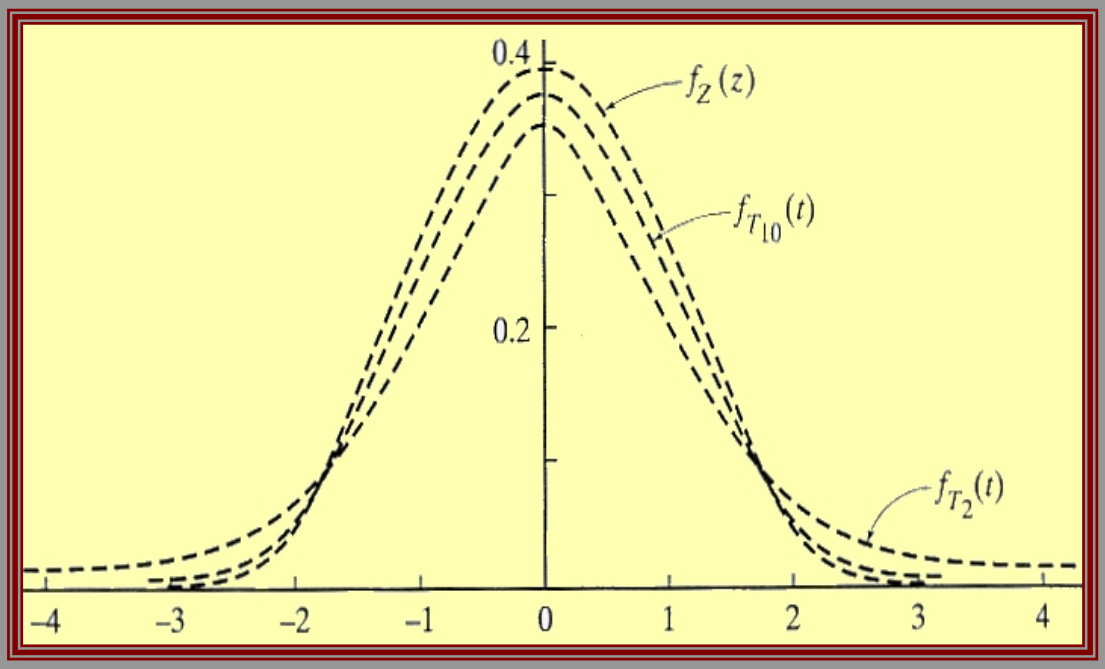
ISSN 1726-3328

JPSS

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



JOURNAL OF PROBABILITY AND STATISTICAL SCIENCE

Volume 14 Number 1 February 2016

ISSN 1726-3328

JPSS

Journal of Probability and Statistical Science

A Comprehensive Journal of Probability and Statistics

for Theorists, Methodologists, Practitioners, Teachers, and Others

Editor-in-Chief: **B. M. Golam Kibria**

Volume 14 Number 1

February 2016

Published by: Susan Rivers' Cultural Institute, Hsinchu City, Taiwan, ROC.

JPSS Editorial Board

JPSS Editorial Board

(continued)

機統學誌 JPSS ISSN 1726-3328

Journal of Probability and Statistical Science

Published by: Susan Rivers' Cultural Institute, Hsinchu City, Taiwan, ROC

Aims and Scope The ***Journal of Probability and Statistical Science*** (***JPSS***, ISSN 1726-3328) is a modified version of the ***Journal of Propagations in Probability and Statistics*** (***JPPS***, ISSN 1607-7083). ***JPSS***, like its predecessor ***JPPS***, is a multipurpose and comprehensive journal of probability and statistics that publishes papers of interest to a broad audience of theorists, methodologists, practitioners, teachers, and any other users of probability and/or statistics. The scope of ***JPSS*** is intended to be quite broad, including all the major areas of probability and statistics. Research papers involving probability and/or statistics, either theoretical or applied in nature, will be seriously considered for publication. Additionally, papers involving innovative techniques or methods in teaching probability and/or statistics will also be considered. Papers submitted for publication consideration will be peer reviewed. Initially, we will publish semiannually, one issue each in February and August. Hopefully, as time accrues, we will be able to publish quarterly. It is the goal of ***JPSS*** to publish a wide range of works involving probability and/or statistics (theoretical and/or applied in nature) and provide widespread availability of such to a broad audience of people interested in probability, statistics and biostatistics.

Submission and Review Policies

1. Submission of manuscript written in English should be mailed (by email attachment) to the **Editor-in-Chief, an Editor, a Coordinating Editor,** or to the **Managing Editor** at the address provided in the ***JPSS*** Editorial Board.
2. A manuscript is accepted only with the understanding that the text has not appeared in publication, and that it is not being simultaneously reviewed by any other journal.
3. Submitted manuscripts are refereed by a double-blind process, meaning that the reviewers will not know the names of the authors and vice versa.
4. If an article is accepted for publication, the author(s) will be required to provide an electronic copy of the paper, in **Micro-soft Word** or **PCTEX** format, through an email attachment. The authors will also be requested to transfer their copyright on certain conditions to the publisher.

Publisher Harold C. H. Chen, Head, Susan Rivers' Cultural Institute. Address: 26, Lane 2, Chien Mei Road, Hsinchu, Taiwan, ROC. Phone: (03)5716594, Fax: (03)5712524.

魏蘇珊文教事業機構發行

總公司: 中華民國臺灣新竹市建美路 2 巷 26 號。

February 1, 2016

Announcing the New *JPSS* Editor-in-Chief!

