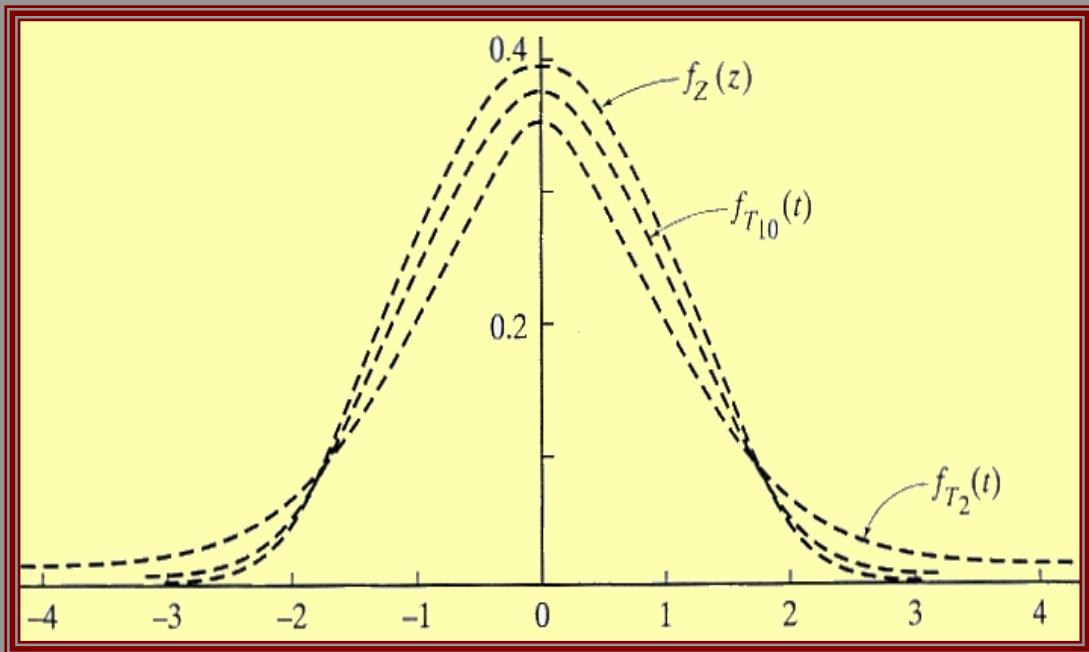


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A comprehensive journal of probability and statistics
for theorists, methodologists, practitioners, teachers, and others



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Chie-Bein Chen / *Takming University of Science and Technology*

Lie-Jane Kao / *Kainan University*

ABSTRACT The world-famous probabilist, Professor Sheldon M. Ross, visited Taiwan on a scholarly trip in October, 2007. It was his first visit to Taiwan, and he had a very enjoyable time in our country. Professor Ross gave several interesting talks at National Dong Hwa University, Takming University of Science and Technology, Academia Sinica, Fu Jen Catholic University, and National Chengchi University, respectively. His talks attracted large audiences, including many of his fans. Besides giving academic speeches, there were also sightseeing activities, such as visiting the Taroko National Park and Sun Moon Lake. In this article, we first introduce Professor Ross's academic background and his contributions to probability. Then we give a detailed report on his visit to Taiwan. We are grateful to Professor Ross for his visit to our country, and we hope that he will come again sometime in the future.

Keywords Grand Hotel; Taroko National Park; National Palace Museum; Sun Moon Lake; Coupon collecting.

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Generalized Exponentiated Beta Distribution

Alfred A. Akinsete
Marshall University

ABSTRACT This paper studies a three-parameter generalization of the exponentiated beta distribution (GEBD). A special case of the distribution is found in Nadarajah [14]. We study various statistical properties of this distribution and obtain expressions for its moment generating function, characteristic function, higher order moments, mean, variance, skewness and kurtosis. The hazard rate function of the distribution is discussed, and its asymptotic behavior is investigated. We demonstrate the sensitivity of the distribution to events where high risks are involved. The method of maximum likelihood estimation for the parameters of the distribution is discussed.

