In the Name of God

The 10th Seminar on Probability and
Stochastic Processes

The Abstracts of Papers

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Preface

This volume contains the abstracts of contributed articles at the 10th Seminar on Probability and Stochastic Processes (SPSP10) in Iran. The Seminar on Probability and Stochastic Processes is a two days event held every two years with cooperation of the Iranian Statistical Society. The SPSP10 organized jointly by Yazd University and the Iranian Statistics Society, is taking place from 19th to 20th of August at Yazd University. The organizing committee of the SPSP10 warmly welcomes the participants to the historical city of Yazd, hoping that their stay in Yazd will be happy and fruitful one. More than 300 participants have taken part in this seminar. Out of 310 articles, 106 articles are selected for oral presentation and 122 articles are selected for poster presentation by the scientific committee of the seminar. We have made every effort to make the seminar as worthwhile as possible.

Acknowledgement

We wish to express out thanks to all whose help has made this gathering possible. In particular we would like to express our gratitude to the administration of Yazd University and Iranian Statistical Society. We gratefully acknowledge the careful efforts of our staff in the Department of Statistics at Yazd University. We also wish to thank all organizations for their great educational as well as financial support in holding SPSP10.

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Masuod Yarmohammadi
Stochastic comparisons of Harris family

S. Abbasi ¹, M. H. Alamatsaz ²

¹,²Department of Statistics, University of Isfahan, Isfahan

Abstract: Harris family of distributions is a known class of extended distributions of the lifetime of a series system with variable number of components. In this paper, we show that several stochastic orderings are preserved by transformation to Harris family. Our results happen to enfold several previous findings regarding the Marshall-Olkin family in this connection.

Keywords: Ageing intensity ordering, Harris family, Marshall-Olkin distribution, Proportional stochastic ordering


¹Speaker’s Name: Somayeh Abbasi s_abbasi_29@yahoo.com
Stochastic orderings of the extended generalized exponential distribution

Maliheh Abbasnejad

Department of Statistics, Hakim Sabzevari University

Abstract: Recently a new distribution, named as extended generalized exponential distribution has been introduced by Kundu and Gupta (2011). In this paper investigate some famous orderings of the extended generalized exponential distribution. Also the expressions of various uncertainty measures of EGE distribution are presented and entropy orderings are discussed.

Keywords: likelihood ratio ordering, dispersion ordering, hazard rate ordering, entropy.

Estimation of stress-strength reliability based on generalized Rayleigh records

M. Abdi\textsuperscript{1}, A. Asgharzadeh\textsuperscript{2}

\textsuperscript{1}Department of Statistics, Higher Education Complex of Bam, Bam, Iran
\textsuperscript{2}Department of Statistics, University of Mazandaran, Babolsar, Iran

\textbf{Abstract:} This paper considers the estimation of the stress-strength reliability based on two-parameter generalized Rayleigh lower records. The maximum likelihood and Bayes estimators are derived. Bayesian credible interval and two bootstrap confidence intervals are also proposed. Finally, the analysis of a real data set has been presented for illustrative purposes.

\textbf{Keywords} Bayes estimator, Bootstrap confidence intervals, Generalized Rayleigh distribution, Maximum likelihood estimator.

\textbf{Mathematics Subject Classification (2010):} 62F10, 62F15, 62N05.
Modelling Cluster Detection in Spatial Scan Statistics: Formation of Spatial Poisson Scanning Window and An ADHD case study

S. M. Aboukhamseen\textsuperscript{1}, A. R. Soltani\textsuperscript{2}

\textsuperscript{1,2}Department of Statistics and Operations Research, Faculty of Science, Kuwait University, Kuwait.

\textsuperscript{2}Department of Statistics Shiraz University, Shiraz, Iran.

Abstract:

In this article we present a testing procedure for spatial scan statistics when the underlying population characteristics are not known. Specifically, the test procedure is designed for the situation when the number of affected cases in the population is random. We further assume that the number of contaminated case in the geographic region of interest follows a Poisson distribution. Then, under the null assumption of no cluster, we prove that the scanning window detecting contaminated cases is indeed a specific homogeneous spatial Poisson point process on the zones that constitute the region of interest. We then proceed to formulate an effective cluster detection testing procedure together with confidence intervals for the parameters of interests. We apply our procedure to the interesting and intensive real case study of detecting clusters of school-aged children diagnosed with attention deficit hyperactivity disorder (ADHD) in the State of Kuwait. We observe that geographic boundaries defining ethno-social groups are significant in determining ADHD prevalence among school-aged children in the State of Kuwait.

\textsuperscript{2}A. R. Soltani: soltani@kuc01.kuniv.edu.kw
Wavelet Shrinkage Estimation Of Regression Function Based on Maximum A Posterior

Mahmoud Afshari\textsuperscript{1}, Behzade Gholizadeh\textsuperscript{2}

\textsuperscript{1}Department of Statistics, College of Science, Persian Gulf University, Bushehr, Iran
\textsuperscript{2}Ph.d Student of Persian Gulf University

\textbf{Abstract}: Using wavelets is one of ways of estimating regression function. In this paper the wavelet shrinkage estimator of nonparametric regression function are considered. We applying the appropriate prior distributions and value of thresholding base on maximum a posterior to obtain the purpose estimator.

\textbf{Keywords}: Nonparametric Regression, Wavelet Transformation, Shrinkage, Prior distribution, Maximum A Posterior, Thresholding.

\textbf{Mathematics Subject Classification (2010)}: 62G08 65T60 62F15.
On the Entropy Rate of Stationary Markov Chains

Mansour Aghababaei Jazi 1, Hasan Zarei2

1,2Department of Statistics, University of Sistan and Baluchestan, Zahedan, Iran

Abstract: In this paper we consider the entropy rate of (stationary) Markov chains and integer valued autoregressive processes as a special case. We study the rate for some orders and extend the result to general order.

Keywords Convolution, Entropy, Markov chain.

Mathematics Subject Classification (2010): 94A15, 60J10.

1 aghababaei@math.usb.ac.ir
On Distribution of the Sum of Dependent Random Variables

Najmeh Ahmadi\textsuperscript{1} and Ali Dolati\textsuperscript{2}

\textsuperscript{1}Department of Statistics, College of Sciences, Shiraz University, 71454 Shiraz, Iran. stat.nahmadi@gmail.com
\textsuperscript{2}Department of Statistics, College of Mathematics, Yazd University, 89195–741, Yazd, Iran. adolati@yazd.ac.ir

Abstract: Mathematical probability theory interested to the computation of distribution of the sum of random variables. It is well known that the distribution of sum of random variables is the convolution of marginal distributions in the case of independence; no general characterization has been given to the general case of sum of dependent random variables. In this paper, we find expression for distribution of the linear combination of two dependent random variables in terms of their associated copula. We also study the effect of dependence structure on the distribution of them. Several examples illustrate our result.

Keywords Convolution, dependent random variables, Copula.

Mathematics Subject Classification (2010): 60E05.
A Bayesian method for bandwidth choice with length-biased data

Masoud Ajami bakhtyarvand
Vali-e-Asr University of Rafsanjan

Abstract: In sampling, arisen data with probability proportional to its length is called Length-biased. Nonparametric density estimation in length-biased sampling is more difficult than other states. A local bandwidth selection method in the smoothed kernel estimation framework was performed in length-biased data by. In this paper, we introduce a new estimator, supposing the bandwidth as a random variable, following inverted gamma prior distribution and it is estimated in Bayesian approach with the lognormal kernel that is proved the pointwise strong consistency of this estimator. Then, the results obtained from the simulation study, carried out to assess a new proposed estimator is compared with the estimator shown by. The noticeable result in this study is that the proposed estimation perform better than that estimator.

Keywords Bayesian Approach, Kernel Density Estimator, Lognormal Kernel, Local Bandwidth Parameter, Monte carlo method.

Mathematics Subject Classification (2010): 62Fxx.
On the Nonparametric Estimation of Hazard Quantile Function in Length-Biased Sampling

M. Akbari ¹, S. Jomhoori and M. Rezaee
Department of Statistics, School of Mathematics and Statistics,
University of Birjand, P.O.Box: 97175-615.
Department of Statistics

Abstract: In this article, a smooth estimator of the hazard quantile function under length-biased sampling is defined and its asymptotic properties are studied. Some simulation results are presented to show performance of this estimator.

Keywords: Hazard quantile function, Length-biased sampling, Quantile density function, Quantile function.


¹M. Akbari: mahboobe_akbari@birjand.ac.ir
Survey to Gene Network Interaction in Microarray Data Analysis

H. Alavi majd¹, A. Talebi ², A. Dolati ³ and K. Gilani ⁴

¹ Professor of Shahid Beheshti University of Medical Sciences, Department of Biostatistics, School of Paramedical Sciences, Tehran, Iran
² PhD Student of Biostatistics Department, School of Paramedical Sciences, Students research committee, Shahid Beheshti University of Medical Sciences, Tehran
³ Assistant Professor of Yazd University, Department of Statistics, Yazd
⁴ Reproductive Biotechnology Research Center, Avicenna Research Institute, ACECR, Tehran

Abstract: Many biological research fields such as cellular and molecular function design need to gene regulatory networks to provide obvious insight and understanding of the biological process, molecular function and cellular component in living cells. These interactions among the genes and their products play an important role in molecular processes. Because of its importance, several computational techniques have been suggested to infer gene regulatory networks from gene expression data. In this review study, three inference methods are discussed: Bayesian network, Boolean network, Correlation coefficient methods. These approaches are discussed in terms of introduction, methodology and recent applications of these approaches in gene regulatory network construction. These approaches are also compared in the discussion section. Moreover, the strengths and weaknesses of these computational techniques are described.

Keywords: Gene regulatory network, Bayesian network, Boolean network, Pajek software.

An asymmetric Markov switching GARCH model: estimation and forecasting

N. Alemohammad¹, S. Rezakhah² and S. Hosseinalizadeh ³ ²

¹Department of Mathematics and Computer Science, Shahed University, Tehran,
²Faculty of Mathematics and Computer Science, Amirkabir University of Technology, Tehran, Iran.
³Department of Computer Engineering and Information Technology, Qazvin Branch, Islamic Azad University, Qazvin, Iran

Abstract: In this paper an extension of Markov switching GARCH model is proposed to model leverage effect, conditional heteroscedasticity and nonlinearity attributes of financial time series. Greedy Gibbs Bayesian learning method is used to estimate the parameters of the model. Due to the complexity of the model a dynamic programming algorithm for forecasting is proposed. Finally we illustrate the model on S&P500 daily returns.