Susan Rivers' Cultural Institute is pleased to announce the appointment of Dr. **B. M. Golam Kibria** as the new Editor-in-Chief for ***JPSS***, succeeding Dr. Paul C. Chiou of Lamar University. Dr. Kibria is a Professor in the Department of Mathematics & Statistics at Florida International University, Miami, FL 33199, USA. He has published over 140 research papers in professional journals including *Journal of the American Statistical Association*, *Journal of Multivariate Analysis*, *IEEE Transactions on Reliability*, and such. Dr. Kibria is an elected member of *International Statistical Institute* (*ISI*) and an elected *Fellow of the Royal Statistical Society* (*FRSS*). He is also involved in the editorial board of many international statistical journals, including *Communications in Statistics.*

- **Harold C. H. Chen**
  Head, Susan Rivers' Cultural Institute
  Hsinchu City, Taiwan, ROC

- **Kuang-Chao Chang**, Managing and Founding Editor of ***JPSS***
  Professor, Department of Statistics & Information Science, Fu Jen Catholic University
  New Taipei City, Taiwan, ROC

" I am pleased to have Dr. B. M. Golam Kibria succeed me as the new Editor-in-Chief of ***JPSS***. Golam possesses outstanding academic and professional credentials that make him well qualified to assume the role of Editor-in-Chief, and I believe he will continue to expand the impact of ***JPSS*** as he continues the journal's tradition of providing exceptional value to the broad audience of theorists, methodologists, practitioners, teachers, and any other users of probability and/or statistics. "

- **Paul C. Chiou**, ***JPSS*** Editor-in-Chief (2003-2015)
  Professor, Department of Mathematics, Lamar University
  Beaumont, TX 77710, USA

ISSN 1726-3328

JPSS

Journal of Probability and Statistical Science

Volume 14 Number 1 February 2016

Table of Contents

Published by: Susan Rivers' Cultural Institute, Hsinchu City, Taiwan, ROC.

Journal of Probability and Statistical Science
14(1), 1-11, Feb. 2016

Functional Local Linear Regression Model with Functional Response

Naceri Amina
Laboratoire de Statistique et Processus Stochastique, Univ. Djillali Liabès

ABSTRACT In this paper, we introduce a new nonparametric estimation of the regression function when both the response variable and the explanatory one are functional. Our estimate is based on local polynomial approach. As asymptotic results, we state the rates of the uniform almost complete convergence of this estimate. The latter expressed as function of the small ball probability of the predictor and as function of the entropy of the set on which the uniformity is obtained.

Keywords Functional data; Kernel method; Local linear estimate; Functional response; Almost complete convergence.

1. Introduction

The functional statistics area has received an increasing interest in recent years. This great consideration is due to the interaction with other applied fields. Typically, this area concerns the modelization of variables taking values in infinite dimensional spaces, which appear in applied sciences such as economics, soil science, epidemiology or environmetal science, among others. Some key references on this topic are the monographs of Ramsay and Silverman [15], Bosq [3], Ferraty and Vieu [14]. In this context, regression model is main tool to explain how a variable of interest Y is linked with a regressor X. In this paper we consider the problem of estimation of the regression function when both variables (response and explanatory) are functional by using local linear method.

It is well known that a local polynomial smoothing has various advantages over the kernel method, namely in the bias term moreover the kernel method, so-called local constant method, is known for being a particular case of the local polynomial method. We return to Fan

Received November 2014, revised August 2015, in final form September 2015.
Naceri Amina is affiliated with Laboratoire de Statistique et Processus Stochastique, Univ. Djillali Liabès, BP 89 Sidi Bel Abbès 22000, Algeria; email: amina_nrc@outlook.fr.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 13-28, Feb. 2016

Extensions of Matrix Multivariate *T*-distribution

José A. Díaz-García
Universidad Autónoma Agraria Antonio Narro

Ramón Gutiérrez-Sánchez
University of Granada

ABSTRACT Supposing Kotz-Riesz type I and II distributions and their corresponding independent univariate Riesz distributions the associated generalised matrix multivariate *T* distributions, termed matrix multivariate *T*-Riesz distributions are obtained. In addition, its various properties are studied. All these results are obtained for real normed division algebras.

Keywords Matrix multivariate; *T*-distribution; Riesz distribution; Kotz-Riesz distribution; Real, complex, quaternion and octonion random matrices; Real normed division algebras.

1. Introduction

In many statistical models, as an alternative to the use of matrix multivariate normal distribution from the 80's it has been assumed a matrix multivariate elliptical distribution. Actually, the matrix multivariate elliptical distribution is a family of distributions that includes the matrix multivariate normal, contaminated normal, Pearson type II and VII, Kotz, Jensen-Logistic, power exponential and Bessel distributions, among others. These distributions have tails that are more or less weighted, and/or display a greater or smaller degree of kurtosis than the normal distribution, refer to Fang and Zhang [12] and Gupta and Varga [16].

In addition, matrix multivariate elliptical distributions are of great interest due to the next invariance property: Assume that $\mathbf{X}$ is distributed according to a matrix multivariate distribution, then the distributions of certain type of matrix transformations of the random matrix, say $\mathbf{Y} = f(\mathbf{X})$, are invariant under all class of matrix multivariate elliptical distribution, furthermore, such distributions coincide when $\mathbf{X}$ is normally assumed, see Fang and Zhang [12] and Gupta and Varga [16].

However, this invariance property is present when certain statistical (probabilistic) dependence is

Received February 2014, revised October 2015, in final form December 2015.
José A. Díaz-García (corresponding author) is affiliated with the Universidad Autónoma Agraria Antonio Narro, Calzada Antonio Narro 1923, Col. Buenavista, 25315 Saltillo, Coahuila, México; email: jadiaz@uaaan.mx. Ramón Gutiérrez-Sánchez is affiliated with the Department of Statistics and O.R, University of Granada, Granada 18071, Spain; email: ramongs@ugr.es.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 29-44, Feb. 2016

Log-Esscher Transformed Laplace Distribution and Its Applications

Sebastian George
St. Thomas College, Pala

Dais George
Catholicate College

Ligi George
St. Thomas College, Kozhencherry

ABSTRACT Esscher transformed Laplace distribution was first introduced by George and George [3] in 2012. It is asymmetric, heavy-tailed and a tilted version of the standard classical Laplace distribution. This distribution belongs to the one parameter exponential family and is suitable for modeling financial and file size data. It was felt that a more realistic model would be a distribution such that the logarithm of the data follows Esscher transformed Laplace distribution. Hence, a new distribution namely, log-Esscher transformed Laplace distribution which is also asymmetric, heavy-tailed and belonging to the one parameter exponential family is introduced. Exponential families are of fundamental importance in probability theory and Statistics. Families of this type are especially tractable for statistical inference. We derive the explicit form of its density, distribution function and quantile function. Various properties and characterizations of the distribution are studied and its parameter is estimated using different methods of estimation. We also consider a real application of this distribution and establish that this distribution is a good fit.