Keywords Beta distribution; Distribution; Entropy; Exponentiation; Moments; Parameter estimation. (AMS 2000: 60E05, 60E10)

1. Introduction

The beta distribution represents a generalization of the uniform distribution, and provides a rather flexible two-parameter model for various types of variables that assume values between 0 and 1 (see, for example, Bain and Engelhardt [1]). The distribution arises in connection with distributions of order statistics, and is used in modeling variation in the proportion or percentage of a quantity occurring in different samples over time (Devore [4]). The derivation of the beta distribution as a ratio of two independent and identically distributed random variables are standard results in literature, particularly in the case where the random variables have either the gamma or F distributions. The beta distributions are very versatile and a variety of uncertainties arising in actuarial science, economics, finance, life testing, survival analysis and telecommunications can be modeled by them (Nadarajah [14]). See also Hayter [10] on the modeling of distributions of the proportion of stock and bees colony. If X is a beta random variable, the probability density function (*pdf*) of X is given by

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Lundberg Process Lifetime Distributions with Aging

Juanjuan Fan / *San Diego State University*

S. G. Ghurye / *University of Alberta*

Richard A. Levine / *San Diego State University*

ABSTRACT Shock models based on Poisson processes have been extensively applied in the reliability and engineering literature. However, these models are not necessarily realistic in practice because they assume increments of the shock process are independent. In this paper we derive lifetime distributions under shocks arriving according to Lundberg processes. We review the univariate Lundberg process from the classic Polya urn experiment and show how to generalize to the multivariate Lundberg process. In particular, we demonstrate the flexibility inherent in these processes toward modeling dependent shock arrivals. We illustrate the application of the Lundberg processes developed by constructing lifetime distributions under Lundberg process shocks incorporating the effect of aging.

Keywords Aging process; Bivariate Lundberg process; Polya-Eggenberger urn model; Shock models; Survival function.

1. Introduction

Shock process models have been applied extensively in the reliability and engineering literature to study survival of a machine under stresses to the system. The shock process is commonly modeled as a Poisson process whereby arrivals of stresses occur according to a Poisson distribution. See Marshall and Olkin [11] and Ghurye and Marshall [4] for the developments of these models. Sheu and Griffith [14] provides a recent engineering application and references to the shock model.

The shock model is also natural for applications in medical disciplines and biological sciences as living organisms sustain damage as a consequence of stresses to the system whether

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A Partially Observed Hybrid Production Inventory System

Lahdar Aggoun / *Sultan Qaboos University*

Lotfi Tadj / *King Saud University*

ABSTRACT In this paper, we consider a dynamic production inventory system for a single reusable product. There are two stocks, one for the serviceable items and one for the re-manufactured ones. We assume that the items in either stock may be subject to deterioration. In this model the deterioration parameters are assumed to be random and are allowed to switch between a finite number values due to various phenomena. Switching is assumed to happen according to the jumps of homogeneous, finite-state Markov chains.

Keywords Partially observed inventory systems; Reference probability measure; Optimal filtering; EM algorithm. (AMS 2000: 60J27, 93E11)

1. Introduction

The environment has become one of the most important issues of our time, and no doubt that it will continue to be well into the future. Most studies of recycling and re-manufacturing focus on environmental benefits because the major drivers – such as preventing the pollution associated with producing and refining virgin materials, reducing the amount of trees that are cut down, and decreasing the amount of material that is landfilled of recycling and re-manufacturing programs have traditionally been environmental in nature.

Operations research (OR) has become one of the most important disciplines applying advanced analytical methods to help make better decisions, and no doubt that it will continue to be well into the future. One of the environment problems tackled by OR researchers concerns the important issue of re-manufacturing, which is the process of restoring or upgrading used products to a like-new condition. Indeed, even though the focus of past

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A General Method of Density Estimation for Negatively Associated Random Variables

