

In the Name of God



Abstracts of
the 3rd Seminar on
Reliability Theory and its Applications

Department of Statistics

and

Ordered and Spatial Data Center of Excellence
Ferdowsi University of Mashhad,
Mashhad, Iran

16-17 May, 2017

Preface

Continuing the series of workshops on “Reliability Theory and its Applications” in Ferdowsi University of Mashhad and two Seminars in University of Isfahan (2015) and University of Tehran (2016), we are pleased to organize the 3rd Seminar on “**Reliability Theory and its Applications**” during 16-17 May, 2017 at the Department of Statistics, Ferdowsi University of Mashhad. On behalf of the organizing and scientific committees, we would like to extend a very warm welcome to all participants, hoping that their stay in Mashhad will be happy and fruitful. Hope that this seminar provides an environment of useful discussions and would also exchange scientific ideas through opinions. We wish to express our gratitude to the numerous individuals and organizations that have contributed to the success of this seminar, in which around 100 colleagues, researchers, and postgraduate students have participated.

Finally, we would like to extend our sincere gratitude to the administration of Ferdowsi University of Mashhad and Faculty of Mathematical Sciences, the Iranian Statistical Society, the Ordered and Spatial Data Center of Excellence, the Scientific Committee, the Organizing Committee and the students of the Department of Statistics at Ferdowsi University of Mashhad for their kind cooperation.

Jafar Ahmadi (Chair)
May, 2017

Topics

The aim of the seminar is to provide a forum for presentation and discussion of scientific works covering theories and methods in the field of reliability and its application in a wide range of areas:

- Accelerated life testing
- Bayesian methods in reliability
- Case studies in reliability analysis
- Degradation models
- Information theory topics in reliability
- Maintainability and availability
- Measures of dependence in reliability
- Network reliability
- Reliability of coherent systems
- Statistical inference for reliability data
- Stochastic aging
- Stochastic ordering and reliability
- Stress-strength modeling
- Optimization methods in reliability

Scientific Committee

1. Ahmadi, J., Ferdowsi University of Mashhad (Iran)
2. Arghami, N.R., Ferdowsi University of Mashhad (Iran)
3. Asadi, M., University of Isfahan (Iran)
4. Asgharzadeh, A., Mazandarn University (Iran)
5. Balakrishnan, N., McMaster University (Canada)

6. Bayramoglu, I., Izmir University of Economics (Turkey)
7. Di Crescenzo. A., Universit degli Studi di Salerno (Italy)
8. Doostparast, M. Ferdowsi University of Mashhad (Iran)
9. Eryilmaz, S., Atilim University, (Turkey)
10. Haghighi, F., University of Tehran (Iran)
11. Hamamadani, A. Z., Isfahan University of Technology (Iran)
12. Khaledi, B.k, Razi University (Iran)
13. Khanjar, M., Birjand University (Iran)
14. Khodadadi, A., Shahid Beheshti University (Iran)
15. Mothasihemi Borzadaran, G. R., Ferdowsi University of Mashhad (Iran)
16. Navarro, J., Universidad de Murcia (Spain)
17. Rezaei Roknabadi, A. H. Ferdowsi University of Mashhad (Iran)
18. Singpurwalla, N. D., City University of Hong Kong (Hong Kong)

Organizing Committee

1. Ahmadi, J., Ferdowsi University of Mashhad
2. Asadi, M., University of Isfahan
3. Amini, M. Ferdowsi University of Mashhad
4. Emadi, M., Ferdowsi University of Mashhad
5. Fashandi, M. Ferdowsi University of Mashhad
6. Jabari, Nooghabi, H. Ferdowsi University of Mashhad
7. Jabari Nooghabi, M. Ferdowsi University of Mashhad
8. Habibi Rad A., Ferdowsi University of Mashhad
9. Mothasihemi Borzadaran, G., Ferdowsi University of Mashhad
10. Razmkhah.M. Ferdowsi University of Mashhad
11. Rezaei Roknabadi, A. H. Ferdowsi University of Mashhad
12. Sadeghpour Gildeh, B. Ferdowsi University of Mashhad

Contents

A note on estimation based on joint progressively first-failure-censored data	
Ahmadi, M. V.	9
Univariate stochastic ordering for near-records based on different classes of life time distributions	
Akbari, M.	10
Selection of the least risky minimal repair system	
Amini, M.	11
Signature-based developments on reliability and dependency of network states	
Asadi, M., Zarezadeh, S.	12
Stochastic comparisons of series systems with independent heterogeneous components	
Asgari, T., Kelkinnama, M.	13
Smallest Rayleigh confidence regions under progressive censoring	
Asgharzadeh, A., Fernandezb, A. J., Abdi, M.	14
Bayesian Laplace regression for C-inflated survival data	
Aslani Akhore Oleiyi, N., Saberi, Z.	15
Random preventive maintenance under mixed effects	
Atlekhani, M., Doostparast, M.	16
New results on stochastic comparisons of series and parallel systems with generalized exponential components	
Bashkar, E., Torabi, H., Dolati, A.	17

Optimal sample size based on prediction problem under progressively type-II censoring	
Basiri, E., MirMostafaei, S.M.T.K.	18
Some measures of income inequality and reliability of systems	
Behdani, Z., Mohtashami Borzadaran, G, R., Sadeghpour Gildeh, B.	19
Some results on the residual entropy of coherent systems	
Chahkandi, M., Toomaj, A.	20
Best linear unbiased estimator based on k-record values from half-normal distribution	
Dastbaravarde, A., Zakerzadeh, H., Manouchehri, F.	21
On the probabilistic mean value theorem and related results	
Di Crescenzo, A.	22
Muti-state systems: Concepts and some applications	
Doostparast, M.	23
Comparison of nonparametric and parametric estimations of a failure rate function for exact data	
Fani, S., Ghoreyshi, A. S.	24
Bayesian nonparametric goodness of fit test for survival data	
Fazeli Asl, F., Saberi, Z.	25
Statistical analysis of linear degradation and failure time data with masked multiple failure modes under accelerated life test	
Haghighi, F., Azizi, F.	26
Optimizing the step stress accelerated life test with two stress variables under type-I progressive censoring	
Hakamipour, N.	27
On invariant test with sequential order statistics: An open problem and some suggestions	
Hashempour, M. , Doostparast, M.	28
The family of lifetime and power-series distributions	
Hassantabar Darzi, F., Eslami, S. M.	29

