

## A BIBLIOGRAPHY ON VARIANCE COMPONENTS AN INTRODUCTION AND AN UPDATE: 1984-2002

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### **INTRODUCTION**

The variability among data may have quite complex structure and the splitting of variation into its individual components is important in many areas of applications. In particular, the study of variation through a class of linear models known as random and mixed models is a central topic in statistics with wide ramifications in both theory and applications. Sometimes these models are called components of variance models since the interest in the model lies in investigating the variances of the effects of factor levels which are assumed to be randomly selected from a large population of levels. These variances are also known as variance components since the total variance can be expressed as the sum of these variances and the error variance. Knowledge of the variance components, i.e., the information on the relative importance and magnitude of the sources of variability in the data is of critical importance in many problems since the isolation of the total variance into the individual components of variance would result in the physical elimination of the sources of variability in question.

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Components of variance models can be traced back at least to the work of astronomer Airy (1861) and are still of considerable interest, particularly, in subjects such as quantitative genetics, industrial experiments, psychometrics, educational testing, economics and precision of measurements, among others. Moreover, during the recent years there has been a renewed surge of interest in the use of variance components in applied areas such as biometrical genetics, animal and plant breeding, statistical process control and quality improvement. Variance components were first employed by Fisher (1918) in connection with genetic research on Mendelian laws of inheritance and Darwinian hypothesis on natural selection. Early developments in statistical models and methods took place in the context of applications in agricultural experiments and textile and wool industries and were pioneered by W.G. Cochran, H. E. Daniels, L. H. C. Tippett, and F. Yates, among others. Some of the earlier research workers who have presented a formal treatment of variance components models include Tippet (1931), Neyman et al. (1935), Yates and Zacopanay (1935), Cochran (1937, 1939), Yates and Cochran (1938), Daniels (1939), Jackson (1939), Yates (1940), Winsor and Clarke (1940), Crump (1946) and Eisenhart (1947).

Although the analysis of variance (ANOVA) was introduced by R. A. Fisher during 1920's most of work during the 1930's, 1940's, and 1950's was directed to the fixed effects model which is by far the most developed. The components of variance model during this period received less attention primarily due to lack of analytical amenability in developing exact and optimal procedures in the area of interval estimation and hypothesis testing. During the 1960's and 1970's point estimation of variance components received a great deal of attention and a number of new procedures were developed. Since then the growth of the literature in this area of statistics has steadily been on the rise as is evidenced by a vast number of articles, papers and books that have appeared in scientific literature during recent decades. It has drawn the attention of many leading researchers in both theoretical and applied areas of statistics.

Most of the early developments during 1940's and 1950's were primarily concerned with point estimation of variance components for balanced data assuming as if the model was a fixed effects model. During this period little progress was made in the area of interval estimation and hypothesis testing except for some results on linear combinations of variance components. Starting late 1970's some attention was directed to this topic, but was largely confined to results on confidence intervals on functions of variance components for balanced data. However, in recent years, the emphasis has shifted to interval estimation and hypothesis testing, particularly for unbalanced data, and during the last couple of decades a great number of results

on confidence intervals and tests of hypotheses have been reported in the literature. Moreover, earlier methods of point estimation were based largely on adaptations of ANOVA methodology; but recent years, driven primarily by advances in computational technology, have witnessed the revival of the old and familiar method of maximum likelihood (ML) and its variant form, the so-called restricted maximum likelihood (REML).

Although much of the research activity in this field centered around the analysis of variance (ANOVA) models with standard assumptions of normality and homoscedasctiy, the newer developments in point estimation for nonnormal data, based on the principles of minimum norm and minimum variance quadratic unbiased estimation (MINQUE & MIVQUE) offered fresh and innovative approaches to variance component estimation and established their link to the ML and REML estimation. The MINQUE and MIVQUE and their variants, such as, minimum norm quadratic estimation (MINQE) and minimum mean square error estimation (MIMSQE), etc., also contributed to the emergence of new approaches to the nonnegative estimation of variance components and have generated a lot of theoretical interest and research activity in the field, resulting in extensive publications of books and papers on the subject.