H. Zarei / Zabol University

H. Jabbari / Ferdowsi University of Mashhad

I. Dewan / Indian Statistical Institute

H. A. Azarnoosh / Ferdowsi University of Mashhad

ABSTRACT Let $\{X_n, n \geq 1\}$ be a stationary sequence of negatively associated random variables having a common marginal density function $f(x)$. Let $\psi_n(x, y)$, $n = 1, 2, \dots$ be a sequence of Borel-measurable functions defined on R^2 . Let $f_n(x) = (1/n) \sum_{k=1}^n \psi_n(x, X_k)$ be the empirical density function. Here we study a set of sufficient conditions under which the probability $P\{\sup_{a+\delta \leq x \leq b-\delta} |f_n(x) - f(x)| > \varepsilon\} \rightarrow 0$ at an exponential rate as $n \rightarrow \infty$, where the rate possibly depends on ε , δ and f and $[a, b]$ is a finite interval.

Keywords Density function; Exponential rate; Negative association; Uniform consistency.
(AMS 2000: 60F15)

1. Introduction

Let $\{X_n, n \geq 1\}$ be a stationary sequence of random variables and the marginal density $f(x)$ of X_1 exists. We consider the problem of estimation of f based on (X_1, \dots, X_n) . Let $\psi_n(x, y)$, $n = 1, 2, \dots$ be a sequence of Borel-measurable functions defined on R^2 . Then the empirical density function is defined as follows:

$$f(x) = \frac{1}{n} \sum_{k=1}^n \psi_n(x, X_k). \quad (1.1)$$

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Reliability of Shared-Load Consecutive- 2-out-of- n : F Systems

Magdi S. Moustafa / *The American University in Cairo*

Samir H. Saad / *Middle Tennessee State University*

ABSTRACT A closed form expression of the reliability of shared-load linear (circular) consecutive 2-out-of- n : F systems is obtained. The Laplace transform is used to obtain a closed form expression of the probability of system failure for consecutive- k -out-of- n : F systems. A closed form expression of the number of paths which contain the same number of failed components in case of $k = 2$ is obtained by using a combinatorial method.

Keywords Consecutive 2-out-of- n :F system; Probability of system failure; Path evaluation; Reliability; MTTF.

1. Introduction

A shared-load consecutive- k -out-of- n : F system is a redundant system in which the working components share the load, and the system fails if k or more consecutive components (of the n i.i.d. components) fail, see [1].

Most work on consecutive- k -out-of- n : F systems takes the point of view that the system is put into operation at time zero and then either works, or fails if k or more consecutive components (of the n i.i.d. components) fail. Many papers have analyzed the reliability of such systems. Bollinger [2] has presented a direct combinatorial method for determining the system failure probability, which is efficient for a small k . Bollinger & Salvia [3] have studied the mean time to failure of such systems for components having an exponential life distribution using a recursive technique to find the number of paths assigned to a given failure state, they also give a form for the upper bound of the number of failed units of which k are consecutive. Satam [4]

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Semi-parametric Time-weighted Population-unbiased Estimates for Software Error Intensity

Show-Long Patrick Koh
Columbia University

ABSTRACT For software error intensity, this paper suggests the semi-parametric time-weighted population-unbiased estimate, which sets the integration of time-weighted estimating errors to zero. Two previous estimates, obtained from different data-collecting requirements, are found to be of this kind. These estimates are compared by the expected time-weighted square errors and its integration; accordingly, one of them is suggested.

Keywords Software error intensity; Time-weighted population-unbiased estimate; Mean square error; Expected square error; Integration.

1. Introduction

Software usually contains faults which cause errors to occur. In order to reduce the error intensity (or the error rate), the software is often put through a testing procedure to detect errors and to remove faults. Let $\Lambda(t)$ denote the software's error intensity after being tested for t units of time. A problem of great importance to software manufacturing is to estimate $\Lambda(t)$. This problem has been studied for more than thirty years. It remains an active field of research due to its diversity in results. Most works are of parametric estimation which is difficult due to the infinite possible models for selection. Chen and Singpurwalla [1] give a good partial review on this problem through the effort of model unification.