Keywords: GARCH models, Markov switching, Forecasting, Bayesian inference, Griddy Gibbs sampling.

Mathematics Subject Classification (2010): 60J10, 62M10, 62F15.
A Sufficient Condition for Absolute Continuity of the Distribution of Lévy Processes

Kasra Alishahi¹, Erfan Salavati²
¹,²Department of Mathematical Sciences, Sharif University of Technology.

Abstract: We consider pure jump Lévy processes with discrete and symmetric Lévy measure and study the absolutely continuity of their distribution with respect to Lebesgue measure. We prove that if \( \eta(r) = \int_{|x|<r} x^2 \nu(dx) \) where \( \nu \) is the Lévy measure, then \( \int_0^1 \frac{r}{\eta(r)} dr < \infty \) is a sufficient condition for absolute continuity. As far as we know, our result is not implied by existing results about absolute continuity of Lévy processes.

Keywords: Lévy Processes, Absolute Continuity, Coupling.

Probabilistic Constructions of Low Discrepancy via Determinantal Processes

Kasra Alishahi\textsuperscript{1}, Mohammadasadegh Zamani\textsuperscript{2}

\textsuperscript{1,2}Department of mathematics, Sharif University of Technology, Tehran, Iran

\textbf{Abstract:} The discrepancy problem, in its classical form refers to the problem of distributing points in some space such that they are evenly distributed with respect to some (mostly geometrically defined) subsets. The discrepancy measures how far a given distribution deviates from an ideal one. Determinantal processes are point processes with correlation functions representable as some determinants. These processes have wide applications in physics, combinatorics and probability theory. A common feature of determinantal processes is the repulsion between points. We see that this property can be exploited to construct configurations with low discrepancy in both geometric and combinatorial settings.
An alternative to general record models: dynamic after-selection estimation

Morteza Amini¹, Nader Nematollahi ²

¹ Department of Statistics, School of Mathematics, Statistics and computer Science, College of Science, University of Tehran, P.O. Box 14155-6455, Tehran, Iran
² Department of Statistics, Allameh Tabataba’i University, Tehran, Iran

Abstract: We introduce the problem of estimation of the parameters of a dynamically selected population in an infinite sequence of random variables and provide its application in the statistical inference based on record values from a non-stationary scheme.

Keywords General record models, Selected population, Uniformly minimum variance unbiased estimator.

Truncated unified skew-elliptical distributions with application to order statistics

Mehdi Amiri¹, Ahad Jamalizadeh², Seyyed Roohollah Roozegar³

¹Department of Statistics, Hormozgan University, Bandar Abbas, Iran
²Department of Statistics, Faculty of Mathematics & Computer, Shahid Bahonar University of Kerman, Kerman, Iran
³Department of Mathematics, Yasouj University, Yasouj, Iran

Abstract: We introduce here the truncated version of the unified skew-elliptical (SUE) distributions. By considering special truncations, the joint distribution of consecutive order statistics from an elliptical random vector were derived as the mixture of truncated SUE distributions. This results were applied to determine some measures in the reliability theory.

Keywords: Truncated unified skew-elliptical distribution, Order statistics, Singular unidied skew-normal distribution.


¹Speaker’s Name: me.amiry@gmail.com
Optimal risk allocation in a market with non-convex preferences

Hirbod Assa²
University of Liverpool

Abstract: The aims of this study are twofold. First, we consider an optimal risk allocation problem with non-convex preferences. By establishing an infimal representation for distortion risk measures, we give some necessary and sufficient conditions for the existence of optimal and asymptotic optimal allocations. We will show that, similar to a market with convex preferences, in a non-convex framework with distortion risk measures the boundedness of the optimal risk allocation problem depends only on the preferences. Second, we consider the same optimal allocation problem by adding a further assumption that allocations are co-monotone. We characterize the co-monotone optimal risk allocations within which we prove the "marginal risk allocations" take only the values zero or one. Remarkably, we can separate the role of the market preferences and th

²Hirbod Assa: assa.hirbod@gmail.com
Distribution of a random sum of exponential random variables

A. Asgharzadeh\textsuperscript{1}, M. Habibi\textsuperscript{12}

\textsuperscript{1} Department of Statistics, School of Mathematical Sciences, University of Mazandaran, Post code 47416-1467, Babolsar, Iran

Abstract: Let \( W_1, \ldots, W_n \) denote the lifetimes of the \( n \) components of a standby system. Then \( X = \sum_{i=1}^{n} W_i \) is the lifetime of the standby system. In this paper, we consider the distribution of \( X \), when the lifetimes components are independent exponential random variables and the number of components in the system is random and follows a discrete uniform distribution. The statistical properties of the distribution are studied. Estimation of the unknown parameters are discussed by the maximum likelihood method. The usefulness of the distribution is illustrated by one real data set.

Keywords. Standby system, Exponential distribution, Uniform distribution, Maximum likelihood estimator. Mathematics Subject Classification (2010): 62F10, 62F15, 62N05.
Ordering Results for Aggregate Claim Amounts from Two Heterogeneous Marshall-Olkin Extended Weibull Portfolios and their Applications in Insurance Analysis

Ghobad Barmalzan\textsuperscript{1}, Abedin Haidari, Amir T. Payandeh Najafabadi
Department of Mathematical Sciences, Shahid Beheshti University, G.C. Evin, Tehran, Iran

Abstract: In this work, we discuss the stochastic comparison of two classical surplus processes in an one-year insurance period. Under the Marshall-Olkin extended Weibull random aggregate claim amounts, we establish some new sufficient conditions for the comparison of aggregate claim amounts in the sense of the usual stochastic order (which implies stop-loss order).

Keywords: Usual Stochastic Order, Stop-Loss Order, Multivariate Chain Majorization, Aggregate Claim Amounts.

Mathematics Subject Classification (2010): 62N05.

\textsuperscript{1}Ghobad Barmalzan: gh-barmalzan@sbu.ac.ir
On the analysis of the two parameter exponential distribution based on progressive type II censored data

R. Arabi Belaghi, H. Bevrani, M. Mohammadi

Department of Statistics, Faculty of Mathematical Sciences, University of Tabriz, Tabriz, Iran

Abstract: In this study, the estimation of the two parameters exponential distribution based on progressive type II censored data were considered. The maximum likelihood (ML), penalized maximum likelihood (PML) and Bayes estimators assuming both of the location and scale parameters to be unknown were obtained. The results show that the PMLE is the same as uniformly minimum variance unbiased estimator (UMVUE). The mean square errors of proposed estimators both analytical and a Mont Carlo simulation study for different types of censoring schemes were computed. The simulation results revealed that the Bayes estimators outperforms the PMLEs. Further the PMLEs is superior to the MLEs.

Keywords: Bayes Estimators, Maximum Likelihood Estimators, Penalized Maximum Likelihood Estimators, Progressive Type II Censored Data.

Mathematics Subject Classification (2010): 62N01 62N02.

1M. Mohammadi: mojtabamohamadi8@gmail.com
A method for selecting generating OWA operator weights models

Alireza Chaji
Shohadaie Hovaizeh University of Technology, khuzestan, Iran

Abstract: In this paper, a new model based on a measure of entropy for obtaining the ordered weighted averaging (OWA) operators is introduced. In the model it is assumed that, according to the available information, the OWA weights satisfy inequality constraints. The model is solved according to some given constraints with specific level of orness comparing the results with other methods. The results demonstrate the efficiency of our model in generating the OWA operator.

Keywords: OWA operator, Operator weights, Maximum entropy.

Mathematics Subject Classification (2010): 94A17 47bxx 47B37.

1 Alireza Chaji : chajialireza@iust.ac.ir
A Note on the Parrondo’s Paradox

Ejlali, N\textsuperscript{1}, Pezeshk, H\textsuperscript{2} and Sadeghi, M\textsuperscript{3}.

\textsuperscript{1}Department of Statistics, Faculty of Mathematical Sciences, Shahid Beheshti University, G.C., Tehran.

\textsuperscript{2}School of Mathematics, Statistics and Computer Science, College of Science, University of Tehran, Tehran.

\textsuperscript{3}National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran 14155-6346.

\textsuperscript{2,3}School of Biological Sciences, Institute for Research in Fundamental Sciences (IPM), Tehran.

Abstract: Consider two losing games. When a player plays these games in a random or periodic strategy, one may expect to see a losing game. The Parrondo’s paradox arises when this combined game leads to a winning one. The original game was invented by Parrondo as a discrete-time version of flashing Brownian ratchet. It has applied in several fields such as economics, physical quantum systems, and population genetics. In this paper, we introduce a new version of paradox by considering a new rule for one of those games. The paradoxical property is shown by some computer simulations.

Keywords Parrondo’s paradox, losing game, winning game, randomized rule.

Mathematics Subject Classification (2010): 60J10,91A60
A normal-Poisson distribution: Theory and applications

Fatemeh Esfandiyari\textsuperscript{1,2} , Eisa Mahmoudi\textsuperscript{2}

\textsuperscript{1,2}Department of Statistics, Yazd University, Yazd, IRAN

Abstract: A new three-parameter distribution called the normal-Poisson (NP) distribution is introduced and studied in details. Some properties of the NP distribution is obtained such as moments and maximum likelihood estimators. The efficiency of this new distribution is illustrated through a real data set to show that it is quite flexible in comparing with the normal and skew normal distributions.

Keywords: Error function, Hazard function, Maximum likelihood estimation, Poisson distribution, Skew normal distribution.

Mathematics Subject Classification (2010): 60E05; 62H10; 62H12.

\textsuperscript{2}Speaker’s Name: Fatemeh Esfandiyari, f.esfandiyari89@gmail.com
American Contingent Claims with Extra Information for the Buyer

Neda Esmaeeli¹, Peter Imkeller²

¹Sharif University of Technology, Department of Mathematical Sciences, Tehran, Iran
²Humboldt-Universität zu Berlin, Institut für Mathematik, Berlin, Germany

Abstract: We consider an American contingent claim on a financial market where the buyer has additional information. Both agents observe the same prices but their information may differ due to some extra information that has been obtained by the buyer in other fashion. The reference information flow is denoted by the filtration \(F\) and the buyer’s information flow is modeled by an initial enlargement of the filtration \(F\). The problem for the buyer is to choose a payoff from the class \(\{R(\tau); \tau \in T\}\) which is optimal in the sense that it has a maximal expectation. As the buyer has more information, he has access to a larger set of available stopping times leading to a higher expected payoff. Therefore, it seems natural to investigate the value of the American contingent claim with asymmetric information. We provide a representation for this value in a suitable product space.