The advances in broadly applicable computing procedures, such as EM algorithm, and abundance of cheap, reliable, and user-friendly software have had tremendous impact on many useful applications of even highly complex and analytically intractable results. In addition, the researchers have diverged their attention to a number of closely related themes and there has been an enormous surge of literature in areas such as linear models for discrete and categorical data, hierarchical or multilevel modeling, diallel cross experiments, prediction of random effects, Bayesian methodology, Gibbs sampling, generalized linear mixed models, random coefficient models, meta analysis, and nonlinear mixed models, among others. Although the literature on variance components is quite extensive, the number of publications devoted to design aspects has been somewhat limited. However, recent developments in the area of methods of estimation and nonlinear random and mixed modeling are closely related to the choice of designs and consequently have drawn the attention of a number of research workers in the field.

The status of variance components till 1950 was documented in a survey paper by Crump (1951) and chapter-length coverage in a book by Anderson and Bancroft (1952) and subsequently by Sheffé (1959, chapters 7 and 8); and later was updated in a comprehensive review by Searle (1971). For a historical account of the subject, see Sheffé (1956) and Anderson (1978, 1979). Most of the recent work on the application, design, methodology and theory associated with variance components

has been summarized in reviews and survey papers by Anderson (1975, 1981), Kleffé (1977), Khuri and Sahai (1985), Henderson (1986), Burdick and Graybill (1988), Hultquist (1988), Singhal, Tiwari and Sahai (1988), Hocking (1989), Searle (1995), Cox (1998), Robinson (1998), Solomon (1998), Samaranyake and Patel (1999), Khuri (2000), Lee (2000); and texts and monographs by Malley (1986), Rao and Kleffé (1988), Burdick and Graybill (1992), Searle, Casella, and McCulloch (1992), P. S. R. S. Rao (1997), Khuri, Mathew and Sinha (1998), Cox and Solomon (2002), and Sahai and Ojeda (2004).

The present bibliography is an attempt to provide a comprehensive listing of available literature on variance components and other related areas covering the period (1984-2002). It is intended to expand and update two earlier works by Sahai (1979) and Sahai, Khuri and Kapadia (1985). Sahai (1979) covering the literature till 1978 provided approximately 2000 entries. Sahai, Khuri and Kapadia (1985) assembled nearly 700 citations on variance components and other related topics, covering the literature between 1978-1983. In the present bibliography, covering the period 1984-2002, more than 2500 entries are provided. A partial coverage of the year 2003 contains nearly 50 entries. Some of the articles may not be specifically concerned with the variance components, but are related in some manner to the general topic. The references have not been classified into certain broad subject categories for two reasons. Firstly, because of the nonaccessibility of a great number of references, and secondly, more often than not the references fall into several overlapping categories and involve subjective judgments. Thus the user of the bibliography cannot and should not rely on the author's classification scheme, but rather would be well advised to explore a broad range of references, when interested in locating publications on certain special topics of interest.

Preparation of a bibliography is somewhat arduous and never complete since quite a few articles remain unpublished and some are published in obscure journals not readily accessible. In the present work an attempt has been made to compile all the papers appearing in "standard" statistical journals and relevant references cited therein.

## METHODS

The coverage of journals varied greatly from one journal to the other. Among statistical journals the coverage is fairly complete for those journals which are regularly scanned in their entirety by the *Current Index to Statistics* (CIS), *Science Citation Index* (SCI), *MathSciNet* (Mathematical Reviews on the Web), *MathSci+* and *Statistical Theory and Methods Abstracts* (STMA). The relevant items from

these publications were located using the keywords such as variance components, random linear models, mixed linear models, random effects, mixed effects, and other related terms. The articles on variance components relating to the genetic population parameters, genetic components of variance, precision of measurements, random coefficient models, including random models in meta-analysis are also included. Moreover, in addition to covering classical analysis of variance and regression models, relevant works on binary, discrete, categorical, log-linear, generalized linear and hierarchical (multilevel) models are also given. In the compilation of this bibliography, we have also made extensive use of the *Cumulative Index to Linear Models* by Cook (1990) and a previously published bibliography by Singhal, Tiwari and Sahai (1988) on the robustness studies to non-normality in variance component models.