This paper adopts a semi-parametric model put forth by Robbins [6] and Ross [7]. The model assumes there are constant m faults in the software and each fault is independently causing errors to occur in accordance with Poisson process with unknown error intensity. The model is first suggested by Robbins [6] in a different context and is brought into the software testing by Ross [7]. Since m is a constant parameter but the distribution of the error intensity of individual

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Some Classes of Shrinkage Estimators for Estimating the Scale Parameter Towards an Interval of Exponential Distribution

Housila P. Singh and Vankim Chander
Vikram University

ABSTRACT The present paper proposes some classes of shrinkage estimators for estimating the scale parameter of one parameter exponential distribution when some apriori or guessed interval containing the parameter θ (say) is available from some past experiences. The need to study this parameter arises due to its importance in life testing and reliability estimation problems. Empirical study shows the high efficiency of the developed classes of shrinkage estimators when compared with its usual unbiased estimator and minimum mean squared error (MMSE) estimator. Simulation study confirms the high efficiency of the developed classes of estimators.

Keywords Bias; Gauss-Legendre integration method; Guessed interval; Mean squared error (MSE); One parameter exponential distribution; Percent relative efficiency (PRE).

1. Introduction

The exponential distribution has its importance due to its variety of applications in reliability engineering and life testing problems. The exponential distribution would be an adequate choice for a situation where failure rate appears to be more or less constant. Davis (1952) studied different type of data and observed that the exponential distribution appears to fit most of the situation quite well.

1.1 The Model

Let x_1, x_2, \dots, x_n be a random sample of size n , drawn from one parameter exponential distribution. The probability density function of which is given by

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An Improvement of Christofides' Randomized Response Technique

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Quaid-i-Azam University

ABSTRACT In this study we present an improvement of Christofides [1] randomized response model. The presented estimator is a weighted estimator of the two estimators based on the Christofides' model. The relative efficiency of the proposed model is seen to be twice of that of Christofides' model. The case of $m \geq 2$ is also presented and compared to the general case proposed by Christofides.

Keywords Randomized response technique; Privacy protection; Estimation of proportion; Sensitive character; Dichotomous population.

1. Introduction

It is easily perceivable that survey respondents may falsify their answers when asked about the possession of the sensitive attributes. The estimation of the parameters based on these falsified responses is biased. One of the methods to decrease this evasive answer bias is the randomized response technique. The randomized response technique is a method to gather the data on sensitive items from the survey respondents while keeping the privacy of the respondents intact. Warner [7], for the first time, studied this problem of estimation bias and proposed a method to gather data on sensitive characteristics. Warner's method consist of two randomized statements both asking about the sensitive characteristic (qualitative) in one way or the other. A large number of improvements of the Warner's method and some other randomized response methods have been developed since the introduction of randomized response methodology by Warner [7]. Horvitz *et al.* [3] claimed to have greater cooperation from the respondents if, in Warner's model, one of the randomized statements is replaced by an unrelated

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On Certain Mixture Distributions Based on Lagrangian Probability Models

Shubiao Li, Carl Lee, and Felix Famoye
Central Michigan University

ABSTRACT In this paper, some bivariate probability distributions for a discrete random variable and a continuous random variable are defined by using the Lagrangian probability distributions. The covariance between the variables of the bivariate probability distribution is obtained. From the bivariate probability distributions, we derive some mixture distributions. The moments of the mixture distributions are also discussed. Finally, we give some examples of the bivariate probability distributions and their corresponding mixture distributions.

Keywords Lagrange expansion; Bivariate distribution; Mixture distribution; Moments.

1. Introduction

Johnson, Kemp, and Kotz [16] devoted a whole chapter to mixture distributions. In this chapter of their book, a clear distinction is made between the term ‘mixing’ and ‘compounding’. The authors distinguished between two categories of mixtures of discrete distributions. One category is a k -component finite mixture distribution, which arises from k different components distributions. The second category arises from a cumulative distribution function characterized by one or more parameters that vary. If the variable parameter has a discrete distribution, it is called a countable mixture and if the parameter has a continuous distribution, we have a continuous mixture. In this paper, we develop a technique to generate bivariate probability distributions for a discrete random variable and a continuous random variable using the generalized Lagrangian distributions. The mixture distributions are then derived from the bivariate probability distributions. Our approach of generating mixture distributions in this paper is similar to the second category.