Inverse Weibull power series distribution	
Hassantabar Darzi, F., Eslami, S. M., MirMostafaei, S.M.T.K.	30
Estimation of stress-strength reliability for the Pareto distribution in the presence of outliers	
Jabbari Nooghabi, M.	31
Generalization of the weighted cumulative inaccuracy measure based on double-sided truncation	
Jalayeri, S., Khorashadizadeh, M.	32
Coherent systems with heterogeneous components	
Kelkinnama, M.	33
Stochastic comparisons of coherent systems	
Khaledi, B., Amini-Seresht, E.	34
Comparison of coherent systems using reverse mean residual order	
Khaleghpanah Nooghabi, E., Rezaei, M., Chahkandi, M.	35
Some monotonicity properties of mean residual life of a k-out-of-n system with nonidentical components	
Khanjari Sadegh, M., Mohammadzadeh, T.	36
Predicting the lifetime of a k-out-of-$n:F$ system in the presence of an outlier	
Khatib Astane, B.	37
Some reliability measures in general form of distributions	
Khorashadizadeh, M.	38
Assessing effect of ranking quality in parametric reliability estimation based on ranked set samples	
Mahdizadeh, M.	39
Semiparametric regression for mean past lifetime	
Mansourvar, Z., Asadi, M.	40
On a dynamic L_2 distance with applications	
Mehrali, Y., Asadi, M.	41

Planning of step-stress accelerated degradation test with dependent competing risks	
Mireh, S., Khodadadi, A., Haghghi, F.	42
Inactivity time of consecutive k-out-of-n system under double monitoring	
Miri, M., Salehi, E.	43
Bayesian estimation for the STH distribution based on type II censored data	
MirMostafae, S.M.T.K., Mahdizadeh, M.	44
A look at the upper and lower means in reliability framework	
Mirzaei, S.	45
The connection between inequality measures and reliability aspects	
Mohtashami Borzadaran, G, R., Behdani, Z., Sadeghpour Gildeh, B.	46
Reliability of a k-out-of-$n:F$ degradation system	
Nezakati, E., Razmkhah, M.	47
The stress-strength reliability under the environmental factors	
Pakdaman, Z. , Ahmadi,J.	48
On Gini-type index applications in reliability analysis	
Parsa, M., Di Crescenzo, A., Jabbari, H.	49
Optimum maintenance policy for a system with three types of failures	
Safaei, F., Ahmadi, J.	50
Reliability of random complex networks based on percolation theory	
Sajadi, F.	51
Non-parametric estimation of bivariate MRL and QRL functions	
Shafaei Noughabi, M.	52
Some results on comparing the mean residual life functions of two groups	
Sharafi, M.	53
Doubly truncated (interval) quantile Shannon entropy	
Shokrani, A., Khorashadizadeh, M.	54

Fuzzy non-parametric predictive inference for the reliability of k-out-of-m systems	
Shokri, S., Sadeghpour-Gildeh, B., Mohtashami Borzadaran, G.R., Fathi Vajargah, B.	55
Cumulative residual inaccuracy in upper record values	
Tahmasebi, S., Daneshi, S., Salehi, M.	56
Endogeneity problem in recurrent event data analysis	
Tavakoli Dinani, Z., Rikhtehgaran, R.	57
Some new results for weighted distributions	
Velayati-Yazdsefat, P. , Salehi, E.	58
An algorithm to assess t-signature	
Zarezadeh, S., Siavashi, M.	59



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



A note on estimation based on joint progressively first-failure-censored data

Ahmadi, M. V. ¹

Department of Statistics, University of Bojnord

Abstract

In this paper, a new life test plan called a joint progressive first-failure-censoring scheme is introduced. The maximum likelihood estimates and the Bayes estimates for the parameters of two exponential distributions are discussed for the new censoring scheme. Moreover, the Bayes estimates are investigated under symmetric and asymmetric loss functions. Finally, a simulation study is performed and an illustrative example is also given.

Keywords: Bayes estimation, Joint progressive first-failure-censoring scheme, Exponential distribution, LINEX loss function, General entropy loss function.

¹mv.ahmadi@ub.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Univariate stochastic ordering for near-records based on different classes of life time distributions

Akbari, M. ¹

Department of Statistics, Mazandaran University

Abstract

The observations between the n th and $(n + 1)$ th upper record value that fall in the interval $(X^U(n) - a, X^U(n))$, where $X^U(n)$ is upper record value and $a > 0$ is a constant, are called the observations near the n th upper record value. In this paper, is obtained some stochastic orderings for number of observations near the n th upper and lower k -records based on different classes of life time distributions. Also, It is shown that only in exponential distribution is possible that the number of observations near the n th and m th upper k -record or lower k -record be equal in distribution.

Keywords: Near-records, Stochastic ordering, Exponential distribution.

¹m.akbari@umz.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Selection of the least risky minimal repair system

Amini, M. ¹

Department of Statistics, University of Tehran

Abstract

Bayesian selection rule is proposed for selection of the subset of the least risky systems based on minimal repair times of repairable systems. The Weibull distribution is considered as the lifetime distribution of the systems. The Laplace approximation is used for computation of the Bayesian selection rule. It is observed through a simulation study that selection of the least risky system results to a high level of accuracy and efficiency.

Keywords: Computational Bayes, Qualifying index set, Ranking, Reliability, Time interval between failures.

¹mort.amini@gmail.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Signature-based developments on reliability and dependency of network states

Asadi, M. ¹ and Zarezadeh, S. ²

¹ Department of Statistics, University of Isfahan

² Department of Statistics, Shiraz University

Abstract

The signature of a network with n components is an n -dimensional vector whose i th element is the probability that the i th failure of the components causes the failure of the network. As a useful tool in assessing the reliability, the signature depends only on the structure of the network. In this talk we first review some recent developments of variants of the notion of signature in one and two dimensions. These include the concepts of t -signature, conditional signature, semi signature and two-dimensional signature. Then, we give the related signature-based mixture representations of the reliability of two-state and three-state networks under different scenarios on the failure distribution of component lifetimes. An important problem in the study of the properties of a multi-state network is to measure information between the state lifetimes of the network. In the sequel, we also address the new developments on the signature-based information measures of the states of a three-state network with states up, partial performance and down. We show that the Kullback-Leibler information, and mutual information between the lifetimes of network states depend only on the network structure. Finally we present some results to measure the dependency between the network lifetime and its component lifetimes based on mutual information between them. Several examples are examined graphically and numerically to illustrate the results.