Among nonstatistical journals, the coverage is relatively complete for those journals being regularly scanned by the CIS, SCI and STMA. This coverage is highly selective in nature and only those entries dealing with the applications of variance component models have been included. For journals not regularly scanned by CIS, SCI and STMA, the coverage has been fairly inconsistent and unsystematic and only those items which came to our attention by random browsing of selected issues of a wide variety of journals, have been included. A number of references that properly belonged to two earlier bibliographies, but came to our attention now, have been included in the form of an appendix (Appendix I). A partial coverage of the year 2003 has been given (Appendix II). A list of books devoted entirely to certain aspects of variance components is provided (Appendix III). Furthermore, references to some selected reviews to the books are also included in the same appendix.

Although the authors have striven to make the coverage of recent literature on variance components as complete as possible, it is but natural that some relevant entries have been unintentionally left out. We would welcome suggestions of any pertinent items for their possible inclusion in any future work.

## DESCRIPTION OF ENTRIES

The bibliography contains references which came to print during the period 1984-2002. The format of the entry citations is the same as used in the earlier bibliographies. They are presented in the following form: Author's last name(s), year of publication, title of the article, name of the journal, volume number, and page numbers. Multiple-authored items are listed under the first named author only. For each author, the items of which he/she is the sole author are listed according to the year. A similar ordering is followed by the multiple-authored items. Only page

numbers are mentioned for the articles appearing in yearbooks, reports and proceedings, as they generally do not have volume numbers for continuity. The language of the articles, if known to be other than English, is also indicated. In order to save space, the conventional abbreviations for the journals, periodicals, proceedings and other publications cited in the bibliography, similar to the ones employed by the *Current Index to Statistics*, have been introduced. A list of the abbreviations and complete names of the publications is given in an appendix (Appendix IV) at the end of the bibliography.

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## APPENDIX IV Abbreviations

AcAgrSca	Acta Agriculturae Scandinavica
AcAppMa	Acta Applicandae Mathematicae: An International Journal on Applying Mathematics and Mathematical Applications
AcMaSci	Acta Mathematica Scientia
AcUPO	Acta Universitatis Palackianae Olomucensis (China)
AdMAAPS	Advances on Methodological and Applied Aspects of Probability and Statistics, N. Balakrishnan (Ed.), Gordon and Breach Science Publishers, London
AdStMetGen	Advances in Statistical Methods for Genetic Improvement of Livestock, D. Gianola and K. Hammond (Eds.), Springer-Verlag, Berlin/New York
AdvApplStat	Advances and Applications in Statistics
AdvRelibty	Advances in Reliability, A. P. Basu (Ed.), North-Holland, Amsterdam
Agro	Agrociencia
AJAgEco	American Journal of Agricultural Economics
AJEpid	American Journal of Epidemiology
AJHuGene	American Journal of Human Genetics
AJMedGen	American Journal of Medical Genetics
AJMMgSci	American Journal of Mathematical and Management Sciences
AJPhyAnth	American Journal of Physical Anthropology
AlgrhJSt	Aligarh Journal of Statistics
AllgeSta	Allgemeines Statistisches Archiv
AMaAPknC	Acta Mathematicae Applicatae Sinica (Chinese Series)
AMaAPknE	Acta Mathematica Applicatae Sinica (English Series)
AMaApS	Acta Mathematica Applicatae Sinica
AMaPekng	Acta Mathematica Sinica (Translated as Chinese Math-Acta)
AmerStat	The American Statistician
AnaQuaCytHist	Analytical and Quantitative Cytology and Histology
AnHuGene	Annals of Human Genetics
AnInStMa	Annals of the Institute of Statistical Mathematics (Japan)
AnlsGenSelAni	Annales de Génétique et de Sélection Animale
AnlsIMathStat	Annals of the Institute of Statistical Mathematics
AnlsStat	Annals of Statistics
AnlyChem	Analytical Chemistry
ANOVABehSc	Applied Analysis of Variance in Behavioral Science, L. K. Edwards (Ed.), Marcel Dekker, New York
AplMaCo	Applied Mathematics and Computation
ApplicMa	Applications of Mathematics (Prague, Czech Republic)
ApplMath	Applications of Mathematics