Keywords American contingent claims, Extra information, initial enlargements of filtrations.

Mathematics Subject Classification (2010): 60G40 60H30 62L15.
Reliability analysis of a semi-Markov repairable system

Malek Fathizadeh\textsuperscript{1}, Omid Kharazmi

Department of Statistics, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran.

Abstract: In this paper, we attempt to present the applications of Markov renewal matrix in reliability analysis of repairable systems. In this regard, a semi-Markov process with n-k+2 states is applied to model the system. A recursive formula is proposed for obtaining the associated Markov renewal matrix. Several important reliability measures such as expected number of working components, expect number of system recoveries, reliability function, mean time to first failure, mean time between failures, and etc. are obtained using the Markov renewal matrix.

Keywords: Laplace transform, Markov renewal matrix, Mean time to failure, Semi-Markov processes, Tridiagonal matrix.

Mathematics Subject Classification (2010): 60K15 90B25.

\textsuperscript{1}Malek Fathizadeh : m.fathi@vru.ac.ir
Improving in hybrid Monte Carlo via Halton sequence with increasing and decreasing informity

Behrouz Fathi-Vajargah ¹, Hamzeh Torabi ², Hojatollah Zakerzadeh ³
Ali.A.L.Zadeh ⁴

¹Department of Statistics, University of Guilan, Rasht, Iran
²,³,⁴ Department of Statistics, University of Yazd, Yazd, Iran

Abstract: The Monte Carlo is a good numerical method in estimation problems. In this paper we apply a new method by using MC method. This method is consisting of three steps. First step is selection number of sub intervals, in second step generating random numbers of uniform (0,1) distribution and third step we must conduct them to k sub interval (such that k is the number of optional sub intervals on (0,1)). Additional we use hybrid Monte Carlo for integral estimation. It is consist of Halton sequence and Monte Carlo or Halton sequence and partition Monte Carlo (PMC (is new method)).

Keywords low-discrepancy sequences, Halton sequence, Partition Monte Carlo, hybrid sequences, quasi-Monte Carlo integration.

Mathematics Subject Classification (2010): 11K45.

Speaker’s Name : Ali.A.L.Zadeh@stu.yazd.ac.ir
A Stochastic Control Approach to Optimal Pairs Trading When the Underlying Assets Have Correlated Jumps

Ali Foroush Bastani\textsuperscript{1}, Elnaz Ghasemi\textsuperscript{2}

\textsuperscript{1,2}Institute for Advanced Studies in Basic Sciences, Department of Mathematics

Abstract:

In recent years, quantitative trading methods have been adopted and implemented by many individual, retail and large institutional investors around the world. Algorithmic trading as a common theme of all these activities, utilizes very advanced mathematical models for making transaction decisions in the financial markets. Pairs trading is one of the most widely used tools in the algorithmic trading literature which dates back to the mid-1980s and involves forming a portfolio of two related stocks whose relative pricing departs from its equilibrium state. In this paper, we propose a stochastic control approach to the problem of pairs trading. We model the log relationship between a pair of stock prices as an Ornstein-Uhlenbeck process driven by a compound Poisson noise and use this to formulate a portfolio optimization as a continuous- time stochastic control problem. We obtain the optimal solution to this control problem via the corresponding Hamilton-Jacobi-Bellman equation. The approach is illustrated with a numerical example involving simulated data for a pair of stocks.

Keywords Algorithmic Trading, Pairs Trading, Stochastic Optimal Control, Hamilton-Jacobi- Bellman Equation.

\textsuperscript{1}Ali Foroush Bastani: bastani@iasbs.ac.ir
On lower bounds for the variance of functions of random variables with weighted distributions

F. Goodarzi, M. Amini and G. R. Mohtashami Borzadaran
Ferdowsi University of Mashhad

Abstract: In this paper, based on the obtained characterization via the lower bounds for the variance of a function of random variable $X$, we find a characterization of the weighted function corresponding to density function $f(x)$, in terms of Chernoff-type inequalities. Subsequently, by using the new characterization, we derive the lower bounds for the variance of a function of the weighted random variable. Moreover, assuming that $X$ is DFR [decreasing failure rate] we find an lower bound for the variance of this function with specific weight functions.

Keywords: Variance bounds, Chernoff inequality, Size-biased distribution, decreasing failure rate.
Mathematics Subject Classification (2010): 60E15.

\footnote{Faranak Goodarzi: f-goodarzi@kashanu.ac.ir}
Usual Stochastic Order Between Largest Claim Amounts and its Applications in Insurance

Abedin Haidari1, Ghobad Barmalzan and Amir T. Payandeh Najafabadi
Department of Mathematical Sciences, Shahid Beheshti University,

Abstract: Suppose $X_{\lambda_1}, \cdots, X_{\lambda_n}$ is a set of non-negative random variables with $X_{\lambda_i}$ having the distribution function $G(\lambda_i, t)$, $\lambda_i > 0$ for $i = 1, \cdots, n$, and $I_{p_1}, \cdots, I_{p_n}$ are independent Bernoulli random variables, independent of the $X_{\lambda_i}$'s, with $E(I_{p_i}) = p_i$, $i = 1, \cdots, n$. Let $Y_i = I_{p_i}X_{\lambda_i}$, for $i = 1, \cdots, n$. It is of interest to note that in actuarial science, it corresponds to the claim amount in a portfolio of risks. In this paper, we discuss the usual stochastic order between the largest claim amounts, $Y_{n:n}$, when the matrix of parameters $(h(p), \lambda)$ changes to another matrix in a mathematical sense. We then apply the results for a special case of the scale model, namely, generalized gamma distribution with possibly different scale parameters to illustrate the established results.

Keywords: Usual Stochastic Order, Largest Claim Amount, Multivariate Chain Majorization, Scale Model, Generalized Gamma Distribution.

Mathematics Subject Classification (2010): 62N05.

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1 Abedin Haidari: abedinhaidari@yahoo.com
Periodically correlated space-time autoregressive Hilbertian processes of order one

M. Hashemi $^2$, J. Mateu$^2$

$^1$Department of statistics, University of Isfahan, Khansar Unit, Isfahan, Iran
$^2$Department of Mathematics, university JAUME

Abstract: In this article, We consider periodically correlated space-time autoregressive processes in Hilbert spaces. We present here results involving existence, and the strong law of large numbers.

Keywords periodically correlated space time autoregressive Hilbertian processes, periodically correlated autoregressive Hilbertian processes, T-periodic sequences, strong law of large number Mathematics Subject Classification (2010): 60G20.
The inactivity time of the \((n - k + 1)\)-out-of-\(n\) system with exchangeable components under stress-strength models

Sh. Hashemi 1,2, E. Salehi 1

1 Department of Basic Science, Birjand University of Technology, Birjand, Iran

Abstract: In this paper, we consider a \((n - k + 1)\)-out-of-\(n\) system consisting of exchangeable components under stress-strength models. In following, the survival function of inactivity time of strengths of such systems is obtained. Finally, we present several properties of the mean inactivity time of a \((n - k + 1)\)-out-of-\(n\) system.

Keywords Stress-strength, Stochastic order, Mean inactivity time, Reliability.

Mathematics Subject Classification (2010): 62N05 60E15.

2Sh. Hashemi : sh.hashemi1986@hotmail.com
Bayes factors with sequential $r$-out-of-$n$ system lifetimes

Majid Hashempour$^1$, Mahdi Doostparast

Department of Statistics, Ferdowsi University of Mashhad, Mashhad, Iran

Abstract: Sequential order statistics (SOS) may be as a flexible tool for analysing stochastic behaviour of engineering complex system lifetimes in which failure of a component may result in more loading on surviving components and hence changing the residual component lifetimes. This paper studies SOS-based Bayes factors (BFs) arising from multiply exponential populations. For various hypotheses, both simple and composite, explicit expressions for the associated BFs are derived in terms of the chi-square distribution function. Findings of this paper can be used for comparing purposes of various systems on the basis of the observed component lifetimes.

Keywords: Exponential model, Bayes Factor, Hypotheses testing, $r$-out-of-$n$ system, Sequential order statistics.


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$^1$Majid Hashempour: ma.hashempour@stu.um.ac.ir
Adaptive Progressively Type-II Censored Competing Risks Data

Fariba Hemmati\textsuperscript{1}, Esmaile Khorram\textsuperscript{2}

\textsuperscript{1}Central Bank of The Islamic Republic of Iran
\textsuperscript{2}Amirkabir University of Technology, Tehran, Iran.

Abstract: In this paper, a competing risks model based on exponential distributions is considered under the adaptive Type-II progressively censoring scheme, for life testing or reliability experiment. Moreover, we assumed that some causes of failures are unknown. The maximum likelihood estimators (MLEs) of unknown parameters are established. The asymptotic distributions of the obtained estimators are derived to construct the confidence intervals as well as the two different bootstraps of different unknown parameters. Under suitable priors on the unknown parameters, Bayes estimates and the corresponding two sides of Bayesian probability intervals are obtained. Also, for the purpose of evaluating the average bias and mean square error of the MLEs, and comparing the confidence intervals based on all mentioned methods, a simulation study was carried out.

Keywords Competing risks; Hybrid censoring; Type-II progressive censoring.

Mathematics Subject Classification (2010): 62N01.

\textsuperscript{1}Fariba Hemmati: hemati@aut.ac.ir
Phase Delays - Theory to Exploratory Data Analysis

John Henstridge  

1University of Western Australia

Abstract:

The estimation of time delays and more complex signal processing methods using time series spectral methods were developed by Hannan and others in the 1970s, building upon engineering ideas in signal processing. These methods worked well when there was a good physical model underlying the processes. Applications were in oceanography originally, then seismology and later areas such as radar and sonar as computational power made it feasible to work at higher frequencies. In all cases the methods added statistical refinement to procedures already in use by engineers and other scientists. Recently we have found an application for these methods in a very different context, the exploration of chemical plants where the relationships between plant components typically have lags, due to material movement or feedback systems. These systems are very complex, typically with hundreds of measurement points and data collected very frequently. The need is for exploratory tools that can understand relationships while not being badly affected by the time lags. This talk illustrates the transition of a statistical method from moderately theoretical to being very applied, from being highly specialist to being more general.

\[1\text{John Henstridge: john@daa.com.au}\]
Fully Stochastic Single-Period Mean-Variance Portfolio Optimization

R. Keykhaei¹, B. Panahbehagh²

¹Faculty of Mathematics and Computer of Khansar, Isfahan, Iran
²Department of Mathematics and computer science, Kharazmi University, Tehran, Iran

Abstract: The only sources of uncertainty in the standard Markowitz’s single-period Mean-Variance portfolio selection problem are the future price of assets. In this paper we study the single-period Mean-Variance portfolio selection problem under general sources of uncertainty, which generalizes the Markowitz’s model. Also we introduce another type of uncertainty which affects the quantity (number, weight, etc.) of each security contained in the portfolio. It is shown that under some general circumstances the set of optimal portfolios in the generalized model coincides with the standard Markowitz’s model.