Keywords: Shannon entropy, Signature, Mutual information, Kullback-Leibler information, Order statistics.

¹m.asadi@sci.ui.ac.ir

²s.zarezadeh@shirazu.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Stochastic comparisons of series systems with independent heterogeneous components

Asgari, T. ¹ and Kelkinnama, M. ²

^{1,2} Department of Mathematical Sciences, Isfahan University of Technology

Abstract

In this paper, we investigate stochastic properties of the smallest order statistics from independent heterogeneous Chen's random variables with different parameters.

Keywords: Series system, Heterogeneous components, Stochastic comparisons.

¹tahere.asgari1371@gmail.com

²m.kelkinnama@cc.iut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Smallest Rayleigh confidence regions under progressive censoring

Asgharzadeh, A. ¹ Fernandezb, A. J. ² and Abdi, M. ³

¹ Department of Statistics, University of Mazandaran

² Departamento de Matemáticas, Estadística e Investigación Operativa,
Universidad de La Laguna

³ Department of Statistics, Higher Education Complex of Bam

Abstract

Balanced confidence regions for the Rayleigh parameters are first presented. Shortest-length confidence intervals and minimum-area joint confidence regions are then proposed. The method of Lagrange multipliers is employed in order to determine the smallest-size sets with the required confidence level. These regions are valid for complete data, and also for standard and progressive Type-II censored data. Applications of the proposed confidence regions in estimation and hypothesis testing are also presented. Finally, a numerical example and a simulation study are given for illustrative purposes.

Keywords: Constrained optimization, Confidence regions, Lagrange method, Non-linear programming.

¹a.asgharzadeh@umz.ac.ir

³me.abdi@bam.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Bayesian Laplace regression for C -inflated survival data

Aslani Akhore Oleiyai, N.¹ and Saberi, Z.²

^{1,2} Department of Mathematical Sciences, Isfahan University of Technology

Abstract

In this paper, we propose the use of Bayesian quantile regression for the analysis of survival data with mixed discrete-continuous distribution with a point mass at C , where these observations of the response variable may be censored at C , where these observations may be right censored or true C . The censoring mechanism is assumed random and possibly dependent on the covariates. Quantile regression allow us to permit covariates to affect survival at different stages in the follow up period, so providing a comprehensive study of the survival distribution. We take a Bayesian quantile regression approach for continuous part by considering the quantile process as a linear combination of covariates. Also the probability of being censored given that the observed value is equal to C , will be analyzed. We build up a Markov Chain Monte Carlo method from related models in the literature to obtain samples from the posterior distribution. We demonstrate the suitability of the model to analyze this censoring probability with a simulated study.

Keywords: Asymmetric Laplace distribution, Bayesian quantile regression, Right censoring, Survival analysis, Two-part model.

¹n.aslani@math.iut.ac.ir

²z.saberi@cc.iut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Random preventive maintenance under mixed effects

Atlekhani, M. ¹ and Doostparast, M. ²

¹ Department of Statistics, Malayer University

² Department of Statistics, Ferdowsi University of Mashhad

Abstract

This paper extends a random preventive maintenance scheme, called repair alert model, when there exist environmental variables which effect on system lifetimes. It can be used for implementing age-dependent maintenance policies on engineering devices. The new model is flexible to including covariates with both fixed and random effects. The problem of estimating parameters is also investigated in details. To do this, it is assumed that the system lifetime distribution belongs to the log-location-scale family of distributions. A real data set is also analysed on the of the results obtained.

Keywords: Random signs censoring, Repair alert model, Log-location-scale family, Fixed and random effects.

¹m_akhani@yahoo.com

²doustparast@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



New results on stochastic comparisons of series and parallel systems with generalized exponential components

Bashkar, E. ¹ Torabi, H. ² and Dolati, A. ³

^{1,2,3} Department of Statistics, Yazd University

Abstract

In this paper, we derive new results on stochastic comparisons of series and parallel systems with independent heterogeneous generalized exponential components. These comparisons are with respect to the usual stochastic ordering, the reversed failure rate ordering and the failure rate ordering. The result established here strengthens and generalizes some of the results of Balakrishnan et al. (2015).

Keywords: Generalized exponential distribution, Stochastic ordering, Majorization, Parallel system, Series system.

¹e.bashkar@stu.yazd.ac.ir

²htorabi@yazd.ac.ir

³adolati@yazd.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Optimal sample size based on prediction problem under progressively type-II censoring

Basiri, E. ¹ and MirMostafaei, S.M.T.K. ²

¹ Department of Statistics, Kosar University of Bojnord

² Department of Statistics, University of Mazandaran

Abstract

Choosing the sample size is a problem faced by anyone doing a survey of any type. In this paper, we study this problem by considering two criteria, the total cost of experiment and mean squared prediction error in prediction problem. Towards this end, we discuss the problem of Bayesian predicting a future progressive censored order statistic from an exponential distribution based on an observed progressive censored order statistics.

Keywords: Optimal sample size, Prediction, Progressive censoring.

¹elham_basiri2000@yahoo.com

²m.mirmostafaei@umz.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some measures of income inequality and reliability of systems

Behdani, Z. ¹ Mohtashami Borzadaran, G, R. ²
and Sadeghpour Gildeh, B. ³

^{1,2,3} Department of Statistics, Ferdowsi University of Mashhad

Abstract

Reliability engineers often need to work with systems having elements connected in parallel and series, and to calculate their reliability. The concepts of inequality measures play an important role in economic, social sciences and other areas. In this paper, we study the relationship between a mean life time of system consisting of n identical and independents having parallel or series structure and some measures of income inequality. The Gini index and generalized Gini index are two particular member of general class of dispersion measures. It is natural to try to relate Gini indices to mean life time of system.

Keywords: Mean residual life function, Reliability, Lorenz curve, Gini index.

¹zbehdani@yahoo.com

²grmohtashami@um.ac.ir

³sadeghpour@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some results on the residual entropy of coherent systems

Chahkandi, M. ¹ and Toomaj, A. ²

¹ Department of Statistics, University of Birjand

² Department of Statistics, Gonbad Kavous University

Abstract

The residual entropy measures the concentration of the conditional probability distribution and the uncertainty of the residual lifetime of a random phenomenon. In this paper, we find some expressions for the entropy of residual lifetime of a coherent system under different conditions on the status of the components. The obtained results can be applied to compare the predictability of the system lifetimes, when we have some information about the component lifetimes of the system at time t .