ApplStat	Applied Statistics
ApPsychM	Applied Psychological Measurement
ApStAgri20	Proceedings of the 2000 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri89	Proceedings of the 1989 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken and J. R. Schwenke (Eds.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri90	Proceedings of the 1990 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken and J. R. Schwenke (Eds.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri91	Proceedings of the 1991 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken and J. R. Schwenke (Eds.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri92	Proceedings of the 1992 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken and J. R. Schwenke (Eds.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri93	Proceedings of the 1993 Kansas State University Conference on Applied Statistics in Agriculture, W. Noble (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri94	Proceedings of the 1994 Kansas State University Conference on Applied Statistics in Agriculture, J. R. Schwenke (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri95	Proceedings of the 1995 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri96	Proceedings of the 1996 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri97	Proceedings of the 1997 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStAgri98	Proceedings of the 1998 Kansas State University Conference on Applied Statistics in Agriculture, G. A. Milliken (Ed.), Department of Statistics, Kansas State University, Manhattan, Kansas, U. S. A.
ApStM&DA	Applied Stochastic Models and Data Analysis
ApStMBI	Applied Stochastic Models in Business and Industry
ArcAniBe	Archives of Animal Breeding
ASAProBays	ASA Proceedings of the Bayesian Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProBiom	ASA Proceedings of the Biometric Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProBiop	ASA Proceedings of the Biopharmaceutical Section, American Statistical Association, Alexandria, Virginia, U. S. A.

ASAProBuEc	ASA Proceedings of the Business and Economic Statistics Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProEnvr	ASA Proceedings of the Section on Statistics and the Environment, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProEpid	ASA Proceedings of the Epidemiology Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProGsSs	ASA Proceedings of the Section on Government Statistics and Section on Social Statistics, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProJS	ASA Proceedings of Joint Statistical Meetings, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProPEng	ASA Proceedings of the Section on Physical and Engineering Sciences, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProQlPr	ASA Proceedings of the Quality and Productivity Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProSoSt	ASA Proceedings of the Social Statistics Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProSrvyRsr	ASA Proceedings of the Survey Research Methods Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProStCp	ASA Proceedings of the Statistical Computing Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProStEd	ASA Proceedings of the Statistical Education Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASAProStGr	ASA Proceedings of the Statistical Graphics Section, American Statistical Association, Alexandria, Virginia, U. S. A.
ASQCTekCon	ASQC Technical Conference Transactions, American Society for Quality Control, Milwaukee, Wisconsin, U. S. A.
AstnB	Astin Bulletin: A Journal of the International Actuarial Association
AstrlJSt	The Australian Journal of Statistics
Auk	Auk (A Quarterly Journal of Ornithology)
AUMC	Annales Universitatis Mariae Curieskodowska, Section A
AUPO	Acta Universitatis Palackianae Olomucensis. Facultas Rerum Naturalium. Mathematica
AusNZJSt	The Australian and New Zealand Journal of Statistics
BAsMS	Bulletin of the Australian Mathematical Society
BayesStat3	Bayesian Statistics, Volume 3, J. M. Bernardo, M. H. DeGroot, D. V. Lindley and A. F. M. Smith (Eds.), Clarendon Press, Oxford, England
BayesStEco	Bayesian Analysis in Statistics and Econometrics, P. K. Goel and S. Iyengar (Eds.), Springer-Verlag, New York
BBmJpn	Japanese Journal of Biometrics (Formerly Bulletin of the Biometric Society of Japan)
BehavGen	Behavior Genetics
BehBraSci	Behavioral and Brain Sciences
BehEcoSoc	Behavioral Ecology and Sociobiology