Keywords Esscher transformed Laplace distribution; Entropy; Financial modeling; Log-Esscher transformed Laplace distribution; Maximum likelihood estimator.

1. Introduction

Esscher transformation of a distribution introduced by Esscher [5], provides a means for creating a regular exponential family from a distribution whose cumulant generating function converges in the regular sense. Esscher transformation (exponential tilting) is useful in connection with the purpose of testing and explains the important characteristics of data. It also helps in embedding a given statistical model in a broader model. George and George [3]

Received March 2015, revised October 2015, in final form November 2015.

Sebastian George is affiliated with St. Thomas College, Pala, Kerala, India. Dais George is affiliated with Catholicate College, Pathanamthitta, Kerala, India. Ligi George (corresponding author) is an Associate Professor in the Department of Statistics at St. Thomas College, Kozhencherry, Kerala, India; email: sabuchennankara@gmail.com.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 45-55, Feb. 2016

Terminal-dependent Estimation for FBSDE with Partial Linear Generator

Yuxia Su and Yutian Wang
Qufu Normal University

ABSTRACT We are concerned with the estimation of Forward-Backward stochastic differential equation (FBSDE) with partial linear generator. The estimators are obtained with both the terminal condition and partial linear generator. We give the semi-parametric estimators and the asymptotic properties in the sense of normality. Some simulation studies are also given to illustrate our methods.

Keywords Terminal condition; Forward-Backward stochastic differential equation; Partial linear generator; Asymptotic normality.

1. Introduction

In this paper, we are concerned with the estimation of Forward-Backward stochastic differential equation (FBSDE) with partial linear generator. The equation is defined by

$$dY_t = (cY_t + \mu Z_t + f(X_t, Y_t, Z_t))dt - Z_t dB_t; \quad Y_T = \phi(X_T), \tag{1.1}$$

where X_t starting from the point x satisfies

$$dX_t = u(t, X_t)dt + \sigma(t, X_t)dB_t; \; X_0 = x,$$

with B_t being standard Brownian motion. Compared to the BSDE, the generator function in (1.1) is additionally associated with another stochastic process characterized by diffusion process X_t, more importantly, the generator function is of semi-parametric form, which involve unknown parameter $\beta = (c, \mu)^\tau$ and unknown function $f(\cdot)$.

Received February 2015, revised May 2015, in final form August 2015.
Yuxia Su (corresponding author) is affiliated with the School of Statistics at Qufu Normal University, Jining, Shandong, 273165, PR China; email: qfsyx@163.com. Yutian Wang is affiliated with the School of Software Engineering at Qufu Normal University, Jining, Shandong, 273165, PR China.
AMS 2000 subject classification: Primary 62F10, 62G05; Secondary 62F12, 62G20, 62E20.
This research was supported by NNSF-TianYuan (11226213) of China.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 57-73, Feb. 2016

Likelihood Transformation and Information Based Approach to Clustering

Milan Bimali and Michael Brimacombe
University of Kansas Medical Center

ABSTRACT The application of the likelihood function in relation to methods of clustering has remained largely unexplored territory. While likelihood functions have been used in spatial clustering, more basic clustering approaches based on likelihood functions have not been pursued. In this article, we propose a likelihood function based approach to clustering observations. Observations in the dataset are assumed to follow a known distribution and observed likelihood functions are obtained. A data matrix is then developed by evaluating the weighted relative likelihood functions at different values in the parameter space, the weights being the Fisher Information evaluated at the mode of the likelihood functions. The proposed clustering approach takes into account the structure of data in relation to the distributional assumption as well as information based similarity among observations in the data. Once obtained, the data matrix can be examined using standard multivariate data analytic techniques such as *k*-means, centroid and PCA based clustering. The method is applied here using simulation studies based on the Poisson, Normal and Cauchy distributions.

Keywords Likelihood functions; Clustering; Distance matrix; Fisher Information.

1. Introduction

For a sample of *iid* X_i's, $\boldsymbol{X} = (X_1, \cdots, X_n)$ with pdf $f(\boldsymbol{x} \mid \theta)$, the likelihood function, introduced and established by Fisher [6], is formally defined as

$$L(\theta \mid \boldsymbol{x}) = f(\boldsymbol{x} \mid \theta) = c\prod_{i=1}^{n} f(x_i \mid \theta)$$

where c is a constant with respect to θ [2, 6-9]. The likelihood function reflects the model-data

Received September 2015, revised November 2015, in final form December 2015.
Authors of this article are affiliated to the Department of Biostatistics at University of Kansas Medical Center, 3901 Rainbow Blvd, Kansas City, KS 66160, USA; email address of Milan Bimali (corresponding author): mbimali@kumc.edu.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 75-80, Feb. 2016

Section of Teaching and Applications

An Application of Fisher's Exact Test in Linguistic Research

One-Soon Her — *National Cheng-Chi University*
Rwei-ju Chuang, Kuang-Chao Chang — *Fu Jen Catholic University*

ABSTRACT Fisher's Exact Test (FET), proposed 90 years ago by the famous pioneering statistician Ronald A. Fisher, is one of the most useful and long-lasting statistical methods for finding the exact permutation significance levels of contingency tables. In particular, for testing whether two classification criteria in 2×2 contingency tables are independent in the situation of small cell frequencies, the much more rapid normal approximation and chi-square calculation are liable to be inaccurate; therefore, the FET can be used instead. In this article, we introduce the FET to the broad audience of researchers/teachers/students in theoretical linguistics by applying the FET to a set of categorical data obtained from research on the mathematical interpretation of plural markers such as the English /-s/ suffix in the world's languages. We hope the contents of this article can be of meaningful use for the broad audience of readers mentioned above.

Keywords Categorical data; Chi-square test; Contingency table; Significance level; Degrees of freedom; Fisher's Exact Test (FET); *P*-value.