Keywords: Coherent system, Residual entropy, Signature vector.

¹mchahkandi@birjand.ac.ir

²ab.toomaj@gonbad.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Best linear unbiased estimator based on k -record values from half-normal distribution

Dastbaravarde, A.¹ Zakerzadeh, H.² and Manouchehri, F.³

^{1,2,3} Department of Statistics, Yazd University

Abstract

The article is discussed the k -record values from the half-normal distribution. The mean, variance and covariance of k -record values are computed. The best linear unbiased estimators for the location and scale parameters of the half-normal distribution are determined based on k -record values.

Keywords: k -record values, Half-normal distribution, Best linear unbiased estimator.

¹dastbaravarde@yazd.ac.ir

²h.zaker@yazd.ac.ir

³fatemeh.shurije@gmail.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



On the probabilistic mean value theorem and related results

Di Crescenzo, A. ¹

Dipartimento di Matematica, Università degli Studi di Salerno

Abstract

The probabilistic mean value theorem was successfully exploited in the past with applications to random lifetimes, order statistics and queueing. A new version of such theorem has been proposed recently in terms of a quantile-based equilibrium distribution. The latter construction involves a generalized Lorenz curve, and allows to obtain new distributions with support $(0, 1)$. On the ground of such notions, we construct various stochastic orders-based relationships for the comparison of means of distorted random variables. These results refer to some concepts of reliability theory and can be applied for assessing stochastic dominance among random lifetimes.

Keywords: Stochastic orders, Quantile function, Lorenz curve, Equilibrium distribution, Reliability theory.

¹adicrescenzo@unisa.it



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Muti-state systems: Concepts and some applications

Doostparast, M. ¹

Department of Statistics, Ferdowsi University of Mashhad

Abstract

Engineering systems are designed to perform some tasks in a given environment. Systems can usually perform the tasks with various distinctive levels of efficiency, called performance rates. A system with a finite number of performance rates is known as multi-state system (MSS). Here, general concepts of MSSs are discussed. Some real examples for MSSs are also explained.

Keywords: Performance rate, Redundancy, Strongly and weakly coherent multi-state systems, Stochastic ordering.

¹doustparast@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Comparison of nonparametric and parametric estimations of a failure rate function for exact data

Fani, S. ¹ and Ghoreyshi, A. S. ²

^{1,2} Department of Statistics, Allameh Tabataba'i University

Abstract

The study of reliability or hazard functions is one of the major topics of interest in biomedical studies and reliability engineering. Many parametric models have received considerable attention in this regard, mainly for reasons of straightforward implementation and ease of analysis. The model misspecification problem of parametric methods motivated many researchers to develop nonparametric approaches in recent years, which demand fewer restrictive assumptions for modeling lifetime data. Although some nonparametric approaches, such as Kaplan-Meier and kernel-based methods, are popular tools for solving function estimation problems, they suffer from some non-trivial issues like restrictions, difficulties with bandwidth or tuning parameter selection. In contrast, one can avoid these issues at the cost of enforcing some qualitative shape constraints. The current study compares the performance of a nonparametric shape-constrained approach with some well-known parametric ones. Empirical studies using simulated and real data sets indicate that the nonparametric shape-constrained method outperforms the parametric counterparts in the case of exact data.

Keywords: Lifetime analysis, Nonparametric shape-constrained approach, Failure rate function, Exact data.

¹s.fani@atu.ac.ir

²at.sa.gh.13700507@gmail.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Bayesian nonparametric goodness of fit test for survival data

Fazeli Asl, F. ¹ and Saberi, Z. ²

^{1,2} Department of Mathematical Sciences, Isfahan University of Technology

Abstract

The paper revisits two-sample hypothesis testing problems. We consider the problem in a fully Bayesian nonparametric framework. Our results are expected to be useful in life testing and survival analysis where classical methods are not quite suitable. Our purpose is to compare two different Bayesian nonparametric methods, Dirichlet process and Pólya tree prior for these problems. Infact, for given two sets of samples \mathbf{X} and \mathbf{Y} , with unknown cumulative distribution F_1 and F_2 , we show that when one of the two samples of life time data had heavier tail, then the Pólya tree prior are better than Dirichlet process prior.

Keywords: Life testing, Bayesian nonparametric, Dirichlet process, Pólya tree.

¹forough.fazeli@math.iut.ac.ir

²z_saberi@cc.iut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Statistical analysis of linear degradation and failure time data with masked multiple failure modes under accelerated life test

Haghighi, F. ¹ and Azizi, F. ²

^{1,2} Department of Mathematics, Statistics and Computer Science, University of Tehran

Abstract

Joint modeling of linear degradation and failure time data with masked cause of failure under simple step stress test is considered. It is assumed that the failure rates associated with different failure modes depend only on the degradation value and belong to a parametric family. Further, it is assumed that due to some practical restrictions the cause of failure for some products may not be observed. This case is known as masking. A simple step-stress is used to shorten the failure time of products and a tampered failure rate (TFR) model is hold to describe the effect of stress changing on the failure rate. The maximum likelihood estimates (MLEs) of model parameters are obtained through an expectation-maximization (EM) algorithm. The influence of incomplete information on the reliability estimation is studied through a Monte-Carlo simulation. Finally, a real example is analyzed to illustrate the application of the proposed methods.

Keywords: Accelerated life test, Competing risks, Degradation, Masked data, Reliability.

¹haghighi@khayam.ut.ac.ir

²fariba.azizi@khayam.ut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Optimizing the step stress accelerated life test with two stress variables under type-I progressive censoring

Hakamipour, N. ¹

Department of Mathematics, Buein Zahra Technical University

Abstract

Due to cost and time consideration, it is difficult to observe all of the products lifetime within a reasonable time period. Hence, censored lifetime data is usually collected in real applications. Even when accelerated life tests are used, censoring is usually inevitable. The main purpose of this paper is to consider the optimal design for simple step stress accelerated life testing with Type-I progressive censoring. Sometimes, one stress variable does not yield enough failure data. Thus, two stress variables are considered. The lifetime of the items follows the exponentiated exponential distribution and a cumulative exposure model is considered. The problem of choosing the optimal times is developed to minimize the asymptotic variance of the reliability estimate at normal stress condition.