BeisDX	Journal of Beijing Normal University (China)
BEntSocA	Bulletin of the Entomological Society of America
BiomPrax	Biometrie-Praximeterie
BiomtrcJ	Biometrical Journal
Biomtrcs	Biometrics
Biomtrka	Biometrika
Biostat	Biostatistics
BJMaStPs	British Journal of Mathematical and Statistical Psychology
BriHeaJ	British Heart Journal
BrJPrSt	Brazilian Journal of Probability and Statistics
BSeismlg	Bulletin of the Seismological Society of America, Oakland, California, U. S. A.
BsLkMdStEc	Bayesian and Likelihood Methods in Statistics and Econometrics: Essays in Honor of George A. Barnard; S. Geisser, J. S. Hodges, S. J. Press and A. Zellner (Eds.), North-Holland; Amsterdam
BuAcPoSci	Bulletin de l'Académie Polonaise des Sciences. Série des Sciences Mathématiques, Astronomiques et Physiques
CalcutSt	Calcutta Statistical Association Bulletin
CandJSt	Canadian Journal of Statistics
CanJForR	Canadian Journal of Forest Research
CasSBIomty	Case Studies in Biometry, L. Lange, L. Ryan, L. Billard, D. Brillinger, L. Conquest and J. Greenhouse (Eds.), Wiley Interscience, Somerset, New Jersey, U. S. A.
Chance	Chance: New Directions for Statistics and Computers
Chemolab	Chemometrics and Intelligent Laboratory Systems
ChinaAMA	Chinese Annals of Mathematics, Series A (Chinese)
ChinaAMB	Chinese Annals of Mathematics, Series B (English)
ChinaJMa	Chinese Journal of Mathematics
ChJAapSt	Chinese Journal of Applied Probability and Statistics (Shanghai, China)
Circulation	Circulation
ClasRMDtAn	Classification and Related Methods of Data Analysis, H. H. Bock (Ed.), North-Holland, Amsterdam
ClinChem	Clinical Chemistry
CmpBiomd	Computer Methods and Programs in Biomedicine
CmpBlgyM	Computers in Biology and Medicine
CmpSt	Computational Statistics (formerly Computational Statistics Quarterly)
CmpStDA	Computational Statistics and Data Analysis
CmpStQ	Computational Statistics Quarterly
CntStatNLJ	Contributions to Statistics: Essays in Honor of N. L. Johnson; P. K. Sen (Ed.), North-Holland, Amsterdam
CommStA	Communications in Statistics, Part A: Theory and Methods
CommStB	Communications in Statistics, Part B: Simulation and Computation