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Modeling Nonlinear Interaction among Selected Asean Exchange Rates

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ABSTRACT The Asian financial crisis that struck most of the East Asian countries in 1997 have caught the attention of many researchers in finance and economic. This is due to realization that during the crisis the countries affected saw their currencies depreciate for more than 50% and their stock markets sharply fall about 30% to 50%. In this paper, we investigate the interaction among exchange rates of three Southeast Asian countries (Malaysia, Singapore and Thailand) or the ASEAN country against British pound sterling between 1990 and 2005. We find that all the exchange rates are not cointegrated. Therefore, instead of modelling the returns data using linear vector autoregression (VAR) models, we assume the returns data are regime-dependent and we use the two regime multivariate Markov switching vector autoregression (MS-VAR) model with regime shifts in both the mean and the variance to extract common regime shifts behaviour from the return series. It is found that MS-VAR model with two regimes manage to detect common shifts in all the exchange rates series and this show evidence of comovement among the three exchange rates. Furthermore, we also found that the MS-VAR model manage to capture a satisfactory timing of the 1997 financial crisis that happen in the three countries.

(JEL Classifications: C32, C51)

Keywords Exchange rates; Nonlinearity, Markov switching vector autoregressive.

1. Introduction

In recent years the study of interaction among exchange rates has gained much attention. Among early papers that discussed this topic are MacDonald and Taylor [25] with found no strong evidence of cointegration among the exchange rates, Baillie and Bollerslev [2] argue that

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On the Distributions of Norms of Spherical Distributions

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ABSTRACT This paper reviews some important results dealing with the norms of distributions of several members of spherical distributions in an accessible manner. Moments of the norms of some spherical distributions are discussed. Then they have been used to derive covariance matrices and higher order standardized moments.

(AMS classification: 60-01, 60E10)

Keywords Spherical distributions; Multivariate normal distribution; Uniform spherical distributions on or inside spheres; Multivariate t distribution; Multivariate Pearson type II distribution; Standardized moments; Covariance matrix.

1. Introduction

The distribution of the norm of a spherical distribution is known in its general form. We specialize it to several members of spherical distributions, namely, multivariate normal distribution, uniform spherical distributions on or inside $p(>2)$ -dimensional spheres, multivariate t distribution and multivariate Pearson type II distribution. Some functions of norms are found to have standard distributions. Moments of norms of some spherical distributions are discussed. They are then used to derive covariance matrices and standardized moments. The standardized moments are moments of Mahalanobis distance. It may pointed out that direct derivation of the above quantities are sometimes intractable.

A p -dimensional random variable \mathbf{Z} is said to have a spherical distribution if its probability density function (pdf) is given by

$$f(\mathbf{z}) = g(\mathbf{z}'\mathbf{z}). \quad (1.1)$$

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Appendix A

1. Acknowledgements
2. On Golam Kibria's 45th Birthday

On Golam Kibria's 45th Birthday

Kuang-Chao Chang
Fu Jen Catholic University

1. Introduction

One of our *JPSS* Coordinating Editors, Dr. B. M. Golam Kibria (see Photo #1 below), will be celebrating his 45th birthday on February 1, 2008. As a good friend of Dr. Kibria, I wish to recognize his birthday by publishing this write-up in *JPSS*, where he has been dedicated for several years. I also take this opportunity to express my thankfulness to Dr. Kibria for all his hard work in serving as a Coordinating Editor.



Photo #1 Dr. Golam Kibria on his 45th birthday

Dr. Kibria is presently working as a tenured associate professor in the Department of Statistics at the Florida International University, Miami, FL 33199, USA. Besides serving for *JPSS*, Dr. Kibria has been the Overseas Managing Editor for the *Journal of Statistical Research* since January 2007. Detailed academic background of Dr. Kibria and his contributions to statistics will be given in Section 2 of this article. Then a list of his publications is given in Section 3. Section 4 is a report on Dr. Kibria's visit to Taiwan in July 2006.

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