Keywords: Single-period Mean-Variance portfolio optimization, Optimal portfolio, Uncertain exit time, Weight coefficient.

Mathematics Subject Classification (2010): 91G10 90C20.
Asymptotic Coverage Levels of Confidence Intervals for prediction in Functional Linear Regression

Omid Khademnoe¹, S. Mohammad E. Hosseini-Nasab²

¹,²Department of Statistics, Shahid Beheshti University, Tehran, Iran

Abstract: Functional linear regression models have drawn much attention recently. In this paper, we focus on a functional linear model with functional covariate and scalar response. We use the stochastic expansions of eigenvalues and eigenfunctions estimators of the covariance operator to construct confidence intervals for prediction in this model. Then, we obtain asymptotic coverage levels for these confidence intervals. Finally, we conduct a simulation study to illustrate the numerical performance of confidence intervals, under various parameter settings.

Keywords: Central limit theorem, Cross-validation, Functional linear regression model, Functional principal component analysis, Prediction.


¹Omid Khademnoe: o_khademnoe@sbu.ac.ir
On the modified of generalized weighted exponential distribution

Omid Kharazmi
Vali-e-asr,Rafsanjan,Iran

Abstract: The new class of weighted exponential (WE) distributions obtained by Gupta and Kundu (2009) applying Azzalinis method to the exponential distribution. Kharazmi, at, al (2013) extended weighted exponential distribution to the generalized weighted exponential (GWE) distribution and studied its different properties. In this study, we generalize the GWE distribution to a new class of extended generalized weighted exponential (MGWE) distribution with one scale parameter and one shape parameters. Several statistical and reliability properties of this new class of distribution are obtained. Estimation and inference procedure for distribution parameters are investigated. Finally, we show that the proposed model can provide better fit than recent class of extended weibull by using two real data examples.

Keywords
- Weighted exponential distribution, Hazard function, Mean residual life time, Stochastic orders, Maximum likelihood estimates.
A New Bayesian Unit Root Test in Unobserved-ARCH Models

Fazlolah Lak\textsuperscript{1}, Mahmood Afshari, Behzad Gholizadeh
Department of Statistics, Factually of Sciences
Persian Gulf University, Boushehr 75168, Iran

Abstract: In this paper a new posterior odds analysis is proposed to test for a unit root in Unobserved-ARCH models. Our analysis extends the Bayesian unit root test of . Also a method for estimating the probability of the null hypothesis in prior odds ratio is demonstrated. Simulation study shows that this method is efficient. An empirical study, based on time series data of daily exchange rate of the German Marc with respect to the Greek Drachma, is applied using this method.

Keywords: Bayes factor, Gibbs sampling, Monte Carlo Markov Chain, Unobserved-ARCH model.


\textsuperscript{1}Speaker Name: Fazlolah Lak \texttt{Lak@pgu.ac.ir}
α-power transformation method for generating distributions

Abbas Mahdavi

Department of Statistics, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran.

Abstract: A new way of introducing a parameter to expand a family of distributions is introduced and as an application a new two-parameter extension of the exponential distribution is proposed and studied. Various fundamental properties including explicit expressions for the moments, quantiles, mode and moment generating function of the new distribution are derived. The maximum likelihood estimator of unknown parameters cannot be obtained in explicit forms and must be obtained by solving a one-dimensional optimization procedure. One real data analysis has been presented for illustrative purposes.

Keywords: exponential distribution, hazard rate function, α-power transformation method, maximum-likelihood estimation, survival reliability function.

Mathematics Subject Classification (2010): 62E10 60E05.

3Abbas Mahdavi: a.mahdavi@vru.ac.ir
A goodness-of-fit test for the extreme value distribution in the presence of outliers

Abbas Mahdavi, Hossein Negarestani
Department of Statistics, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran

Abstract: This article provides a simple robust method to test of goodness of fit for the extreme value distribution (Type I family) by using the new diagnostic tool called the "Forward Search” (FS) method. One of the powerful goodness-of-fit tests is the correlation coefficient test, but this test suffers from the presence of outliers. We introduce the FS version of this test that is not affected by the outliers. Also by use the transformation study, an application to the two-parameter Weibull distribution is investigated. The performance and the ability of this procedure to capture the structure of data are illustrated by some simulation studies.

Keywords: Forward search procedure, Goodness of fit test, Correlation coefficient test, Outlier, Robust approach.


\footnote{Hossein Negarestani: negarestani@vru.ac.ir}
A note on Bayesian inference for the Topp-Leone distribution

M. Mahdizadeh

Department of Statistics, Hakim Sabzevari University, P.O. Box 397, Sabzevar, Iran

Abstract: This article deals with parameter estimation for the Topp-Leone distribution using Bayesian approach. Especial attention is given to its performance relative to traditional maximum likelihood method. This does not seem to be attended enough in the literature. Monte Carlo simulations are employed to compare different estimators based on complete and censored samples.

Keywords: Asymmetric loss function; Failure rate; Unit interval.

Mathematics Subject Classification (2010): 62N01; 62F15.
A gamma-Weibull distribution: Model, properties and applications

R.S. Meshkat, H. Torabi²
Yazd University, 89175-741, Yazd, IRAN

Abstract: In this paper, a new distribution, namely, gamma-Weibull (GW) distribution is proposed and studied. Some results for its moments are provided. To estimate the model parameters, the maximum likelihood estimators and the asymptotic distribution of the estimators are discussed. Finally, in order to show the usefulness of the new distribution, application of a real data set is demonstrated.

Keywords gamma-Weibull distribution, Weibull distribution, Hazard function, Maximum likelihood estimation.

Mathematics Subject Classification (2010): 60E05, 62H10, 62H12.

²Speaker's Name: R.S. Meshkat r.meshkat@gmail.com
The asymptotic distribution of Gini and Zenga indices

Mirzaei, S. ¹, Mohtashami Borzadaran, G. R.², Amini, M.³
Ferdowsi University of Mashhad, Mashhad, Iran

Abstract: The inequality index can be used to measure the dispersion of an income distribution. The Gini and Zenga are two classical inequality indices that are recently receiving growing attention. Having asymptotic representation of Gini and Zenga estimators, we can achieve several inferential goals. So, in this paper, the asymptotic distribution of two indices is our concentration, allowing for the construction of more reliable inferences.

Keywords: Asymptotic distribution, Income inequality index, Gini index, Zenga index.


¹Mirzaei, S.: sh-mirzaee@pnu.ac.ir
The Cowan’s Copula and its Extension

S.M. Mirhosseini\textsuperscript{1}, A. Dolati\textsuperscript{2}

\textsuperscript{1}mmirhoseini@yazd.ac.ir
\textsuperscript{2}adolati@yazd.ac.ir

\textbf{Abstract}: This paper considers a class of absolutely continuous bivariate exponential distributions whose univariate margins are the ordinary exponential distributions. We study different mathematical properties of the Cowan’s model. We introduce some extensions and study their properties. \textbf{Keywords} Bivariate exponential distribution; Copula; Dependence; Measure of association; Mathematics Subject Classification (2010): Primary 62E15; Secondary 62H10.
Longitude Shape Analysis by Using the Spherical Coordinates

Meisam Moghimbeygi, Mousa Golalizadeh

Department of Statistics, Tarbiat Modares University, Tehran, Iran

Abstract: The longitudinal shape analysis is one of the important topics in morphometry. Up to the Kendall’s definition of shape, the shape appertains of non-Euclidean space, so longitudinal study of shape on sphere is pursued in this paper. Using the triangulation and size of shape, the prediction of the shape of the configuration in a period of time will be considered. Also, real data analysis will be discussed and the relevant interpretations are presented.

Keywords: Longitudinal Model, Nonparametric Inference, Shape Analysis, Triangulation, Non-Euclidean space.

Mathematics Subject Classification (2010): 62G08.

1Mousa Golalizadeh: golalizadeh@modares.ac.ir
Prediction in GINAR(1) Time Series Model

M. Mohammadpour, Kh. Rezvani

Department of Statistics, University of Mazandaran, Babolsar, Iran

Abstract: The paper focuses on the forecasting of integer-valued time series, modeled by the INAR(1) with geometric innovations. Bayesian methodology is used to obtain point and interval predictions for future values of the process with their classic counterparts. The proposed approaches are illustrated with a simulation study and a real example.

Keywords: Bayesian prediction, Count time series, Forecasting, INAR model.

Mathematics Subject Classification (2010): 60G10; 60G25.
Notes on Generalized Reversed Failure Rate

G. R. Mohtashami Borzadaran¹

¹Department of Statistics Faculty of Mathematical Sciences Ferdowsi University of Mashhad

Abstract: There has been growing interest in study of reliability function such as reversed failure rate and its properties and applications. Some of them are similar to those of failure rate and some have different approach and motivation. Distribution with an increasing (decreasing) generalized failure rate IGFR (DGFR) has useful applications in pricing and supply chain problems. Many distributions with their GFR and the closure properties of them have important role in economical aspects. Some notion of ageing is related to generalized reversed failure rate with the implications and view to the link with elasticity function is obtained and mentioned shortly. The DGRFR and related version are studied via a variant point of view criteria and also discussed closure properties. The weighted distributions with monotone generalized reversed failure rate is our concentration for finding more approach and result based on the GRFR of original distribution which is the last part of the paper.

Keywords Elasticity function, Reversed failure rate, Increasing generalized failure rate, Generalized reversed failure rate, Weighted distributions.

Mathematics Subject Classification (2010): 60E05 60E10 62N99.