CommStSM	Communications in Statistics: Stochastic Models
Complexity	Complexity
COMPSTAT6	Computational Statistics: Proceedings of the Sixth Symposium on Computational Statistics, Physica-Verlag, Heidelberg, Germany
COMPSTAT7	Computational Statistics: Proceedings of the Seventh Symposium on Computational Statistics, F. De Antoni, N. Lauro and A. Rizzi (Eds.), Physica-Verlag, Heidelberg, Germany
COMPSTAT9	Computational Statistics: Proceedings of the Ninth Symposium on Computational Statistics, K. Momirovic and V. Mildner (Eds.), Physica-Verlag, Heidelberg, Germany
COMPSTAT12	Computational Statistics: Proceedings of the Twelfth Symposium on Computational Statistics, A. Prat (Ed.), Physica-Verlag, Heidelberg, Germany
COMPSTAT13	Computational Statistics: Proceedings of the Thirteenth Symposium on Computational Statistics, R. Payne and P. Green (Eds.), Physica-Verlag, Heidelberg, Germany
COMPSTAT14	Computational Statistics: Proceedings of the Fourteenth Symposium on Computational Statistics, J G. Bethlehem and P G. M. Van der Heijden (Eds.), Physica-Verlag, Heidelberg, Germany
ConClnTr	Controlled Clinical Trials
ContbStoch	Contributions to Stochastics, W. Sendler (Ed.), Physica-Verlag, Heidelberg
ContEcon&S	Contributions to Econometrics and Statistics Today: In Memoriam Guenter Menges; H. Schneeweiss and H. Strecker (Eds.), Springer-Verlag, Berlin/New York
CPrStOlkin	Contributions to Probability and Statistics: Essays in Honor of Ingram Olkin; L. J. Gleser, M. D. Perlman, S. J. Press and A. R. Sampson (Eds.), Springer-Verlag, Berlin/New York
CropSci	Crop Science
CuBioI	Cuadernos de Bioestadistica y Sus Aplicaciones Informaticas, Facultad de Medicina, Universidad de Zaragoza, Zaragoza, Spain
DecisnSc	Decision Sciences
DevPsyc	Developmental Psychology
DiscMath	Discrete Mathematics
DiscMathASM	Discussiones Mathematicae – Algebra Stochastic Methods
DiscMathPS	Discussiones Mathematicae- Probability and Statistics
DrugInfJ	Drug Information Journal
DscnExp&S	Design of Experiments: Ranking and Selection, T. J. Santner and A. Tamhane (Eds.), Marcel Dekker, New York
EcoJ	Econometric Journal
EcolgApp	Ecological Applications
EcolgMdl	Ecological Modelling
Ecology	Ecology
EcomtrRv	Econometric Reviews

EconLet	Economic Letters
Econmtca	Econometrika
EconTher	Econometric Theory
EconThPrct	Readings in Econometric Theory and Practice, W. E. Griffiths, H. Lütkepohl and M. E. Bock (Eds.), North-Holland, Amsterdam
EdPsMeas	Educational and Psychological Measurement
EDVMdBio	EDV in Medizin und Biologie (Germany)
EgpStJ	Egyptian Statistical Journal
EncyBioP	Encyclopedia of Biopharmaceutical Statistics, S. -C. Chow (Ed.), Marcel Dekker, New York
EncyStatSc	Encyclopedia of Statistical Sciences, S. Kotz and N. L. Johnson (Eds.), John Wiley, New York
EncyStatSc1	Encyclopedia of Statistical Sciences, Update Vol. 1, S. Kotz, C. B. Read and D. L. Banks (Eds.), John Wiley, New York
EnvEcost	Environmental and Ecological Statistics
EnvrMtrc	Environmetrics
EssStatSci	Essays in Statistical Science: Papers in Honour of P. A. P. Moran, J. Gani and E. J. Hannan (Eds.), Applied Probability Trust, Sheffield, England
EstmFunctn	Estimating Functions, V. P. Godambe (Ed.), Clarendon Press, Oxford, England
EsTS&AIPro	Essays in Time Series and Allied Processes: Papers in Honor of E. Hannan: Vol. 23A, Journal of Applied Probability; J. Gani and M. B. Priestley (Eds.), Applied Probability Trust, Sheffield, U. K.
Evolutn	Evolution
ExpDsnSMGS	Experimental Design, Statistical Methods and Genetic Statistics, K. Hinkelmann (Ed.), Marcel Dekker, New York
ExplrANOVA	Fundamentals of Exploratory Analysis of Variance, D. C. Hoaglin, F. Mosteller and J. W. Tukey (Eds.), John Wiley, New York
FEJThSt	Far East Journal of Theoretical Statistics
FFSNU	Folia Facultatis Scientiarum Naturalium Universitatis
FoQP	Food Quality and Preference
GctaMa	Gaceta Matematica, Institute Jorge Juan, Madrid, Spain
GenDisCTra	Genetic Dissection of Complex Traits, D. C Rao and M. A. Province (Eds.), Academic Press, MA.
GeneEpid	Genetic Epidemiology
GeneRsr	Genetic Research
Genetcs	Genetics
Genetica	Genetica
GenSelEvo	Genetics, Selection, Evolution
GjrStR	Gujarat Statistical Review
HdbkStat8	Handbook of Statistics, Volume 8: Statistical Methods in Biological and Medical Sciences, C. R. Rao and R. Chakraborty (Eds.), North Holland, Amsterdam