1. Introduction

In social science research, researchers often encounter numerical data that is of discrete type and can be classified into several categories. Such kind of data is called *categorical data* by statisticians. One of the most commonly used statistical methods for analyzing categorical data is using *chi-square test* to test the null hypothesis of independence between two response variables for integer type of data arranged in a *contingency table*. In a contingency table with r rows and c columns, which is often referred to as a $r \times c$ table, there is an integer

Received September 2015, revised November 2015, in final form December 2015.
One-Soon Her is a Distinguished Professor in the Graduate Institute of Linguistics and the Research Center of Mind, Brain, and Learning at National Cheng-Chi University, Taipei, Taiwan, ROC; email: onesoon@gmail.com. Rwei-ju Chuang (corresponding author) is an Associate Professor and Kuang-Chao Chang is a Professor in the Department of Statistics and Information Science at Fu Jen Catholic University, Hsinchuang, New Taipei City, Taiwan, ROC; emails: stat1007@mail.fju.edu.tw and stat1016@mail.fju.edu.tw.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 81-94, Feb. 2016

Section of Teaching and Applications

A Simulation Study on Statistical Analysis of Pooled Samples in Periodontal Research − A Preliminary Report

Kuang-Min Chang
Rutgers School of Dental Medicine
Yuan-Ho Lee
Soochow University
Kuang-Chao Chang
Fu Jen Catholic University

ABSTRACT Periodontal research frequently requires sampling the gingival tissue from small animals such as rat. Due to limited quantity of available gingival tissue in such animals, it has been reported that instead of processing each sample individually, samples in the same group are pooled, processed and analyzed for proteinase activities. Means of pooled samples are then compared between groups. Since samples are pooled, the results may be different from that when each sample is processed individually. We investigated this issue with statistical tools to determine if "pooled sample" protocol can produce the same results as that with the individual sample protocol. We conducted a series of Monte Carlo simulation studies to investigate the power of *t* test when samples were pooled or individually processed. Data of thousands of different sets of statistical parameters such as variance, sample size and proteinase activities were generated by computer. Five thousand sets of data were generated and analyzed. The simulation results indicated that, under certain circumstances, the powers of *t* test with pooled samples could be different from those when each sample was processed individually. Large sample size and small variance can minimize the difference. Pooled sample protocol may produce different results from that with individual sample. Results obtained from experiments with pooled samples should be interpreted with caution.

Keywords Pooled samples; Gingiva, Collagenase; Diabetes; Power function.

Received August 2015, revised November 2015, in final form December 2015.

Kuang-Min Chang (BDS, DMD, and Ph.D) is an Associate Professor in the Department of Periodontics at Rutgers School of Dental Medicine, Rutgers University, 110 Bergen St., Newark, NJ 07103-2400, USA; email: dugongbu@gmail.com. Yuan-Ho Lee, currently an Adjunct Professor in the Department of Economics at SooChow University, Taipei, Taiwan, ROC, was a Professor in the Department of Economics at Fo Guang University, Jiaushi, Ilan County, Taiwan 262, ROC. Kuang-Chao Chang is a Professor in the Department of Statistics and Information Science at Fu Jen Catholic University, Hsinchuang, New Taipei City, Taiwan, ROC; email: stat1016@mail.fju.edu.tw.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), 95-98, Feb. 2016

An Old Example of Coupon Collecting Problem

Kuang-Chao Chang
Fu Jen Catholic University

ABSTRACT In Chang [1], there is a real example of coupon collecting problem in 1960's: the Princess Snow White Chewing Gum (PSWCG). However, the story in that example is incomplete. In this article, the author gives a complete story of PSWCG, and he validates a formula of expected sample size obtained in Chang and Ross [2].

Keywords Coupon collecting problem; Multiple subset coupon collecting problem; Poisson process.

1. Introduction

In the classical Coupon Collecting Problem (CCP), there are L different types of coupons and a collector seeks to collect one of each (say, to win some prize). The collector continuously collects one coupon at a time until at least one of each type is obtained. Let $p_h\,(>0)$ be the fixed probability of collecting a type h coupon, h = 1,…, L, such that $p_1+\cdots+p_L=1$. In Chang [1], a childhood example of CCP is given as follows:

> During the mid-1960's, when the author of this article was an elementary school student, there was a very popular snack amongst children and youngsters in Taiwan — the Princess Snow White Chewing Gum (PSWCG). Inside each package is the gum and a card with a number on its backside. On the front side of each card is a particular figure from the well-known Chinese ancient novel "*The Romance of the Three Kingdoms*". There are altogether 100 different figures, therefore the numbers on the backside of the cards are integers numbered from 1 to 100. If a card collector can obtain a complete set of cards consisting of all 100 different figures, he or she will win a big prize from the chewing gum company. However, most of the card collectors stopped with disappointment in the sequel because some of the cards such as #6, #15, #28, #42, #56, and #98 were very rare. Among those rare cards, #98 seemed like it never appeared (and therefore #98 was termed the "dead card"). The above chewing gum story is a real example of CCP in which L = 100 and the probability p_{98} is extremely small.

Received September 2015, revised December 2015, in final form January 2016.
Kuang-Chao Chang is a Professor in the Department of Statistics and Information Science at Fu Jen Catholic University, Hsinchuang, New Taipei City, Taiwan, ROC; email: stat1016@mail.fju.edu.tw.

 ISSN 1726-3328

Journal of Probability and Statistical Science
14(1), Appendix, Feb. 2016

Appendix

1. **Editorial Note**
2. **Acknowledgements**
3. ***JPSS* Subscription Forms**

February 1, 2016

Editorial Note

There are eight articles in this issue. Five of them are on the Theory and Methods and three articles are on the Teaching and Applications. Theory and methods consists of mostly linear regression models and its applications, distributions theory and likelihood transformation and information, while teaching and applications consists of application of Fisher's exact test in Linguistic research, analysis of pooled sample in periodontal research and an interesting old example of coupon collecting problem.

- **B. M. Golam Kibria**, *JPSS* Editor-in-Chief
  Professor, Department of Mathematics & Statistics, Florida International University
  Miami, FL 33199, USA

Journal of Probability and Statistical Science
14(1), A2-A5, Feb. 2016

Acknowledgements

The ***JPSS*** (and the former ***JPPS***) would like to acknowledge the service of the following probabilists and/or statisticians as referees during the period August 2001 to February 2016. An asterisk indicates refereeing for more than one paper during the period.