¹G. R. Mohtashami Borzadaran : gmb1334@yahoo.com
Randomized order restricted estimators for treatment means with a control group

R. Momeni, J. Etminan

1Department of Statistics, University of Birjand
2Department of Statistics, University of Birjand

Abstract: We consider an experiment which consists of k treatment groups and a control group. Let the sample means $\bar{X}_0, \ldots, \bar{X}_k$ be independent normal variates with expected values $\mu_0, \ldots, \mu_k$ and with variances $\sigma^2_{w_0}, \ldots, \sigma^2_{w_k}$. Let $w_0, \ldots, w_k$ be positive weights and $\mu^*_0, \ldots, \mu^*_k$ be the restricted maximum likelihood estimators (RMLE) subject to the constraints $\mu_0 \leq \mu_i$ for $1 \leq i \leq k$. Lee (1988) establish that for large k, the RMLE fails in the sense of mean squared error. Since we propose the new estimator that uniformly performs better than unrestricted and restricted maximum likelihood estimators. Our simulation study suggests that the our estimator compete well with two another estimators. Although the gains in efficiency due to the procedures proposed can be substantial.

Keywords: Randomized order restricted estimator (RORE), Restricted maximum likelihood estimator (RMLE), Unrestricted maximum likelihood estimator (UMLE), Mean squared error (MSE).
Asymptotic behavior of least square estimator for stochastic differential equation arisen from RL electrical circuits

Parisa Nabati
Urmia University of Technology, Urmia, Iran.

Abstract: This paper investigates the problem of the parameter estimation of stochastic differential equation arisen from RL electrical circuits when the voltage is affected by the noise and the current is observed at the discrete time points. The least square method that is used to estimate the resistor is called $\hat{R}_n$. The strong consistency of $\hat{R}_n$ is discussed when inductor is a known parameter.

Keywords: Estimation, Least square estimator, Strong consistency, Stochastic differential equations.

Mathematics Subject Classification (2010): 65C05.
Complete Convergence for Weighted sums of FGM random sequences

Naderi, H.\textsuperscript{1}, Amini, M.\textsuperscript{2} Bozorgnia, A.\textsuperscript{3}

\textsuperscript{1,2,3}Department of Statistics, Faculty of Mathematical Sciences, Ferdowsi University of Mashhad, Mashhad, Iran

Abstract:

Some complete convergence theorems for weighted sums of FGM random sequences are provided and applied to empirical distribution, sample $p$th quantile and sample mean of random weighting estimate.

Keywords Complete convergence, FGM sequence, Copula.

MSC(2010):60F15

\textsuperscript{2}Amini M: bastani@iasbs.ac.ir
A High Order Finite Difference Scheme for Stochastic Advection Diffusion Equations

M. Namjoo, A. Mohebban

Departement of Mathematics, School of Mathematical Sciences, Vali–e–Asr University of Rafsanjan, Rafsanjan, Iran.

Abstract: In this paper for the numerical approximation of stochastic advection diffusion equations, an explicit higher order finite difference scheme is constructed. In continuation the main properties of stochastic difference schemes, i.e. consistency, stability and convergency, are established for proposed stochastic difference scheme.

Keywords Stochastic partial differential equations, Consistency, Stability, Convergence.

Mathematics Subject Classification (2010): 34A12, 34D20.

M. Namjoo : namjoo@vru.ac.ir
The discrete beta generalized exponential distribution

Vahid Nekoukhou

Department of Statistics, University of Isfahan, Khansar Unit, Isfahan, Iran

Abstract: In this paper, a discrete analogue of the beta generalized exponential distribution is studied. This new distribution contains some previously known discrete distributions as well as two new models. The hazard rate function of the new model can be increasing, decreasing, bathtub-shaped and upside-down bathtub. Some distributional and moment properties of the new distribution are discussed and, finally, the model with a real data set is examined.

Keywords: Beta-G distributions, Beta generalized exponential distribution, Discrete generalized exponential distribution, Hazard rate function.

Mathematics Subject Classification (2010): 11J71.
Likelihood-Based Inference in Vector Autoregressive Models with Multivariate Scaled t-Distributed Innovations by Means of EM Based Algorithms

A.R. Nematollahi¹, A.S. Mirniam ²
¹Department of Statistics, Shiraz University, Shiraz, Iran
²Department of Statistics, Shiraz University, Shiraz, Iran

Abstract: This paper is concerned with the likelihood-based inference of vector autoregressive Models with multivariate scaled t-distributed innovations by applying the EM-based (ECM and ECME) algorithms. The ECM and ECME algorithms, which are analytically quite simple to use, are applied to find the maximum likelihood estimates of the model parameters and then compared based on the computational running time and the accuracy of estimation via a simulation study. The results demonstrate that the ECME is efficient and usable in practice.

Keywords Vector autoregressive process, ECM algorithm, ECME algorithm, EM algorithm, multivariate scaled t-distribution.

2A.R. Nematollahi : ar.nematollahi@gmail.com
Some Results on APND Random Variables

H.R.Nili Sani¹, M. Amini², A.Bozorgnia³

1 Dept. of Stat., University of Birjand, Birjand-Iran.
2Dept. of Stat., University of Ferdowsi, Mashhad-Iran.
3Dept. of Stat., University of Khayyan, Mashhad-Iran.

Abstract: Asymptotically pairwise negatively dependent random variables were introduced by Nili Sani et.al(2015). This class includes independent random variables(henceforth r.v.’s) and pairwise negatively dependence r.v.’s. In this note, we discuss the asymptotic behavior of the tail of $X_1 + X_2$ that $X_1, X_2$ are APND r.v.’s and extend some results of Rangbar et.al.(2008) and (2009).The limit theorems for the new class of r.v.’s are also proved and some results of Beak and Park (2010) and Soo Hak Sung(2014) are extended to this class conveniently.

Keywords Max-sum equivalence, Negatively dependent r.v.’s, Asymptotically pairwise negatively dependent r.v.’s, Complete convergence, Fundamental maximal inequality.

Mathematics Subject Classification (2010): 60F15.

³Speaker’s Name :Nili Sani nilisanil@birjand.ac.irr
Some Asymptotic Results on Improved LASSO Estimators

M. Norouzirad\textsuperscript{1}, M. Arashi\textsuperscript{2}, A.K.Md. Ehsanes Saleh\textsuperscript{3}

\textsuperscript{1,2}Department of Statistics, School of Mathematical Sciences, University of Shahrood, Shahrood, Iran,
\textsuperscript{3}School of Mathematics and Statistics, Carleton University, Ottawa, Canada

Abstract: In the context of regression modeling, when the number of predictors are relatively large with respect to sample size, the least absolute shrinkage and selection operator (LASSO), adds some level of sparsity to the estimation of parameter vector to improve the prediction. When the coefficients are subjected to lie in a subspace hypothesis, we propose to use a restricted LASSO estimator along with its preliminary test and shrinkage versions. Asymptotic distributions with properties of the newly defined LASSO-type estimators are derived and some graphs are depicted to show the performance of asymptotic relative efficiencies.

Keywords: LASSO, Asymptotic distributional risk, Asymptotic relative efficiency, Preliminary test LASSO, Shrinkage LASSO.

Mathematics Subject Classification (2010): 62F12, 62J07.

\textsuperscript{1}Speaker’s Name: norouzirad@shahroodut.ac.ir
Stochastic Differential Equations for SIS and SIR epidemic models

Mahmood Parsamanesh\textsuperscript{1,2}, Rahman Farnoosh\textsuperscript{2}
\textsuperscript{1}Zabol, University of zabol, Faculty of sciences
\textsuperscript{2}Tehran, Iran university of science and technology, Faculty of mathematical sciences

Abstract: Two epidemic models, Susceptible-Infectious-susceptible (SIS) and Susceptible-Infectious-Removed (SIR), are introduced in this article. These models are expressed in the form of system of ordinary differential equations, their dynamics are determined and finally the systems of stochastic differential equations are derived for them. moreover, numerical solutions of systems of ODEs and SDEs for epidemic models are compared by some examples.

Keywords: Epidemic models, SIS model, SIR model, Initial reproduction number, Stochastic differential equations.

Mathematics Subject Classification (2010): 92D30 60H10 60H35.

\textsuperscript{1}M.Parsamanesh : m.parsamanesh@uoz.ac.ir
Markov chain Monte Carlo and the Advent of Big Data

Vahid Partovinia

Department of Mathematics and Industrial Engineering
Ecole Polytechnique de Montreal

Abstract: Markov chain Monte Carlo (MCMC) was a hot topic in early 1990’s. Now MCMC is a standard numerical tool that statisticians use to fit complex Bayesian models. This tool has a well studied theory which provides computational approximation to the posterior. The advent of big data is a new and a hot topic. We live in online era, where people can easily lie to their best friends but cannot lie to their mobile phones. The smart technology gathers massive data in different personal and private levels, for instance. I will discuss the common challenges of this new era. Throughout the talk I argue that Markov chain Monte Carlo can be used as a powerful computational tool.

1Vahid Partovinia: vpartovinia@gmail.com
An Approximation to Finite- and Infinite-time Ruin Probabilities of Compound Poisson Processes

Amir T. Payandeh Najafabadi
Department of Mathematical Sciences, Shahid Beheshti University, G.C. Evin, 1983963113, Tehran, Iran.

Abstract: Consider the problem of evaluating infinite-time (or finite-time) ruin probability under a given compound Poisson surplus process. Such problem leads to an integro-differential equation which cannot be solve analytically, in the most of situations. This article approximates claim size distribution by a finite mixture exponential, say Hyperexponential, distribution. Then, it restates the corresponding integro-differential equation as a solvable ordinary differential equation (or a partial differential equation for finite-time ruin probability). Application of our findings has been given though a simulation study.

Keywords Ruin probability, Compound Poisson Processes, mixture exponential (Hyperexponential) distribution, Heavy-tailed distributions.

Mathematics Subject Classification (2010): 97K50, 97K60, 65L70.
Slashed generalized normal distribution: Model and properties

Atefe Pourchitsaz\(^1,2\), Eisa Mahmoudi\(^2\) and Hamide Jafari\(^3\)

\(^{1,2,3}\)Department of Statistics, Yazd University, 89175-741, Yazd, IRAN

Abstract: In this paper a new generalized version of the normal distribution, called the slashed generalized normal distribution, is introduced. Probability distribution function of the new distribution is obtained. Also, moments, moment generating function and some other properties of the proposed distribution are derived.

Keywords Generalized normal distribution, Moments, Normal distribution, Slash distribution.