Keywords: Exponentiated exponential distribution, Step stress accelerated life test, Type-I progressive censoring.

¹nooshin.hakami@aut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



On invariant test with sequential order statistics: An open problem and some suggestions

Hashempour, M. ¹ and Doostparast, M. ²

¹ Department of Statistics, School of Science, University of Hormozgan

² Department of Statistics, Ferdowsi University of Mashhad

Abstract

In this paper, sequential order statistics (SOS) coming from heterogeneous exponential populations are considered. On the basis of the observed multiple SOS samples the generalized likelihood ratio test (GLRT) is derived for testing the homogeneity of the populations. It is shown that the GLRT in this case is scale invariant. Some guidelines for deriving the uniformly most powerful scale-invariant test (if exists) are also given.

Keywords: Hypotheses testing, Invariant test, Sequential order statistics.

¹ma.hashempour@hormozgan.ac.ir

²doustparast@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



The family of lifetime and power-series distributions

Hasantabar Darzi, F. ¹ and Eslami, S. M. ²

¹ Faculty of Mathematics and Statistics , University of Sistan and Baluchestan

² Faculty of Mathematics and Statistics, Velayat University

Abstract

In this study, we introduce the family of lifetime distributions by compounding any proper continuous lifetime distribution and truncated power-series (PS) distribution, named the family of lifetime-power series distributions (FPS). This new family of distributions contains several lifetime distributions such as generalized exponential (GE), generalized Weibull (GW), generalized Rayleigh (GR), inverse Weibull (IW) and many continuous distributions by compounding of PS distributions. The FPS distributions have decreasing, increasing, decreasing-increasing failure rate. The properties of the proposed family are discussed. A simple EM-type algorithm for iteratively computing maximum likelihood estimates is presented. A formal equation for Fisher information matrix is derived in order to obtaining the asymptotic covariance matrix. The experimental results are illustrated based on real data sets.

Keywords: Power-series distribution, EM algorithm, Hazard rate, Maximum likelihood estimation.

¹hasantabar_f@math.usb.ac.ir

²m.siavashi@cse.shirazu.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Inverse Weibull power series distribution

Hasantabar Darzi, F. ¹ Eslami, S. M. ² and MirMostafae, S.M.T.K. ³

¹ Faculty of Mathematics and Statistics, University of Sistan and Baluchestan

² Faculty of Mathematics and Statistics, Velayat University

³ Department of Statistics, University of Mazandaran

Abstract

In this paper, we introduce the Inverse Weibull-power series (IW-PS) class of distributions, which is obtained by compounding inverse Weibull and power series distributions. This new class of distributions contains several life time models such as: inverse Weibull-geometric (IW-G), inverse Weibull-Poisson (IW-P), inverse Weibull-logarithmic (IW-L) and inverse Weibull-binomial (IW-B) distributions as special cases. The hazard rate function of the IW-PS distribution can be decreasing and unimodal among others. Various properties of this class of distributions are discussed and the estimation of parameters are obtained by method of maximum likelihood. An EM algorithm is proposed for computing the estimates and expression for their asymptotic variances and covariances are derived. Special distributions are studied in some detail. At the end, in order to show the flexibility and potentiality of the new class of distributions, we demonstrate applications of two real data sets.

Keywords: Inverse Weibull, Power-series distribution, EM algorithm, Hazard rate, Maximum likelihood estimation.

¹hasantabar_f@math.usb.ac.ir

²m.eslami@velayat.ac.ir

³m.mirmostafae@umz.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Estimation of stress-strength reliability for the Pareto distribution in the presence of outliers

Jabbari Nooghabi, M. ¹

Department of Statistics, Ferdowsi University of Mashhad

Abstract

The present paper discussed the problem of estimating the stress-strength reliability parameter $R = P(X < Y)$, where X and Y follow the Pareto distribution, independently. Assuming X has the Pareto distribution in the presence of outliers and the random variable Y is not contaminated with outliers. Different estimators of R were derived when only the shape parameters are unknown. In particular, we obtain the maximum likelihood, moment method and least squares estimator of the unknown parameters and derived estimates of R . Also, in each situation the shrinkage estimation of the stress-strength reliability parameter is derived by using a prior guess R_0 . Monte Carlo simulation study has been used to compare the different methods of estimation in any situation.

Keywords: Shrinkage estimation, Pareto distribution, Maximum likelihood estimator, Moment method, Least squares, Stress strength model, Outliers.

¹jabbarinm@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Generalization of the weighted cumulative inaccuracy measure based on double-sided truncation

Jalayeri, S. ¹ and Khorashadizadeh, M. ²

^{1,2} Department of Statistics, University of Birjand

Abstract

In this paper, some characteristics of weighted cumulative residual (past) inaccuracy for truncated random variables investigated based on two generalization of Shannon entropy (cumulative entropy by Rao, et al, 2004 and Kerridge's inaccuracy by Kerridge, 1961). Several characteristics, including monotonicity, bounds and their relations to proportional (reversed) hazard model obtained for left, right and double-sided truncation random variables.

Keywords: Cumulative residual (past) inaccuracy, Inaccuracy measure, Interval cumulative residual inaccuracy, Weighted interval cumulative residual inaccuracy, Proportional (reversed) hazard model.

¹samirajalayeri@yahoo.com

²m.khorashadizadeh@birjand.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Coherent systems with heterogeneous components

Kelkinnama, M. ¹

Department of Mathematical Sciences, Isfahan University of Technology

Abstract

In this paper, we study the aging properties and stochastic ordering of coherent systems with heterogeneous components which components lifetime distributions follow the proportional hazard rate models. The results are based on the new concept of the survival signature.

Keywords: Coherent system, Survival signature, Heterogeneous components, Stochastic orders, Aging properties.

¹m.kelkinnama@cc.iut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Stochastic comparisons of coherent systems

Khaledi, B. ¹ and Amini-Seresht, E. ²

¹ Department of Statistics, Razi University

² Department of Statistics, Bu-Ali Sina University

Abstract

The purpose of this talk is to present some stochastic ordering results among the lifetimes of two coherent systems consisting of two different sets of i.i.d. component lifetimes with the same signature vector in the sense of the hazard rate order, the reversed hazard rate order and the likelihood ratio order. Next, these comparisons results are combined into the known results in the literature to get more general results, in which the two systems have two different sets of component lifetimes as well as two different signature vectors.

Keywords: Stochastic orders, Coherent systems, Signature.