JPSS Referees (listed in alphabetical order according to last name)

Ahmed Abu-Taleb, Dept. of Math. and Statistics, Jordan U. of Sci. & Tech., Irbid 22110, Jordan.
K. K. Achary, Dept. of Statistics, Mangalore U., Mangalore, India.
Ivo Adan, Dept. of Math. & Comp. Sci., Eindhoven U. of Tech., 5600 MB Eindhoven, The Netherlands.
Abd EL-Baset A. Ahmad, Dept. of Math., Assiut U., Assiut, Egypt.
Md. Saleh Ahmed, Dept. of Math. & Statistics, Sultan Qaboos U., Muscat, Sultanate of Oman.
Alfred A. Akinsete, Dept. of Math., Marshall U., Huntington, WV 25755, USA.
Essam K. Al-Hussaini, Dept. of Statistics & O. R., Kuwait U., Safat 13060, Kuwait.
M. T. Alodat*, Dept. of Statistics, Yarmouk U., Irbid, Jordan.
Mohammad Fraiwan Al-Saleh*, Dept. of Statistics, Yarmouk U., Irbid, Jordan.
Cecile Amblard, Laboratoire TIMC, UMR CNRS 5525, 38706 La Tronche, France.
Gokarna Raj Aryal, Dept. of Math., U. of South Florida, Tampa, FL 33620, USA.
Ayman Baklizi*, Dept. of Math., Statistics, and Physics, Qatar U., Doha, Qatar.
N. Balakrishnan*, Dept. of Math. & Statistics, McMaster U., Hamilton, Ontario, Canada L8S 4K1.
Shakti Banerjee, Reader, School of Statistics, Devi Ahilya U., Khandwa Road, Indore-452001, India.
Lucio Barabesi, Dept. di Metodi Quantitativi, U. di Siena, Piazza S. Francesco, 8, 53100 Siena.
Shaul K. Bar-Lev*, Dept. of Statistics, U. of Haifa, Haifa 31905, Israel.
Ismihan Bayramoglu, Dept. of Math., Izmir U. of Economics, Balcova, Izmir, Turkey.
Robert J. Beaver, Dept. of Statistics, U. of California at Riverside, Riverside, CA 92521-0002, USA.
Munni Begum*, Dept. of Mathematical Sciences, Ball State U., Muncie, Indiana 47306, USA.
Atanu Biswas, Applied Statistics Unit, Indian Statistical Institute, 203 B. T. Road, Kolkata -700 108, India.
John J. Borkowski*, Dept. of Mathematical Sciences, Montana State U., Bozemen, Montana 59717, USA.
Ronald W. Butler, Dept. of Statistics, Colorado State U., Fort Collins, CO 80523-1877, USA.
Manuel Ordoñez Cabrera, Dept. of Math. Analysis, U. of Sevilla, 41080 Sevilla, Spain.
Elvan Ceyhan*, Dept. of Math., Koc U., Sariyer, Istanbul, Turkey.
Feng-Shun Chai, Institute of Statistical Science, Academia Sinica, Taipei, Taiwan, ROC.
Ping-Shing Chan, Dept. of Statistics, Chinese U. of Hong Kong, Shatin, New Territories, Hong Kong.
Kuo-Hwa Chang*, Dept. of Industrial Engineering, Chung Yuan Christian U., Chung-Li, Taiwan, ROC.
Yi-Ping Chang*, Dept. of Business Math., Soochow U., Taipei, Taiwan, ROC.
Anne Chao, Institute of Statistics, National Tsing Hua U., Hsin-chu 30043, Taiwan, ROC.
Chang-Tai Chao*, Dept. of Statistics, National Cheng-Kung U., Tainan, Taiwan, ROC.
Min-Te Chao*, Inst. of Statistical Sci., Academia Sinica, Taipei, Taiwan, ROC.
Asis. Kr. Chattopadhyay, Reader in Statistics, Calcutta U., Kolkata 700 019, India.
Ajit Chaturvedi, Dept. of Statistics, Delhi University, New Delhi, India.
Arijit Chaudhuri, Applied Statistics Unit, Indian Statistical Institute, Kolkata-700108, India.
Chung Chen, School of Management, Syracuse U., Syracuse, NY 13244-2130, USA.
Jie Chen*, Dept. of Math. and Statistics, U. of Missouri-Kansas City, Kansas City, MO 64110, USA.
Mu-Chen Chen*, Dept. of Business Management, Taipei Univ. of Technology, Taipei, Taiwan, ROC.
Philip E. Cheng, Institute of Statistical Science, Academia Sinica, Taipei, Taiwan, ROC.
Chih-Hua Chiao, Dept. of Business Math., Soochow U., Taipei, Taiwan, ROC.
Paul C. Chiou*, Dept. of Math., Lamar U., Beaumont, TX 77710, USA.

JPSS Referees (continued 1)