Mathematics Subject Classification (2010): 60E05; 62H10; 62H12.
The Topp-Leone Distribution: Revisited

A. Pourdarvish, S.M.T.K. MirMostafaee, Kimia Naderi

Department of Statistics, University of Mazandaran, Babolsar, Iran

Abstract: deals with a two-parameter model, called the Topp-Leone distribution. Some of the main properties of this important model, such as the shape of the density, hazard rate function, mean residual lifetime and the moments have been reviewed. Maximum likelihood estimation of the parameters is also discussed. The paper concludes with a real data example.

Keywords Akaike information criterion, Mean residual lifetime, Moments, Reverse hazard rate function.

Mathematics Subject Classification (2010): 60E05; 62E99.

1Speaker’s name: naderi.kimia@yahoo.com
A note on the mean remaining time to failure of the censored data under type-I and type-II censoring schemes

M.H. Poursaeed\textsuperscript{1, 2}

\textsuperscript{1}Department of Mathematics, Lorestan University, 465 Khoramabad, IRAN

Abstract: The most common case of censoring is what is referred to as right censored data. There are two well known right censoring schemes which are conventional type-I and type-II censoring. In this paper, we propose two expected values for measuring the remaining lifetime of censored data, under these censoring schemes, by which one can predict the the failure time of censored units. Several properties of the proposed measures are derived. We also propose a likelihood function, call it predicted likelihood, to estimate the unknown parameters of a statistical model under type-I and type-II censoring. It is shown that, in the case where the model is exponential, the estimator based on which maximizes predicted likelihood is sometimes more efficient than the maximum likelihood estimator based on classical method.

Keywords Mean residual life function, reliability function, hazard rate, likelihood function, exponential distribution.

A Long Memory Linear Arch Model and R/S Statistic for Estimating its Long Memory Parameter

Rohollah Ramezani\textsuperscript{1}, Seyed Abolfazl Mousavi\textsuperscript{2}

\textsuperscript{1,2}Department of Statistics, Faculty of Mathematics and Computer Science, University of Damghan, Damghan, Semnan, Iran

Abstract: Usually, it is assumed that the variance is invariant in the examination of time series data. But the variance is not invariant in applications. Therefore, various models are suggested so that the variance is expressed as a function of observation. One of the well-know models which often is used is an autoregressive conditional heteroscedasticity (ARCH) model that is used in economic fields such as foreign exchange rate, stock prices, ... .

In this article assumed that $r_t$ is conditionally heteroscedasticity nonlinear (ARCH) process for which the conditional variance of the observable sequence $r_t$ is the square of an inhomogeneous linear combination of $r_s$, $s < t$, we give conditions under which, for integers $l \geq 2$, $r^l_t$ has long memory autocorrelation and normalized partial sums of $r^l_t$ convergence to fractional Brownian motion. In the next we consider estimator for a long memory parameter in introduced model.

Keywords: conditional heteroskedasticity, ARCH models, long memory, R/S estimator.

Mathematics Subject Classification (2010): 62M10 37M10.

\textsuperscript{2}Seyed Abolfazl Mousavi: mousavi.stat@gmail.com
Testing Linear against Constant Hazard Function

Aliakbar Rasekhi$^{1,2}$

$^1$ Department of Biostatistics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

Abstract: We consider the problem of testing Rayleigh distribution against exponentiality, based on a random sample of observations. This problem is equivalent to test increasing linear against constant hazard function in survival analysis. Since the two families are separate, the ratio of maximized likelihoods (RML) statistic does not have the usual asymptotic chi-square distribution. We derive saddlepoint approximation to the distribution of the RML statistic which is equivalent to the most powerful invariant test and show that this approximation is more accurate than the normal approximation, especially for tail probabilities that are the main values of interest in hypothesis testing.

Keywords Hazard function, Most powerful invariant test, Saddlepoint approximation, Test of Exponentiality


$^2$Aliakbar Rasekhi: rasekhi@modares.ac.ir
Asymptotic Normality of the Chromatic Number of a Random Graph

Ali Rejali\textsuperscript{1}, Farkhondeh Sajadi\textsuperscript{2}
\textsuperscript{1}Isfahan University of Technology
\textsuperscript{2}University of Isfahan

Abstract: In this paper we prove that the limiting distribution of the Chromatic number of a random graph $G_{n,p}$, with fixed edge-probability $p$, after appropriate centering and scaling is Normal, when the number of vertices $n$, goes to infinity.

Keywords The Chromatic number, Martingale differences, Central limit theorem.

Mathematics Subject Classification (2010): 05C80 05C15 60F05.
Periodically Correlated Multi-component Locally Stationary Processes

S. Rezakhah¹, N. Modarresi²

¹Faculty of Mathematics and Computer Science, Amirkabir University of Technology, Iran.
²Department of Mathematics and computer science, Allameh Tabataba’i University, Tehran, Iran.

Abstract:

We introduce a new class of non-stationary processes, say periodically correlated locally stationary (PC-LS) process. Assume that 0 = s_o < s_1 < ... and B_j = (s_{j-1}, s_j], for j ∈ N. Let X^{ls}(t) = \sum_{j=1}^{\infty} X_{lj}^{ls}(t) I_{B_j}(t) where X_{lj}^{ls}(t) is a mixture of two stationary processes with exponentially convex weights. By this, we provide X^{ls}(t) as a multi-component locally stationary process. Also we consider \{X_p^j\} as a sequence of periodically correlated random variables. We define an orthogonally scattered random measure M_j on subsets of B_j by X_p^j = M_j(B_j) and set X_p^j(t) = M_j(s_{j-1}, t] for t ∈ B_j with some special correlation. Then X_p(t) = \sum_{j=1}^{\infty} X_p^j(t) I_{B_j}(t) is a continuous time periodically correlated process which we study its spectral representation. Finally we assume that X^{ls}(t) and X_p(t) are independent and define X(t) = X^{ls}(t) + X_p(t) as a certain multi-component PC-LS process which has both periodically correlated and locally stationary properties. The covariance structure and the time dependent spectral representation of such a process are characterized.

Keywords Periodically correlated; Spectral representation; Multi-component locally stationary processes; exponentially convex covariance.

¹S. Rezakhah : rezakhah@aut.ac.ir
Prediction via bivariate concomitants of bivariate order statistics

Seyyed Roohollah Roozegar¹, Ahad Jamalizadeh², Mehdi amiri³

¹Department of Mathematics, Yasouj University, Yasouj, Iran
²Department of Statistics, Faculty of Mathematics & Computer, Shahid Bahonar University of Kerman, Kerman, Iran
³Department of Statistics, Homozgan University, Bandar Abbas, Iran

Abstract: In this paper, by considering a \((2n)\)-dimensional elliptically random vector \((X^T, Y^T)^T\), we derive the joint distribution of bivariate concomitants of order statistics \((X_{[r]}, Y_{[s]})^T\). Further, by considering an elliptical distribution for the \((2n + 1)\)-dimensional random vector \((X_0, X^T, Y^T)^T\), and treating \(X_0\) as a covariate variable, we present mixture representations for the joint distributions \((X_0, X_{[r]}, Y_{[s]})^T\) and \((X_0, aX_{[r]} + bY_{[s]})^T\). These mixture representations enable us to obtain the best (nonlinear) predictors of \(X_0\) based on \(X_{[r]}\) and \(Y_{[s]}\), and \(X_0\) based on \(aX_{[r]} + bY_{[s]}\).

Keywords: Bivariate Concomitants, Elliptical distribution, Mixture distribution, Multivariate unified skew-elliptical distribution, Order statistics.


¹Speaker’s Name : Ehsanroozegar@yahoo.com
A study for testing Zero inflated Negative Binomial versus Negative Binomial distribution

Zahra Saberi¹, Maryam Hassanpour Khademi²

¹Assistant professor of statistics, Faculty of Mathematical Sciences, Isfahan University of Technology, Isfahan, Iran.
²M.s. of statistics, Faculty of Mathematical Sciences, Isfahan University of Technology, Isfahan, Iran.

Abstract: Count data often show a higher incidence of zero counts than would be expected if the data were negative binomial distributed. Zero-inflated negative binomial models are a useful class of models for such data, but parameter estimates may be seriously biased if the nonzero counts are over dispersed in relation to the negative binomial distribution. These types of data are commonly found in various scientific disciplines such as finance, insurance, biomedical, econometrical, ecology, and health sciences. We therefore provide a score test for testing negative binomial models against zero-inflated negative binomial alternatives. The score test has an advantage over the LRT and the Wald test in that the score test only requires that the parameter of interest be estimated under the null hypothesis. The purpose of this paper is test a negative Binomial against a zero inflated negative binomial model, we show that zero inflated negative binomial better fitting for count data with excess zero.

Keywords: Count data, Negative binomial distribution, Score test, Zero inflation distribution, Zero inflated Negative Binomial distribution


Maryam Hassanpour Khademi: maryam.hassanpour@math.iut.ac.ir
The residual lifetime of linear consecutive $k$-out-of-$n$ systems with exchangeable components

E. Salehi

1Department of Basic Science, Birjand University of Technology, Birjand, IRAN

Abstract: In this paper, we consider the linear consecutive $k$-out-of-$n$ systems consisting of exchangeable components. We study the reliability properties of the residual lifetimes of such systems under the condition that at least $n - r + 1$, $(r \leq n)$, components of the system are operating and present some stochastic comparisons on this conditional random variable.

Keywords: Order statistics, Exchangeable, Stochastic ordering, Reliability.

Mathematics Subject Classification (2010): 62N05 60E15.
Expressions for the mean of the order statistics from the skew-normal distribution and their application

Mahdi Salehi and Mahdi Doostparast
Department of Statistics, Ferdowsi University of Mashhad,
P.O. Box 1159, Mashhad, 91775 Iran

Abstract: In design of experiments and reliability analyze, order statistics (OS) are used for various purposes including model checking, estimation of parameters and prediction. Most of these procedures are defined on the basis of the expectations of OS. In this paper, explicit expressions for moments of OS coming from the skew-normal (SN) distribution are derived. The SN model enjoys interesting properties from the normal distribution while captures asymmetric behaviour in the parent population. Two real data sets are analyzed as illustration purposes.

Keywords Order statistics, Skew-normal distribution, Goodness-of-fit test.

1Speaker: Salehi2sms@gmail.com (M. Salehi), doustparast@um.ac.ir (M. Doostparast)
On a Class of Weighted Rank Correlation Measures

Majid Sanatgar\textsuperscript{1} and Ali Dolati

Department of Statistics, Yazd University, Iran

Abstract: In this paper a class of weighted rank correlation coefficients associated with the well-known Spearman’s rank correlation coefficient is studied based on the copulas. Some analytical properties and explicit values for several copulas are discussed. Asymptotic behavior is established in the case of independence.