HdbkStat12	Handbook of Statistics, Volume 12: Environmental Statistics, G. P. Patil and C. R. Rao (Eds.), North Holland, Amsterdam
HdbkStat18	Handbook of Statistics, Volume 18: Bioenvironmental and Public Health Statistics, P. K. Sen and C. R. Rao (Eds.), North Holland, Amsterdam
HdbkStat22	Handbook of Statistics, Volume 22: Statistics in Industry, R. Khattree and C. R. Rao (Eds.), North Holland, Amsterdam
Heredity	Heredity
HlthSORM	Health Services and Outcomes Research Methodology
HorSci	HortScience
HumBio	Human Biology
HumHrdty	Human Heredity
IBSProNet	Proceedings of the 5 <sup>th</sup> Meeting of the Biometric Society Network for Central America, The Caribbean, Mexico, Colombia and Venezuela, Instituto Nacional de Estadistica, Geografia e Informatica, Mexico, DF
IEEEAuCn	IEEE Transactions on Automatic Control
IMAJ	IMA Journal of Mathematics Applied in Medicine and Biology
InOper	Investigacion Operational Revista (Cuba)
InsMaEc	Insurance Mathematics and Economics
IntEconR	International Economic Review
IntJFor	International Journal of Forecasting
IntStRvw	International Statistical Review
JABES	Journal of Agricultural, Biological and Environmental Statistics
JAdRsr	Journal of Advertising Research
JahRev	Jahanagirnagar Review; Part A (Science)
JAMA	Journal of the American Medical Association
JAnmlBreGen	Journal of Animal Breeding and Genetics
JAnmlSci	Journal of Animal Sciences
JApEcmtx	Journal of Applied Econometrics
JAppEcol	Journal of Applied Ecology
JAppStat	Journal of Applied Statistics
JApStSci	Journal of Applied Statistical Science
JASA	Journal of the American Statistical Association
JAstrlMa	Journal of the Australian Mathematical Society
JBES	Journal of Business and Economic Statistics
JBiophSt	Journal of Biopharmaceutical Statistics
JBusUChi	Journal of Business of the University of Chicago
JC&CPsyh	Journal of Consulting and Clinical Psychology
JChem	Journal of Chemometrics
JChinaSt	Journal of the Chinese Statistical Association (Taipei, Taiwan)
JClinPer	Journal of Clinical Periodontology

