powers of parameter, $R(t)$ and 'P' under type I and type II censorings. Simulation study is conducted to judge the performance of these estimators and the order of dominance of different estimators was recorded. It was observed that the improved estimators were successful in taking advantage of the available prior estimates. For a family of lifetime distributions and Generalized Half-logistic distribution (GHLD), Empirical Bayes shrinkage estimators are derived for the powers of parameter, hazard-rate and reliability function under squared-error loss function (SELF) and general entropy loss function (GELF). These estimators are developed under inverted gamma prior distribution and are compared with UMVUES, MLES and IOES (only for family of lifetime distributions) in respect of efficiencies. In order to estimate the hyper parameters, two methods are used. Type II censored data is considered. For a family of lifetime distributions, some improved estimators for the powers of the parameter are also proposed. Preliminary test estimators based on UMVUE, MLE, Bayes estimator (BE) and empirical Bayes estimator (EBE) are defined. The bias and mean square error of the proposed estimators are derived. The superiority interval of the parameter of interest was also obtained in which the preliminary test estimators outperform the UMVUE, MLE, BE and EBE. A comparative study of different methods of estimation is done through simulation studies.

Contents

1. The Apperception and accretion of the reliability theory 2. Shrinkage estimators of the reliability characteristics of a family of lifetime distribution 3. Empirical bayes shrinkage estimation of the reliability characteristics of a family of lifetime distribution 4. Shrinkage estimators of the reliability characteristics of generalized half-logistic distribution 5. Shrinkage estimators of the reliability characteristics of three parameter burr distribution 6. On the construction of preliminary test estimator for the powers of the parameter of a family of lifetime distributions 7. Empirical bayes shrinkage estimation of the reliability characteristics for generalized half logistic distribution 8. Shrinkage estimators of the reliability characteristics of generalized inverted scale family of distributions 9. Shrinkage estimators of the reliability characteristics of Moore and Bilkam family of lifetime distributions. References.

02. NEERA KUMARI

Some Contributions to Bayesian Estimation Procedures for Lifetime Models.

Supervisor : Dr. Ranjita Pandey

Th 24091

Abstract
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Statistical literature is replete with numerous lifetime distributions which are used as models for estimating, optimizing and predicting the total, mean and remaining lifetimes of life units or system and its components. Evidence of collateral relationship between distributions and real life situations is available in the form of research papers, text books and monographs. In life-testing studies the time to occurrence of some designated event is called *lifetime*. Lifetime data is defined as the time to occurrence of some event of interest in a population. The inability to record all observations on lifetime units under study is termed as censoring. The present thesis incorporates some selected censoring mechanisms in the inferential procedures for the lifetime model analysis. Heart of the present thesis is centered on development of Bayesian estimation procedures for some selected lifetime models which support a range of hazard functions. Symmetric and asymmetric loss functions under informative and non-informative priors are considered variously for the different distributions. The present thesis is devoted to the development of Classical maximum likelihood and Bayes estimates of the parametric functions. The former are computed using Newton Raphson algorithm while Bayes estimates are approximated by using Lindley approximation, Tierney and Kadane approximation, and Markov Chain Monte Carlo techniques for the considered lifetime distributions. Numerical illustrations of theoretical findings are based on some classical and simulated lifetime data-sets. The theoretical developments carried out in the present thesis are expected to be helpful to the data analysts and practitioners in their data-based research analysis. In future the scope of the present study can be extended to different lifetime distributions including mixture distributions for different priors and loss functions.

Contents

1. Fundamental preliminaries 2. Bayesian parameter estimation of beta log Weibull distribution under type II censoring 3. Bayesian parameter estimation of beta log Weibull distribution under type II progressive censoring 4. Bayesian parameter estimation of power generalized Weibull distribution under type II censoring 5. Bayesian parameter estimation of power generalized Weibull distribution under type II progressive censoring 6. Bayesian parameter estimation of inverse size biased p-dimensional rayleigh distribution under different censoring. Bibliography.

03. VYAS (Shantanu)

Contributions to Inferential Procedures for Some Reliability Models.

Supervisor : Prof. Ajit Chaturvedi

Th 24092

Abstract
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Firstly we considered Exponentiated distributions. Two measures of reliability are considered, $R(t) = P(X > t)$ and $P = P(X > Y)$. Point estimation and testing procedures are developed for different parametric functions under Type II and Type I censoring. Next we considered a Three parameter Burr distribution. Point and interval estimation procedures are developed for the parameters and Reliability functions under Type II and Type I censoring. Next a family of lifetime distributions, which covers many well-known lifetime distributions as specific cases, is considered. Bayesian estimation procedures are developed for two measures of reliability under

Type II and Type I censoring. Two type of loss functions namely squared error loss function (SELF) and General entropy loss function (GELF) are considered. Next we proposed, a new class of estimators based on preliminary tests under Type-II censoring. Three type of preliminary test estimators based on uniformly minimum variance unbiased estimator (UMVUE), maximum likelihood estimator (MLE) and empirical Bayes estimator (EBE) are defined. The performances of preliminary test estimators (PTE's) are compared with conventional estimators. Next a family of lifetime distributions is explored. The basic properties of the family and its reliability characteristics are studied. We derive the moment estimators of unknown parameters. We also derive Maximum likelihood estimators and UMVU estimators of parameters and reliability functions. Next, a new three-parameter generalized distribution named as Generalized Gamma- Maxwell distribution is introduced. Maximum likelihood estimation of parameters and reliability functions is performed through numerical methods. Next, a new Length biased distribution named as Generalized Length Biased Maxwell distribution is introduced. The basic properties of the distribution and its reliability characteristics are studied. We derive the moment estimators, maximum likelihood estimators and UMVU estimators of parameters and reliability functions. We present some numerical findings based on simulation and real data.

Contents

1. Reliability science: A concise review of chronicle and contemporary era
2. Estimation and testing procedures for the reliability functions of expatiated distributions under censorings
3. Estimation and testing procedures for the reliability functions of three parameter Burr distribution under censorings
4. A Bayesian approach for reliability estimation of a family of life-time distributions under squared error and entropy losses
5. Preliminary test estimators for the reliability characteristics of exponential distribution based on type II censoring
6. Estimation of reliability functions for a family of lifetime distributions
7. Generalized Gamma-Maxwell distribution: Properties and estimation of reliability functions
8. Generalized length biased Maxwell distribution: Properties and related estimation procedures. Bibliography.