Tzu-Chin R. Chou, Dept. of Applied Statistics & Info. Sci., Ming Chuan U., Taoyuan, Taiwan, ROC.
Gautam Choudhury, Mathematical Sciences Division, Institute of Advanced Study in Science and Technology, Paschim Boragaon, Guwahati-781035, Assam , India.
Rwei-ju Chuang*, Dept. of Statistics & Info. Sci., Fu Jen Catholic U., Taipei, Taiwan, ROC.
Po-Huang Chyou*, Marshfield Medical Research Foundation, Marshfield, WI 54449, USA.
M. N. Dehspande, Dept. of Statistics, Institute of Science, Nagpur, India.
Jyoti Divecha, Sardar Patel University, Anand 388120, India.
David Drain, Dept. of Math. & Statistics, U. of Missouri-Rolla, Rolla, MO 65409-0020, USA.
Author Dryver, School of Applied Statistics, NIDA, Thailand.
Md. El-Haj Ebrahem, Dept. of Statistics, Faculty of Science, Yarmouk U., Irbid, Jordan.
Jamie Emerson*, Perdue School of Business, Salisbury U., Salisbury, MD 21801, USA.
Shu-Kai Fan*, Dept. of Industrial Engineering, Yuan-Ze U., Taoyuan, Taiwan, ROC.
Cheng-Der Fuh*, Inst. of Statistical Sci., Academia Sinica, Taipei, Taiwan, ROC.
Paul H. Garthwaite, Dept. of Statistics, The Open U., Milton Keynes, United Kingdom.
Abbas Gerami, Statistical Research Center, Tehran, Iran.
Andrés Suárez González, ETSE Telecomunicación, Universidade de Vigo, 36200 Spain.
Mohamed Habibullah, Dept. of Information, Operations and Analysis, Northeastern U., Boston, MA, USA.
John Haddad, Dept. of Math., American U. of Beirut, Beirut, Lebanon.
Anwar Hassan*, P. G. Dept. of Statistics, U. of Kashmir, Srinagar 190006, India.
Chien-Pai Han*, Dept. of Math., U. of Texas at Arlington, Arlington, TX 76019, USA.
Jan Hannig, Dept. of Statistics and O. R., U. of North Carolina at Chapel Hill, Chapel Hill, NC 27599, USA.
Hisham Hilow, Dept. of Math., Univ. of Jordan, Amman 11942, Jordan.
Syed A. Hossain*, Management Science Dept., Rider U., Lawrenceville, NJ 08648, USA.
Chia-Ding Hou*, Dept. of Statistics & Info. Sci., Fu Jen Catholic U., Taipei, Taiwan, ROC.
Chuhsing K. Hsiao, Div. of Biostatistics, Inst. of Epidemiology, National Taiwan U., Taipei, Taiwan, ROC.
Hui-Kuang Hsieh*, Dept. of Math. & Statistics, U. of Massachusetts at Amherst, Amherst, MA 01003, USA.
Yu-Sheng Hsu*, Dept.of Math., National Central Univ., Chung-Li, Taiwan, ROC.
Hsiao-Yun Huang*, Dept. of Statistics & Information Science, Fu Jen Catholic U., Taipei, Taiwan, ROC.
Steve Yih-huei Huang, Dept. of Math., Tamkang U., Tamsui, Taipei, Taiwan, ROC.
J. T. Gene Hwang, Dept. of Math., Cornell U., Ithaca, NY 14853, USA.
Anwar H. Joarder*, Dept. of Mathematical Sciences, King Fahd U. of Petroleum and Minerals, Dhahran, Saudi Arabia 31261.
Borko D. Jovanovic*, Dept. of Preventive Medicine, Northwestern U., Chicago, IL 60611, USA.
Sanpei Kageyama, Dept. of Math., Hiroshima U., Hagashi-Hiroshima 739-8524, Japan.
Chihwa Kao*, Center for Policy Research, Syracuse U., Syracuse, NY 13244, USA.
J. C. Ke*, Dept. of Statistics, National Taichung Institute of Technology, Taichung, Taiwan, ROC.
Deepa Khandpal, Dept. of Statistics, The M. S. Univ. of Baroda, Vadodara 2, India.
André I. Khuri*, Dept. of Statistics, U. of Florida, Gainesville, FL 32611-8545, USA.
B. M. Golam Kibria*, Dept. of Statistics, Florida International U., Miami, FL 33199, USA.
Jong-Min Kim*, Division of Science and Mathematics, U. of Minnesota, Morris, MN 56267, USA.
Max King, Deputy Dean, Faculty of Business & Economics, Monash U., Clayton Campus, Clayton, Victoria 3800, Australia.
Show-Long Patrick Koh* (Ph.D, Columbia U., 1982), Taipei, Taiwan, ROC.
Celestin C. Kokonendji, Universite de Pau et des Pays de l'Adour, Laboratoire de Mathematiques Appliquees-UMR 5142 CNRS,Departement Statistisque et Traitement Informatique des Donnees, Avenue de l'Universite-64000 Pau, France.
Andrzej Korzeniowski*, Dept. of Math., U. of Texas at Arlington, Arlington, TX 76019, USA.
Tomasz J. Kozubowski*, Dept. of Math., Univ. of Nevada at Reno, Reno, NV 89557, USA.
Elies Kouider*, College of Business, Ferris State U., Big Rapids, MI 49307, USA.
Kalimuthu Krishnamoorthy, Dept. of Math., U. of Louisiana at Lafayette, LA 70504, USA.
Debasis Kundu, Dept. of Math., Indian Institute of Technology, Kanpur, Pin-208016, India.
Eiji Kurozumi, Dept. of Economics, Hitotsubashi U., 2-1 Naka, Kunitachi, Tokyo, 186-8601, Japan.

JPSS Referees (continued 2)