¹bkhaledi@hotmail.com

²e.amini@basu.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Comparison of coherent systems using reverse mean residual order

Khaleghpanah Nooghabi, E.¹ Rezaei, M.² and Chahkandi, M.³

^{1,2,3} Department of Statistics, University of Birjand

Abstract

The performance ordering of the coherent systems is well known topic in the reliability. Many works and researches in different criteria have been done. Now, we are interested in ordering the coherent system with dependent identical distributed components in terms of reversed mean residual lifetime. The results are based on the representation of the system distribution as a distorted distribution function of the common components' distribution.

Keywords: Distortion, Reverse mean residual lifetime, Stochastic order, Copula.

¹e.khaleghpanah@birjand.ac.ir

²mjrezaei@birjand.ac.ir

³mchahkandi@birjand.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some monotonicity properties of mean residual life of a k -out-of- n system with nonidentical components

Khanjari Sadegh, M. ¹ and Mohammadzadeh, T. ²

^{1,2} Department of Statistics, Faculty of Mathematical Sciences and Statistics,
University of Birjand

Abstract

This article considers some monotonicity properties of the residual life and the mean residual life (MRL) of a k -out-of- n System in two cases, when all components of the system are working, also when the failed components of the system are known. We assume that the lifetimes of the system components are independent random variables but not necessarily identically distributed (inid), extending some results in literatures.

Keywords: Mean residual life, k -out-of- n System, Inid components, IFR, DFR.

¹mkhanjari@birjand.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Predicting the lifetime of a k -out-of- $n:F$ system in the presence of an outlier

Khatib Astane, B. ¹

Department of Statistics, University of Neyshabur

Abstract

Consider a k -out-of- $n:F$ system which the lifetimes of the components are not identically distributed such that there is only one outlier. Based on an observed data set, the prediction problem of the lifetime of the system is investigated in this paper. The exponential distribution is used to obtain the results in details. Finally an illustrative example is presented.

Keywords: Order statistics, Single outlier model, Proportional hazard rate model, Exponential distribution.

¹khatib_b@neyshabur.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some reliability measures in general form of distributions

Khorashadizadeh, M. ¹

¹ Department of Statistics, University of Birjand

Abstract

In this paper, some properties of concepts in reliability such as log-odds rate, proportional hazard model and stress- strength model are studied in a general form of distributions.

Keywords: Hazard rate function, Reversed hazard rate function, Log-odds rate function, Stress-Strength model.

¹m.khorashadizadeh@birjand.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Assessing effect of ranking quality in parametric reliability estimation based on ranked set samples

Mahdizadeh, M.¹

Department of Statistics, Hakim Sabzevari University

Abstract

This article deals with reliability estimation from exponential population when data are collected by ranked set sampling. Performances of some estimators in the presence of ranking errors are compared with that of the usual estimator in simple random sampling.

Keywords: Covariate information, Judgment ranking, Stress-strength model.

¹mahdizadeh.m@live.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Semiparametric regression for mean past lifetime

Mansourvar, Z. ¹ and Asadi, M. ²

^{1,2} Department of Statistics, University of Isfahan

Abstract

The mean past lifetime measures the expected time elapsed since the failure of a subject till the time of observation. In the presence of covariates, regression models are needed to study the association between the mean past lifetime function and potential regression covariates. In this paper, we propose the proportional mean past life model for fitting survival data under left censoring. To estimate the model parameters, martingale estimating equations are developed, and the asymptotic properties of the resulting estimators are established.

Keywords: Counting process, Martingale estimating equation, Mean past lifetime, Proportional model, Reversed hazard rate.

¹z.mansourvar@sci.ui.ac.ir

²m.asadi@sci.ui.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



On a dynamic L_2 distance with applications

Mehrali, Y. ¹ and Asadi, M. ²

^{1,2} Department of Statistics, University of Isfahan

Abstract

In this paper, we propose a dynamic form of L_2 distance between the probability distributions of two nonnegative continuous random variables. We investigate some properties of the proposed measure and explore its relation with some well known stochastic and aging concepts. Empirical results are also presented leading to an estimator for the proposed criterion. The results are then employed to compare two probability distributions based on real data sets.

Keywords: Aging, Information measures, Residual life, Stochastic ordering.

¹yasermehrali@gmail.com

²m.asadi@sci.ui.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Planning of step-stress accelerated degradation test with dependent competing risks

Mireh, S.¹ Khodadadi, A.² and Haghghi, F.³

^{1,2} Department of Statistics, Faculty of Mathematical Sciences, Shahid Beheshti University

³ Department of Mathematics, Statistics and Computer Science, University of Tehran

Abstract

Today, many products are designed to function for a long period of time before they fail. For such highly-reliable products, collecting step-stress accelerated degradation test (SSADT) data can provide useful reliability information. SSADT is more useful for developing products when there is inadequate knowledge for test conditions. Some efficient SSADT plans have been proposed when the underlying failure modes are independent. However, how to design an efficient SSADT plan for the dependent failure modes with linear degradation data is still a problem to be solved. The aim of this paper is to provide an SSADT plan for these cases. Copulas are used to describe the dependence between failure modes. Finally, we use the proposed method to deal with the SSADT design with dependent failure modes for a real data set and a simulation study.

Keywords: Competing risk, Copula function, Linear degradation, Reliability function, Step-stress accelerated degradation test.

¹s_mireh@sbu.ac.ir

²a_khodadadi@sbu.ac.ir

³haghghi@khayam.ut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Inactivity time of consecutive k -out-of- n system under double monitoring

Miri, M. ¹ and Salehi, E. ²

^{1,2} Department of Statistics, Birjand University of Technology

Abstract

The consecutive k -out-of- n systems are important structures in reliability engineering due to their applications in various real life situations. In this paper, we study the inactivity time of these systems under the condition that the total number of failed components at time t_1 is r , and at time t_2 ($t_1 < t_2$) the system failed. We obtain explicit expressions for the survival function of the corresponding inactivity time when the components are exchangeably dependent.

Keywords: Inactivity time, Exchangeable, Reliability, Coherent system.