Keywords: ranks, weighted rank correlation coefficient, copulas.


\textsuperscript{1}Speaker’s Name: Majid Sanatgar Email: m.sanatgar@stu.yazd.ac.ir
Dirichlet processes applied to clustering of longitudinal data via piecewise mixed-effects models

Elaheh Shams¹, Reyhaneh Rikhtehgaran¹¹

¹Department of Mathematical Sciences, Isfahan University of Technology, Isfahan, Iran.

Abstract: This paper applies Dirichlet processes (DPs) in fitting piecewise mixed-effects models. The skew normal is adopted as the distribution of residuals for observations measured before a random time point and then the distribution shifts to the normal. The DP is considered as the prior for the distribution of the random change point. The discreteness nature of the DP is utilized to cluster subjects according to their distributional behavior over time along with achieving more efficient estimates. We also have used transition mixed-effects models to account for the autocorrelation among observations over time. A joint modeling approach is used to handle the bias created in these models. The Gibbs sampling technique is adopted to achieve the parameter estimates. The performance of the proposed model is illustrated by conducting a simulation study.

Keywords Dirichlet processes, Hierarchical models, Markov chain Monte Carlo simulation methods, Piecewise regression model, Skew-normal distribution.


¹Reyhaneh Rikhtehgaran: r.rikhtehgaran@cc.iut.ac.ir
Hill-Type Estimators and Invariance

Mehdi Shams\textsuperscript{1,2}, Gholamreza Hesamian\textsuperscript{2}

\textsuperscript{1}Department of Mathematical Sciences, University of Kashan, Isfahan, Iran.
\textsuperscript{2}Department of Statistics, Payame Noor University, Tehran 19395-3697, Iran.

Abstract: The Hill-type estimators has been used in extreme value theory in order to estimate the tail index related to a distribution function with a positive index. We will introduce a new Hill-type estimator which is invariant. In addition, its asymptotic distributional representation and asymptotic normality are investigated.

Keywords: Invariant Hill-type, heavy tailed index estimator, second order regular variation, extreme value theory, regular variation.


\textsuperscript{2}Speaker's Name: Mehdi Shams, mehdisams@kashanu.ac.ir
A New Bivariate Exponential distribution

Z. Sharifonasabi 1, M. H. Alamatsaz 2, I. Kazemi 3
1,2,3Department of Statistics, University of Isfahan, Isfahan

Abstract: In this paper, we present a new positive quadrant dependent copula and study its different properties. Then, we introduce a class of absolutely continuous bivariate distributions whose univariate margins are exponential and study its various statistical properties. To estimate the parameters, we use the method of Inference Function for Margins. Monte Carlo simulations are performed to illustrate the behavior of the estimates of the parameters. Finally, a data analysis has been performed to illustrate the flexibility of the proposed distribution.

Keywords Copula, Dependence, Bivariate distribution, Exponential distribution, Simulation.

Mathematics Subject Classification (2010): 60E, 62E.
Expected Number of Real Roots of Certain Gaussian Random Trigonometric Polynomials

Soudabeh Shemehsavar\textsuperscript{1}
\textsuperscript{1}School of Mathematics, Statistics and Computer Science, University of Tehran, Tehran, Iran

Abstract: We consider a random trigonometric polynomial where the coefficients form a sequence of Gaussian random variables. By assuming that the increments are independent, we provide the asymptotic behavior of the expected number of real roots of random trigonometric polynomial as order \( \frac{2\sqrt{2}}{\sqrt{3}} \). Also by the symmetric property assumption of coefficients, we show that the expected number of real roots is of order \( \frac{2n}{\sqrt{3}} \).

Keywords Random Trigonometric Polynomials, Brownian motion, Symmetric Property.

Mathematics Subject Classification (2010): 65H42 60G99.
Discrete Exponential INAR(1) model

M. Shirozhan¹, M. Mohammadpour²

²Department of Statistics, University of Mazandaran, Babolsar, Iran.

Abstract: In this paper, we introduce a new stationary first order integer-valued autoregressive process with discrete exponential marginal distributions. Several statistical properties of the process are established, including the autocorrelation function, spectral density function, joint probability generating function, multi-step ahead conditional expectation and variance, the one-step transition probabilities. Estimations of the model parameters are obtained by the conditional least squares, non parametric method and maximum likelihood estimation methods. The performance of the estimates of methods is checked by a small Monte Carlo simulation.

Keywords Binomial thinning, Mixture distribution, Exponential distribution, Estimation.


¹M. Shirozhan : ms.shirozhan@gmail.com
A new measure of inaccuracy based on past lifetime

R. Siroosi, and M. Khorashadizadeh

Department of Statistics, School of Mathematical Sciences and Statistics,
University of Birjand, Iran.

Abstract: ? has defined a measure of inaccuracy which is a generalization of ? entropy. In literature of information science, several generalization and alternative measure of Kerridge inaccuracy and Shannon entropy have been studied. In this paper, we try to generalize Kerridge inaccuracy measure based on cumulative distribution of the past lifetime \((t − X|X ≤ t)\). We also obtain its relation with some reliability concepts such as reversed hazard rate (RHR), mean past lifetime (MPL) and proportional reversed hazard rate model (PRHM). A bound for the proposed measure in terms of MPL function has been derived. Finally, it is shown that the DCPI under some conditions, can determine the distribution function uniquely.

Keywords Shannon entropy, Kerridge inaccuracy, cumulative past inaccuracy, dynamic cumulative past inaccuracy, reversed hazard rate, mean past lifetime, proportional reversed hazard model.

Mathematics Subject Classification (2010): 62B10 62N05 90B25.
On bivariate dynamic cumulative past entropy

R. Siroosi\textsuperscript{9}, and M. Khorashadizadeh
Department of Statistics, School of Mathematical Sciences and Statistics,
University of Birjand, Iran.

Abstract: In this paper, we define two version of dynamic cumulative past entropy (DCPE) in bivariate setup and study their relations with reliability concepts such as bivariate reversed hazard rate (BRHR) and bivariate reversed mean residual lifetime (BRMRL). It is shown that the bivariate DCPE is not invariant under non-singular transformations. We also obtain an upper bound for bivariate DCPE based on BRMRL. Finally an example due to standard log-logistic distribution is presented.

Keywords Shannon entropy, cumulative past entropy, dynamic cumulative past entropy, bivariate reversed hazard rate, bivariate reversed mean residual lifetime.

Mathematics Subject Classification (2010): 62B10 62N05 90B25.

\textsuperscript{9}Speaker's Name: sirousi.razieh89@yahoo.com
Generalized Mixture Representations for Inactivity Times of Coherent Systems

A. Sotoudeh\textsuperscript{1}, S. Goliforushani\textsuperscript{2}

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

Abstract: In this paper, we derive some generalized mixture representations for the reliability functions of inactivity times of coherent systems under two specific conditions concerning the status of the components or the system in terms of reliability functions of inactivity times of order statistics.

Keywords Coherent system, Inactivity time, Order statistics, Signature; Reliability function, Generalized mixture.


\textsuperscript{1}A. Sotoudeh : abdorrahim.sotoudeh@math.iut.ac.ir
Stable Multiple Markov Processes

M. Taghipour\textsuperscript{1}, A.R. Nematollahi\textsuperscript{2}

\textsuperscript{1}Department of Statistics, College of Sciences, Qom University
\textsuperscript{2}Department of Statistics, College of Sciences, Shiraz University

Abstract: In this paper, we provide necessary conditions for a discrete-time symmetric $\alpha$-stable processes to be linear 2-ple Markov. The aim of this paper is to extend the results given by Adler et al. (1990) to general multiple Markov processes, called linear multiple Markov processes. A necessary and sufficient condition based on the covariation for SoS processes to be linear multiple Markov is provided. A complete description of this class of covariation functions including the stationary case is given.

Keywords Markov stable processes, Time changed Levy motion, Covariation function.
Mathematics Subject Classification (2010): 60G10 60J05.

\textsuperscript{1}M. Taghipour: mtaghipour2002@gmail.com
Weighted Integration to Solutions of SDE’s with uniformly elliptic diffusion

M. Tahmasebi¹, Tahmasebi: tahmasebi@modares.ac.ir
¹Department of Applied Mathematics, Faculty of Mathematical Sciences, Tarbiat Modares University, P.O. Box 14115-134, Tehran, Iran

Abstract: In this work we prove an integration by parts formula for the solution of the SDE monotone drifts in the Wiener space. We construct an approximating sequence of SDE’s with globally Lipschitz drifts and obtain a uniform bound for the integral of their solutions.

Keywords stochastic differential equation, monotone drift, Malliavin calculus.

Mathematics Subject Classification (2010): 60H10.
Information Measures for Weighted Distributions of Exp-G Family

Saeid Tahmasebi¹, Ali Akbar Jafari²
¹Department of Statistics, Persian Gulf University, Bushehr, Iran
²Department of Statistics, Yazd University, Iran

Abstract: Weighted distributions are widely used in statistical sciences and arise when the observations generated from a stochastic process are recorded with some weight function. In this article, we derive analytical expressions of $\beta$-entropy for different weighted distributions of exp-G family. Further, we present general forms of the residual entropy measures of order $\beta$ for this family.

Keywords: Exp-G family, Tsallis entropy, Weighted distributions.

Mathematics Subject Classification (2010): 60E05 94A17.

¹Saeid Tahmasebi: tahmasebi@pgu.ac.ir
Extreme Value Distributions for Skew-t Distributions

Asma Taimouri\textsuperscript{1}, Mohsen Khosravi\textsuperscript{1}, Ahad Jamalizadeh\textsuperscript{1}

\textsuperscript{1}Faculty of Mathematics and Computer, Shahid Bahonar University of Kerman, Kerman, Iran

Abstract: In this paper we discuss extreme value distributions of several skew-t distributions. Recently, Chang and Genton (2007) obtained extreme value distributions for the three types of skew-t distributions. Here we modified some of their results about Type III skew-t distribution. We consider an extension of Type I skew-t distribution, termed as skew-t-t distribution, and we obtain it’s extreme value distribution. Finally, we drive the extreme value distribution of the skew-t-normal distribution.

Keywords Domain of attraction, Extreme value, Skew-t distribution, Skew-t-normal distribution, Tail ratio.

Mathematics Subject Classification (2010): 60G70 62H10 62E10.