Stephen M. S. Lee, Dept. of Statistics & Actuarial Sci., The U. of Hong Kong, Hong Kong.
Tai-Ming Lee*, Dept. of Statistics & Information Science, Fu Jen Catholic U., Taipei, Taiwan, ROC.
Tian-Shyug Lee*, Graduate Institute of Management, Fu Jen Catholic U., Taipei, Taiwan, ROC.
Tze-San Lee*, NCEH/EHHE, MS E70, CDC, Atlanta, GA 30333, USA.
Paul S. Levy*, Statistics Research Div., RTI International, Research Triangle Park, NC 27709-2194, USA.
Pen-Hwang Liau, Dept. of Math., National Kaohsiung Normal U., Kaohsiung, Taiwan, ROC.
Chien-Tai Lin*, Dept. of Math., Tamkang U., Tamshui, Taipei, Taiwan, ROC.
Shang P. Lin, Dept. of Health Studies (Biostatistics Lab), U. of Chicago, Chicago, IL 60637, USA
Tsair-chuan Lin, Dept. of Statistics, National Taipei U., San Shia, Taipei County 237, Taiwan, ROC.
Shaw-Hwa Lo*, Dept. of Statistics, Columbia U., New York, NY10027, USA.
Hung-Yi Lu*, Dept. of Statistics & Information Science, Fu Jen Catholic U., Taipei, Taiwan, ROC.
Hsing Luh*, Dept. of Math. Sciences, National Chengchi U., Taipei, Taiwan, ROC.
Eisa Mahmoodi, Dept. of Statistics, Shiraz U., Shiraz, 71454, Iran.
M. Manoharan, Dept. of Statistics, Calicut U., Kerala, India.
Farzana Abdulla Maraghi, School of Information Systems, Computing and Math.,Brunel U., Uxbridge, UK.Suzanne McCoskey, Dept. of Economics, United States Naval Academy, Annapolis, MD 21402, USA.
Vincent F. Melfi, Dept. of Statistics and Probability, Michigan State U., East Lansing, MI 48824, USA
Weiwen Miao*, Dept. of Math. & Comp. Sci., Macalester College, Saint Paul, MN 55105, USA
Reza Modarres, Dept. of Statistics, George Washington U., Washington DC 20052, USA.
Magdi S. Moustafa, Dept. of Math., The American U. in Cairi, Cairo 11511, Egypt.
Rida E. A. Moustafa, Center for Computational Statistics, Goerge Mason U., Fairfax, VA 22030, USA.
Hari G. Mukerjee*, Dept. of Math. & Statistics, Wichita State U., Wichita, Kansas 67260-0033, USA.
K. Muralidharan*, Dept. of Statistics, M. S. Univ. of Baroda, Baroda 390002, India.
Hassen A. Muttlak, Dept. of Mathematical Sci., King Fahad U. of Petroleum and Minerals, Dhahran 31261, Kingdom of Saudi Arabia.
S. P. Nabar, 501, Nav-swapna' Santacruz Chembur Link Rd., Near University Campus, Vidyanagari, Mumbai 400098, India.
Saralees Nadarajah, Dept. of Statistics, U. of Nebraska, Lincoln, NE 68583, USA.
U. V. Naik-Nimbalkar, Dept. of Statistics, U. of Pune, Poona, India.
Valery Nevzorov, Dept. of Prob. & Statistics, St-Petersburg State U., St-Petersburg, Russia.
Lan Ma Nygren, Rider U., Lawrenceville, NJ 08648, USA.
Hernando Ombao, Dept. of Statistics, U. of Illinois at Urbana-Champaign, Champaign, IL 61820, USA
B. N. Pandey, Dept. of Statistics, Banarus Hindu U., Varanasi 221005, India.
M. N. Patel*, Dept. of Statistics, School of Sciences, Gujarat U., Ahmedabad-380009, India.
W. L. Pearn, Dept. of Indus. Engineering & Management, National Chiao-Tung U., Hsinchu, Taiwan, ROC.
Gyan Prakash, Dept. of Statistics, Harish Chandra P. G. College, Varanasi, U. P., India.
Serge B. Provost*, Dept. of Statistical and Actuarial Sciences, U. of Western Ontario, London, Ontario, Canada N6A 5B7
Mezbah Rahman*, Dept. of Math. & Statistics, Minnesota State U, Mankato, MN 56001, USA.
Mohammad Shafiqur Rahman*, Mathematics, Statistics and Computer Science Discipline, School of Natural and Physical Sciences, U. of Papua New Guinea (PNG), Papua New Guinea.
Mohammad Z. Raqab*, Dept. of Math., U. of Jordan, Amman 11942, Jordan.
Harold B. Sackrowitz, Dept. of Statistics, Rutgers U., Piscataway, NJ 08854-8019, USA.
Amitava Saha*, Deputy Director Mines Safety (Stat.), Directorate General of Mines Safety, Dhanbad, Jharkhand-826001, India.
L. N. Sahoo*, Dept. of Statistics, Utkal U., Bhubaneswar 751004, India.
Mohammad Salehi M.*, Dept. of Math., Statistics, and Physics, Qatar Univ., P.O. Box 2713, Doha, Qatar.
Nahid Sanjari F., Statistics Dept., Shiraz U., Shiraz 71454, Iran.
Jose Almer T. Sanqui, Dept. of Mathematical Sciences, Appalachian State U., Boone, NC 28608, USA.
Meckinley Scott, Dept. of Math., U. of Alabama, Tuscaloosa, AL 35478, USA.
Patrizia Semeraro, Dept. of Math., Politecnico, di Torino, 10129 Torino, Italy.
Yuehjen E. Shao, Dept. of Statistics & Info. Sci., Fu Jen Catholic U., Taipei, Taiwan, ROC.

JPSS Referees (continued 3)