¹miri-stu@birjandut.ac.ir

²salehi@birjandut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Bayesian estimation for the STH distribution based on type II censored data

MirMostafaei, S.M.T.K.¹ and Mahdizadeh, M.²

¹ Department of Statistics, University of Mazandaran

² Department of Statistics, Hakim Sabzevari University

Abstract

In this paper, we consider type II right censored order statistics from the STH distribution which is a lifetime distribution. The maximum likelihood estimation is discussed. Then, we focus on the problem of Bayesian estimation of the unknown parameter. Since the integral related to the Bayes estimate can not be obtained explicitly, we propose the Markov chain Monte Carlo technique to derive the result. A real data example ends the paper.

Keywords: Bayesian estimation, MCMC technique, Censoring.

¹m.mirmostafaei@umz.ac.ir

²mahdizadeh.m@live.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



A look at the upper and lower means in reliability framework

Mirzaei, S. ¹

Department of Statistics, Payame Noor University

Abstract

In this work, a relation between the some notions in reliability and the upper and lower means is established. The similarity between income inequality curves and the upper and lower means gives the idea of connecting economy and reliability. So, we also refer the relationship between the Zenga new inequality curve and some uncertainty measures. The result is illustrated with several models commonly used in informetrics, such as exponential, Pareto and lognormal.

Keywords: Mean residual life, Mean waiting time, Zenga curve, Upper and lower means.

¹sh_mirzaee@pnu.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



The connection between inequality measures and reliability aspects

Mohtashami Borzadaran, G. R.¹ Behdani, Z.² and Sadeghpour Gildeh, B.³

^{1,2,3} Department of Statistics, Ferdowsi University of Mashhad

Abstract

The economic and social studies contain many parametric models for Lorenz curve. The Lorenz curve and Gini index were defined by Lorenz (1905) and Gini (1912) respectively are helpful and popular tools for measuring income or wealth. After them many extension and inequality measures are achieved in view of them. Also, Lorenz order and related partial order are applied and modified for comparison of income distributions up to now. The concept of total time on test and aging criteria such as IFR, IFRA, NBU, HNBUE, ... have an important role in reliability. The inequality curves and indices and some links with reliability aging and TTT transform curve are concentrated in this talk. Characterizing aging properties via using inequality curves and partial ordering discussed here also. Basic notes of TTT order, convex (increasing convex) total time on test transform order and total time on test in average (TTTA) are applied in view of inequality measures. Dispersive ordering and inequality ordering and also characterizing right spread order via increasing convex order studied. Application and a sample view and their relations with inequality measures is the last part of this work.

Keywords: Aging class, Total time on test transform, Lorenz curve, Gini index, Statistic order, Lorenz order.

¹grmohtashami@um.ac.ir

²zbehdani@yahoo.com

³sadeghpour@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Reliability of a k -out-of- $n:F$ degradation system

Nezakati, E. ¹ and Razmkhah, M. ²

^{1,2} Department of Statistics, Ferdowsi University of Mashhad

Abstract

In this paper, a k -out-of- $n:F$ system with degrading components is considered. Likelihood and reliability function is derived based on degradations and the effect of presence a cold standby component is investigated on the reliability and parameter estimates. The gamma process is assumed for degradation of active and standby components. Finally the results are illustrated via a real data set.

Keywords: Cold standby component, Gamma process, Likelihood function, Reliability.

¹nezakati-e@mail.um.ac.ir

²razmkhah_m@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



The stress-strength reliability under the environmental factors

Pakdaman, Z. ¹ and Ahmadi, J. ²

^{1,2} Department of Statistics, Ferdowsi University of Mashhad

Abstract

Environmental factors such as temperature, humidity, dust, fumes or corrosive agents often have considerable influence on system reliability characteristics. In this paper, we assume that the effect of the environmental factors on the system can be modelled by a distortion function and under this assumption the stress-strength reliability is studied. Also, the dynamic stress-strength reliability and the number of working components of static stress-strength system are considered.

Keywords: Stress-strength reliability, Distortion function, Distorted probability distribution.

¹pakdaman.zohreh@stu.um.ac.ir

²ahmadi-j@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



On Gini-type index applications in reliability analysis

Parsa, M. ¹ Di Crescenzo, A. ² and Jabbari, H. ³

^{1,3} Department of Statistics, Ferdowsi University of Mashhad

² Dipartimento di Matematica, Università degli Studi di Salerno

Abstract

The reliability scientists have always investigated the ageing properties of different systems structures and for this reason utilizing applicable tools is vitally important. The Gini-type index is an applicable diagnostic tool to realise the ageing properties of lifetime variables. In this paper Gini-type and its properties are studied. Besides different illustrative examples are given for further intuition. Later, a new stochastic order in terms of Gini-type index is introduced to compare the speed of ageing of components and systems.

Keywords: Reliability, Ageing properties, Stochastic comparisons.

¹parsa.motahareh@mail.um.ac.ir

²adicrescenzo@unisa.it

³jabbarinh@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Optimum maintenance policy for a system with three types of failures

Safaei, F. ¹ and Ahmadi, J. ²

^{1,2} Department of Statistics, Ferdowsi University of Mashhad

Abstract

Consider a system subject to three types of failures with different rate functions and different costs in which repairs and replacement. The type *I* and *II* failures arrive according to a non-homogeneous Poisson process where type *I* can be repair $(k - 1)$ times by a minimal repair policy. We suppose that type *III* of failure is catastrophic failure and the system should be replaced with a new one. We are interested in determining an optimal planned replacement time which minimizes the expected discounted costs.

Keywords: Minimal repair, Non-homogeneous Poisson process, Optimal replacement.

¹safaei_fa123@yahoo.com

²ahmadi-j@um.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Reliability of random complex networks based on percolation theory

Sajadi, F. ¹

Department of Statistics, University of Isfahan

Abstract

In this paper we evaluate the reliability of a complex network using concepts of percolation theory by regarding the network failure as a percolation process. The critical threshold of percolation can be used as network failure criterion. In particular we consider complex systems which can be modeled as a general inhomogeneous random graphs.

Keywords: Complex network, Random graph, Percolation threshold, Network reliability.

¹f.sajadi@sci.ui.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Non-parametric estimation of bivariate MRL and QRL functions

Shafaei Noughabi, M. ¹

Department of Mathematics and Statistics, University of Gonabad

Abstract

When we deal with dependent pairs of lifetimes, estimation of bivariate mean residual life (BMRL) and bivariate α -quantile residual life (α -BQRL) functions may play a key role in survival analysis. We present the empirical non-parametric estimators of them based on complete data and discuss their main asymptotic properties. We have a real data example to illustrate their applications.

Keywords: Bivariate mean residual life , Bivariate α -quantile residual life, Empirical estimator.