\textsuperscript{1}Asma Taimouri: Taimouri.asma@yahoo.com
Hypothesis Testing of Hidden Periodicities by Quantile Periodogram

M. TAZIKINEJAD¹, M. KHALAFI², M. AZIMMOHSENİ³
Golestan University

Abstract: Detecting hidden periodicities in a time series is a challenging problem. Fisher’s test based on the periodogram, a common method for this purpose, is not a powerful tool to detect all effective hidden periodicities. The quantile periodogram introduced by Li (2012) is an alternative approach for this purpose. In this article, based on a simulation study, we try to show the performance of the quantile periodogram.

Keywords Hidden periodicity; Quantile periodogram; Quantile regression


³Marziye Tazikinejad: marziyetaziki@yahoo.com
Goodness-of-Fit Test for Normality Based on Empirical Distribution Function

Hamzeh Torabi and Narges Montazeri Hedesh
Department of Statistics, Yazd University, Yazd, Iran.

Abstract: In this paper, a goodness-of-fit test for normality based on the comparison of the theoretical and empirical distributions is proposed. Critical values are obtained via Monte Carlo for several sample sizes and different significance levels. From the simulation study results it is concluded that the best performance against asymmetric alternatives with support on \((-\infty, \infty)\) and alternative distributions with support on \((0, \infty)\) is achieved by the new test. Other findings derived from the simulation study are that SJ and Robust Jarque-Bera tests are the most powerful ones for symmetric alternatives with support on \((-\infty, \infty)\), whereas entropy-based tests are preferable for alternatives with support on \((0, 1)\).

Keywords: goodness-of-fit tests, Robust Jarque-Bera test, SJ test, test for normality.

Mathematics Subject Classification (2010): 62F03 62F10.
Prediction For Lindley Distribution Based on Progressively Type-II Censored Samples

R. Valiollahi¹, A. Asgharzadeh²

¹Department of Statistics, Semnan University, Semnan, Iran
²Department of Statistics, University of Mazandaran, Babolsar, Iran

Abstract: Prediction of unobserved or censored observations is an interesting topic in reliability and life-testing experiments. This paper considers the prediction problem of times to failure of units censored in multiple stages in a progressively censored sample from the Lindley distribution. The maximum likelihood predictor, the best linear predictor and the conditional median predictor are provided. A numerical example and a Monte Carlo simulation study are given to illustrate the prediction methods discussed in this paper.

Keywords: Lindley Distribution, Progressively Type II censored sample, Maximum likelihood prediction, Best unbiased prediction, Conditional median prediction.

A new generalized Pareto - Poission distribution generated by beta random variables

Shahram Yaghoobzadeh Shahrastani
University of Payame Noor, Soomehsara, Iran

Abstract: In this paper, we introduce a new five-parameters distribution called as the beta Pareto-Poisson (BPP) distribution. We obtain several properties of the new distribution such as its probability density function, its Moments of order statistics and Mean deviations. The maximum likelihood estimation procedure is presented in this paper, then usefulness of distribution (BPP) is shown using a real dataset.

Keywords: Pareto distribution, beta Pareto-Poisson distribution, Maximum likelihood estimation, beta distribution, Order Statistics.

Mathematics Subject Classification (2010): 62E10.

1Speaker’s Name: Shahram Yaghoobzadeh Shahrastani yagoubzade@gmail.com
Bounds for Some Dynamic Information Divergence Measures by Using Entropy and Quantile Function

Gh. Yari ¹, P. Torabi Kahlan ², M. Yaghoobi ³
Iran University of Science and Technology

Abstract: Quantile functions are efficient and equivalent alternatives to distribution functions in modeling on analysis of statistical data (See ?,?). Motivated by this, in the present paper, we study a quantile based on shannon entropy and residual entropy in the quantile setup. we also obtain a bound for dynamic Kullback-Leibler discrimination measure by using residual quantile entropy (RQE). Also we find a bound for Kerridge’s inaccuracy based on quantile function and a bound for Renyi divergence by using hazard rate quantile function and Jensen’s inequality.

Keywords: shannon entropy, dynamic Kullback-Leibler discrimination measure, quantile function, Kerridge’s inaccuracy, Renyi divergence.


³Speaker’s Name: marjanyaghoobi@gmail.com
Comparing Recurrent and Vector Singular Spectrum Analysis with Artificial Neural Networks in Time series Analysis

M. Yarmohammadi

1Department of Statistics, Payame Noor University, Tehran, Islamic Republic of Iran

Abstract: In this research we consider three nonparametric techniques known as Artificial Neural Networks (NN) and Recurrent and Vector Singular Spectrum Analysis (SSA) for forecasting real time series data. As nonparametric techniques are not bound by any assumptions, it is more likely to provide an accurate representation of the true scenario in comparison to parametric techniques.

Keywords Artificial Neural Networks, Singular Spectrum Analysis, forecasting, Exchange rate.
Application of Statistical Tests of Anisotropy for Fractional Brownian Textures to Mammograms

Gholamhossein Yari, Soodeh Moallemian

School of Mathematics, Iran University of Science and Technology, Tehran, Iran

Abstract: In this paper, we apply a methodology for analysis of texture anisotropy. This method is based on some statistical tests which are able to detect anisotropy of a texture. The method is introduced and applied on simulated data. We show that on a database of 100 full-field mammograms, about 60 percent of textures can be considered as anisotropic with a high level of confidence. These empirical results suggest that the fractional Brownian fields are better than the usual Brownian fields for modeling the mammogram texture.

Keywords: Anisotropy, Anisotropic fractional Brownian field, Texture analysis, Hurst index, Mammography.


1Soodeh Moallemian: moallemian@mathdep.iust.ac.ir
Exponential Pareto II Distribution

Gholamhossein Yari\textsuperscript{1}, Zahra Tondpour\textsuperscript{2}

School of Mathematics, Iran University of Science and Technology.

Abstract: In this article, we introduce a distribution, namely, exponential Pareto II which is generalization of exponential Pareto distribution. Various properties of the exponential ParetoII distribution such that moments, limiting behavior, mode, hazard function, shannon entropy and entropy for \textit{i}$^{th}$ order statistics of this distribution corresponding to the independent random samples size $n$ are obtained. Finally a real data set is given to illustrate the use of this distribution.

Keywords Exponential distribution, Pareto distribution, Moment, Entropy, Order statistics.

Mathematics Subject Classification (2010): 62E15.

\textsuperscript{2}Zahra tondpour: ztondpour@mathdep.iust.ac.ir
Shrinkage Estimation of Scale Parameters for Two Exponential Distributions Based on Record Values

H. Zakerzadeh, M. Karimi
Department of Statistics, Yazd University, Yazd, Iran

Abstract: The exponential distribution is applied in a very wide variety of statistical procedures. Among the most prominent applications are those in the field of life testing and reliability theory. When there are two record samples available for estimating the scale parameter, a preliminary test is usually used to determine whether to pool the samples or use the individual sample. In this paper, the preliminary test estimator and shrinkage estimator are studied. The optimum level of significance for preliminary test estimation and the optimum values of shrinkage coefficient are obtained based on minimax regret criterion under weighted square error loss function.

Keywords: Minimax regret criterion, Optimal significance level, Preliminary test estimation, Record values, Shrinkage estimator.

Mathematics Subject Classification (2010): 62C20.

1M. Karimi : mkarimiz68@yahoo.com
A reliability measure for judgement post stratified data

Ehsan Zamanzade $^1$, Ali Dastbaravarde $^2$

$^1$ Department of Statistics, University of Isfahan, Isfahan 81746-73441, Iran
$^2$ Department of Statistics, Yazd University, P.O. Box 89175-741, Yazd, Iran

Abstract: In this paper, we propose a reliability measure for judgement post stratified data. We show that our proposed measure is unbiased and have less variance than its counterpart in simple random sampling.

Keywords: Judgement post stratification, reliability analysis, simple random sampling.

Mathematics Subject Classification (2010): 62D05 62N05 62G05.

$^1$Speaker: E.zamanzade@sci.ui.ac.ir
Rate of Convergence for Sample Covariance Operator of $H$-valued Periodically Correlated Time Series

Atefeh Zamani, 1

1Department of Statistics, Faculty of Science, Shiraz University, Shiraz 7146713565, IRAN.

Abstract: Periodically correlated (PC) or cyclostationary time series, as a special class of nonstationary time series, is of great importance in climatology, hydrology, electrical engineering, signal processing and economics. These time series have a periodic structure in their means and covariances. Consequently, an important feature in studying PC time series is identifying the value of the period, $T$. This paper focuses on convergence rate of covariance operators of Hilbertian valued periodically correlated processes, which can be applied while determining the value of $T$ in these time series.

Keywords $H$-valued Periodically Correlated Processes, Time Series, Convergence Rate.

Mathematics Subject Classification (2010): 62M10 60B12.
Skew Normal Autoregressive Models with Markov Property

Hamid Reza Zareifard¹, Fardin Malek Mohammdi²

¹zareifard@jahrom.ac.ir
²fardinmalek13@yahoo.com

Abstract: Recently some authors have introduced in the literature stationary stochastic processes, in the time and in the spatial domains, whose finite-dimensional marginal distributions are multivariate skew-normal (SN). In this work, we study the construction of skew normal autoregressive (AR) models proceeded by replacing the normal noise by a skew normal noise. The focus of the paper is to introduce a skewed AR model with Markov property. In this line, we show that AR models driven by closed skew-normal (CSN) noise enjoy some of the useful properties of Gaussian AR models.

Keywords Autoregressive models, Markov property, Closed skew-normal distribution.
Test of independence for some well-known bivariate distributions

M. Zargar\(^1\), H. Jabbari and M. Amini
Department of Statistics, Ordered and Spatial Data Center of Excellence, Ferdowsi University of Mashhad, Mashhad, Iran

Abstract: In this paper, we study the dependence structure of some bivariate distribution functions based on dependence measures of $\lambda$ and then compare these measures with Spearman’s rho and Kendall’s tau. Moreover, the empirical power of a class of distribution-free tests is computed based on exact and asymptotic distribution of $U$-statistics. Our results are obtained from simulation work in some continuous bivariate distributions. Also, we apply examples to illustrate the results.

Keywords: Copula functions, Celebioğlu-Cuadras copula, Gumbel-Barnett distribution, Gumbel’s bivariate distribution, Negative quadrant dependence, U-Statistics.


\(^{1}\)M. Zargar : zargar-m@yahoo.com