Henri Schurz, Dept. of Math., Southern Illinois U., Carbondale IL 62901-4408, USA.
Mangala shah, Dept. of Statistics, The M. S. Univ. of Baroda, Vadodara 2, India.
Ashok shanubhogue, Dept. of Statistics, Sardar Patel U., Anand 388120, India.
R. L. Shinde, North Maharashtra U., Jalgaon, India.
John F. Shortle*, Dept. of Systems Engineering & O. R., George Mason U., Fairfax, VA 22030, USA.
M. Shreehari, Dept. of Statistics, M. S. Univ. of Baroda, Baroda 390 002, Inidia.
G. N. Singh, Dept. of Applied Math., Indian School of Mines U., Dhanbad-826 006, India.
Rajesh singh, Dept. of Statistics, Amravati U., Maharashtra, India.
Sarjinder Singh, Dept. of Applied Math., Texas A & M Univ. at Kingsville, Kingsville, TX 78363, USA.
A. K. Sinha, Dept. of Statistics, Patna U., Patna, India.
Muni S. Srivastava, Dept. of Statistics, U. of Toronto, Toronto, Ontario, Canada M5S 3G3.
Khalaf S. Sultan, Dept. of Statistics & O. R., King Saud U., Riyadh 11451, Saudi Arabia.
Jürgen Symanzik, Dept. of Math. & Statistics, Utah State U., Logan, UT 84322-3900, USA.
Ryszard N. Syski, Dept. of Mathematics, Univ. of Maryland, College Park, MD 20742, USA.
Lotfi Tadj*, Dept. of Statistics and O. R., King Saud U., Riyadh 11451, Saudi Arabia.
Hideaki Takagi, School of Systems and Information Engineering, U. of Tsukuba, 1-1-1 Tennoudai, Tsukuba-shi, Ibaraki 305-8573, Japan.
Lehana Thabane, Dept. of Clinical Epidemiology and Biostatistics, McMaster U., Hamilton, Ontario, Canada L8S 4K1.
Guo-Liang Tian, Dept. of Statistics & Actuarial Science, U. of Hong Kong, Hong Kong, PROC.
Andrey V. Timofeev, Dept. of Statistics, Speech Technology Center, St.-Petersburg, 196084, Russia.
Fred Torcaso*, Dept. of Math. Sci., The Johns Hopkins U., Baltimore, MD 21218, USA.
Alex Trindade, Dept. of Math. & Statistics, Texas Tech U., Lubbock, TX 79409-1042, U.S.A.
Li-Ju Tsai*, Dept. of International Trade and Finance, Fu Jen Catholic Univ., Taipei, Taiwan, ROC.
S. K. Upadhyay, Dept. of Statistics, Banarus Hindu U., Varanasi, India.
R. Vasudeva, Dept. of Statistics, Mysore U., Mysore, India.
Andrei Volodin, School of Math. and Statistics, U. of Western Australia, Crawley, Perth, WA 6009, Australia.
Abdus S. Wahed, Dept. of Biostatistics, U. of Pittsburgh, Pittsburgh, PA 15217, USA.
Yat-Wah Wan, Graduate Institute of Global Operations Strategy and Logistics Management, National Dong Hwa U., Hualien, Taiwan, ROC.
Chia-Li Wang, Institute of Applied Mathematics, National Donghwa U., Hualian, Taiwan, ROC.
Ching-Yun Wang, Div. of Pub. Health Sci., Fred Hutchinson Cancer Research Center, Seattle, WA 98109, USA.
Pu Patrick Wang*, Dept. of Math., U. of Alabama, Tuscaloosa, AL 35478, USA.
Peitsang Wu, Dept. of Industrial & Management Engineering, I-Shou U., Kaohsiung, Taiwan, ROC.
Liugen Xue, College of Applied Sciences, Beijing U. of Technology, Beijing, China.
Keying Ye, Dept. of Statistics, Virginia Polytechnic Institute and State U., Blacksburg, VA 24061, USA.
Calvin K. Yu, Dept. of Indus. Engineering & Management, Mingchi U. of Tech., Taipei, Taiwan, ROC.
Yiqiang Q. Zhao, School of Math. and Statistics, Carleton U., Ottawa, Ontario, Canada K1S 5B6.
Zhen Zhao, CDC/NCHSTP, Mail Stop E-10, 1600 Clifton Road, Atlanta, GA 30333, USA.
Lixing Zhu, Department of Math., Hong Kong Baptist U., Hong Kong, China.

JPSS *Journal of Probability and Statistical Science* ISSN 1726-3328

Subscription/Order Form (for **organizations**)

(**PDF version of future, current, and back issues**)

Name of Organization: _____

Contact Person: _____ Phone: _____

Email Address: _____

Mailing Address (optional): _____

_____

Subscription (in year) : _____ (from _____ to _____)

Back Issue Orders (optional)(Vol./No.) : _____

Total Amount: U.S.$_____

Signature of Contact Person: _____ Date: _____

Please return the form and a cheque (in U.S.$ and payable to **Susan Rivers' Cultural Institute**) to

Dr. **Kuang-Chao Chang** (Managing Editor, *JPSS*) (**stat1016@mail.fju.edu.tw**)
Department of Statistics and Information Science
Fu Jen Catholic University
510 Chung Cheng Road, Hsinchuang
Taipei Hsien, **TAIWAN**, ROC

or remit your payment to

Account Number: **026-53-01021-4**
Payee: Susan Rivers' Cultural Institute
Bank Name: North Hsinchu Branch, Mega International Commercial Bank Co., LTD
Bank swift code: **ICBCTWTP026**
Address: #129, Chung Cheng Road, Hsinchu City, TAIWAN 30051
Phone: 03-5217171 Fax: 03-5262642

Subscription Rates

Regular rates: US$38/per year for individuals; US$68/per year for organizations.

Discounted rates: US$68/every two years and US$88/every three years for individuals; US$118/every two years and US $168/every three years for organizations.

Paper version of 2003-2006 back issues rates: US$25/per issue for individuals; US$35/per issue for organizations. (including air mail postage and handling)

CD version containg 15 volumes of *JPSS* 2003-2017 to be available in August 2017 !!!

JPSS *Journal of Probability and Statistical Science* ISSN 1726-3328

Subscription/Order Form (for **individuals**)

(PDF version of future, current, and back issues)

Subscriber's Name: _____ Phone: _____

Affiliation: _____ Email: _____

Mailing Address (optional): _____

_____

Subscription (in year) : _____ (from _____ to _____)

Back Issue Orders (optional)(Vol./No.) : _____

Total Amount: U.S.$_____

Signature: _____ Date: _____

Please return the form and a cheque (in U.S.$ and payable to **Susan Rivers' Cultural Institute**) to

Dr. **Kuang-Chao Chang** (Managing Editor, *JPSS*) (**stat1016@mail.fju.edu.tw**)
Department of Statistics and Information Science
Fu Jen Catholic University
510 Chung Cheng Road, Hsinchuang
Taipei Hsien, **TAIWAN**, ROC

or remit your payment to

Account Number: **026-53-01021-4**
Payee: Susan Rivers' Cultural Institute
Bank Name: North Hsinchu Branch, Mega International Commercial Bank Co., LTD
Bank swift code: **ICBCTWTP026**
Address: #129, Chung Cheng Road, Hsinchu City, TAIWAN 30051
Phone: 03-5217171 Fax: 03-5262642

Subscription Rates

Regular rates: US$38/per year for individuals; US$68/per year for organizations.

Discounted rates: US$68/every two years and US$88/every three years for individuals; US$118/every two years and US $168/every three years for organizations.

Paper version of 2003-2006 back issues rates: US$25/per issue for individuals; US$35/per issue for organizations. (including air mail postage and handling)

CD version containg 15 volumes of *JPSS* 2003-2017 to be available in August 2017 !!!