¹mohamad.shafae@gmail.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some results on comparing the mean residual life functions of two groups

Sharafi, M.¹

Department of Statistics, Razi University

Abstract

The mean residual life (MRL) function or remaining life expectancy function at age t is defined to be the expected remaining life given survival to age t . In this paper, we first propose two new tests for comparing mean residual life functions of two populations. We also obtain some results on limit theorems under null and fixed hypothesis. Finally, some examples is presented for illustration and is discussed about comparing powers of proposed test statistics.

Keywords: Asymptotic distribution, Brownian motion process, Convergence, Mean residual order, Nonparametric test.

¹m.sharafi@razi.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Doubly truncated (interval) quantile Shannon entropy

Shokrani, A. ¹ and Khorashadizadeh, M. ²

^{1,2} Department of Statistics, University of Birjand

Abstract

It is well known that Shannon's entropy plays an important role in the measurement of uncertainty of probability distributions. Also, in statistical modelling and analysis of data there is an equivalent and alternate approach, through the quantile function (QF), which is very important in exploratory data analysis and in many other areas of applied statistics. In the present paper, we introduce and study quantile version of the Shannon entropy functions in doubly truncated (interval) lifetime, which includes the residual and past lifetimes as special case.

Keywords: Shannon entropy, Quantile function, Generalized failure rate, Quantile doubly truncated Shannon entropy.

¹afsaneshokrani@gmail.com

²M.Khorashadizadeh@Birjand.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Fuzzy non-parametric predictive inference for the reliability of k -out-of- m systems

Shokri, S. ¹ Sadeghpour-Gildeh, B. ² Mohtashami Borzadaran, G.R. ³

and Fathi Vajargah, B. ⁴

¹ Department of Statistics, International Campus, Ferdowsi University of Mashhad

^{2,3} Department of Statistics, Ferdowsi University of Mashhad

⁴ Department of Statistics, Faculty of Mathematical Sciences, University of Guilan

Abstract

The aim of this paper is to present a new method for evaluating the reliability of k -out-of- m systems, titled the fuzzy non-parametric predictive inference. With this end in view, this paper presents fuzzy, lower and upper probabilities for the reliability of k -out-of- m systems. For the sake of reaching this aim, attention has been restricted to the k -out-of- m systems with exchangeable components. Moreover, the problem of evaluating system reliability based on nonparametric predictive inferential (NPI) approach has been considered in this paper, in which defining the parameters of reliability function as crisp values is not possible, and parameters of reliability function are described with the use of a triangular fuzzy number. Formula of a fuzzy reliability function and its α -cut set are also presented. Moreover, the fuzzy reliability of structures is defined on the basis of fuzzy numbers, and the fuzzy reliability functions of k -out-of- m systems are discussed. Finally, some numerical examples are presented to illustrate how to calculate the fuzzy reliability function and its α -cut set.

Keywords: k -out-of- m systems, Lower and upper probabilities, Nonparametric predictive inference, Fuzzy number.

¹soheilshokri@yahoo.com, sadeghpour@um.ac.ir, grmohtashami@um.ac.ir, fathi@guilan.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Cumulative residual inaccuracy in upper record values

Tahmasebi, S.¹ Daneshi, S.² and Salehi, M.³

^{1,3} Department of Statistics, Persian Gulf University

² Department of Statistics, Faculty of Mathematics, Shahrood University of Technology

Abstract

In this paper, we propose a measure of cumulative residual inaccuracy between distribution of the n th upper record value and parent distribution F . We discuss some reliability properties of the proposed measure.

Keywords: Cumulative residual inaccuracy; Upper record values; Measure of inaccuracy.

¹tahmasebi@pgu.ac.ir

²stahmasby@yahoo.com

³sdaneshi445@gmail.com



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Endogeneity problem in recurrent event data analysis

Tavakoli Dinani, Z. ¹ and Rikhtehgaran, R. ²

^{1,2} Department of Mathematical Sciences, Isfahan University of Technology

Abstract

In this paper, we analyze recurrent event data in the framework of mixed-effects models to control the between and within subject variabilities among observations. We assume that longitudinal variables are informative for the analysis of recurrent data and thus are considered as covariates in the structure of underlying mixed-effects model. Since longitudinal variables are stochastic, they may be correlated with the random effects. This correlation causes biased estimates of regression coefficients. To solve this problem, we propose jointly modelling of longitudinal and recurrent event data in the framework of shared-random effects models. Bayes estimates of model parameters are achieved by the use of Gibbs sampling algorithm. A simulation study is conducted to show the performance of the proposed model.

Keywords: Endogeneity, Gibbs sampler, Longitudinal data, Mixed-effects models, Recurrent event data.

¹z.tavakoli@math.iut.ac.ir

²r_rikhtehgaran@cc.iut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



Some new results for weighted distributions

Velayati-Yazdsefat, P. ¹ and Salehi, E. ²

^{1,2} Department of Basic Sciences, Birjand University of Technology

Abstract

In this paper, we derive some new results on preservation properties of the star shaped, moment-generating-function and Laplace transform orders under weighted distributions. Then we apply the obtained results to establish our results about preservation of the new better (worse) than used in star shaped; NBUS (NWUS), new better (worse) than used in the moment-generating-function; NBU_{mgf} (NWU_{mgf}) and new better (worse) than used in Laplace transform, NBUL (NWUL) classes for weighted distributions.

Keywords: Residual lifetime, Stochastic order, Aging class, Weighted distribution, Reliability.

¹parham.amari@gmail.com

²salehi@birjandut.ac.ir



Third Seminar on
Reliability Theory and its Applications
May 16-17, 2017



An algorithm to assess t-signature

Zarezadeh, S. ¹ and Siavashi, M. ²

^{1,2} Department of Statistics, Shiraz University

Abstract

Due to the importance of *signature* vector in studying the reliability of networks, some researchers explored the problem of signature estimation. The signature is used when at most one link may fail at each time instant. Recently, the concept of t-signature has been defined to get the reliability of network for the case where the failure of more than one link is possible at each time instant. The t-signature is a probability vector and depends only on the network structure. In this paper, we propose an algorithm to compute the t-signature. The performance of the proposed algorithm is evaluated for some networks.

Keywords: Network reliability, BFS algorithm, Signature.

¹s.zarezadeh@shirazu.ac.ir

²m.siavashi@cse.shirazu.ac.ir