JCmpGrSt	Journal of Computational and Graphical Statistics
JDairSci	Journal of Dairy Science
JDalIT	Journal of Dalian University of Technology (China)
JEconmxt	Journal of Econometrics
JEEdBehSt	Journal of Educational and Behavioral Statistics
JEEdStat	Journal of Educational Statistics
JExpEd	Journal of Experimental Education
JHarIT	Journal of Harbin University of Technology (China)
JIAgSt	Journal of the Indian Society of Agricultural Statistics
JIndnStA	Journal of the Indian Statistical Association
JInfOpSc	Journal of Information and Optimization Sciences
JItalStS	Journal of the Italian Statistical Society
JJapnSt	Journal of the Japan Statistical Society
JJBeh	Japanese Journal of Behaviormetrics
JJiaU	Journal of Jiangxi Normal University, Natural Sciences Edition (China)
JJSocCS	Journal of the Japanese Society of Computational Statistics
JKarU	Journal of Karadeniz University – Series Mathematics and Physics (Turkey)
JKoreaSt	Journal of the Korean Statistical Society
JMarRsr	Journal of Marketing Research
JMathChn	Journal of Mathematics (Chinese), Wuhan University, Peoples Republic of China
JMathW	Journal of Mathematics (Wuhan) (China)
JMultiAn	Journal of the Multivariate Analysis
JNnparsSt	Journal of Nonparametric Statistics
JNOknSt	Jahrbuecher für Nationaloekonomie und Statistik
JNWU	Journal of Northwest University (China)
JOffStat	Journal of Official Statistics
JPerRsr	Journal of Periodontal Research
JPerSoPs	Journal of Personality and Social Psychology
JpJAppSt	Japanese Journal of Applied Statistics
JpnJBiom	Japanese Journal of Biometrics (Formerly: Bulletin of the Biometric Society of Japan)
JQAnthro	Journal of Quantitative Anthropology
JQualTek	Journal of Quality Technology
JRSS-A	Journal of the Royal Statistical Society, Series A
JRSS-B	Journal of the Royal Statistical Society, Series B
JSCNorU(NSE)	Journal of South China Normal University (Natural Science Edition)
JStatRsr	Journal of Statistical Research (University of Dacca, Bangladesh)
JStCmpSm	Journal of Statistical Computation and Simulation
JStMgSy	Journal of Statistics and Management Systems

JStPar	Journal de Societe de Statistique de Paris, Paris, France
JStPlInf	Journal of Statistical Planning and Inference
JSysSMaS	Journal of Systems Sciences and Mathematical Sciences (Beijing, China)
JTimSerA	Journal of Time Series Analysis
KorApS	Korean Journal of Applied Statistics
KWMeth	Kwantitatieve Methoden
Kyba	Kybernetika (Academy of Sciences of the Czech Republic, Prague)
LatntTrMod	Latent Trait and Latent Class Models, R. Langeheine and J. Rost (Eds.), Plenum, New York
LatTCModSS	Applications of Latent Trait and Latent Class Models in the Social Sciences, J. Rost and R. Langeheine (Eds.), Waxmann-Verlag, Münster, Germany
LiDaAnal	Lifetime Data Analysis
LinAlgAp	Linear Algebra and Its Applications
LINSTA84	Proceedings of the International Conference on Linear Statistical Inference LINSTAT '84 (Pozna'n, 1984), Kluwer Academic Publishers, Dordrecht.
LINSTA93	Proceedings of the International Conference on Linear Statistical Inference LINSTAT '93 (Pozna'n, 1993), Kluwer Academic Publishers, Dordrecht.
ListyBio	Listy Biommetryczne /Biometrical Letters (Polish Biometric Society)
LngStRptMs	Workshop on Design of Longitudinal Studies and Analysis of Repeated Measures Data, S. R. Wilson (Ed.), Centre for Mathematics and Its Applications, Canberra, Australia
MaBiosci	Mathematical Biosciences
MaMethSt	Mathematical Methods of Statistics
MaOpfStS	Mathematische Operationsforschung und Statistik, Series Statistics
MaSlovac	Matematicky Casopis Slovenskej Akademie Vied (Bratislava, Slovakia)
MathModl	Mathematical and Computer Modeling
MatStos	Applied Mathematics (Poland)
MeasErrSur	Measurement Errors in Surveys, P. P. Biemer, R. M. Groves, L. E. Lyberg, N. A. Mathiowetz and S. Sudman (Eds.), John Wiley, New York
MedDscnM	Medical Decision Making
Metrika	Metrika
Metron	Metron
MGeodaet	Manuscripta Geodaetica
MODA5	Advances in Model Oriented Data Analysis and Experimental Design, A. C. Atkinson and L. Pronzato (Eds.), Physica-Verlag Ges. M. B. H., Heidelberg, Germany
ModCorData	Modeling Longitudinal and Spatially Correlated Data: Methods, Applications, and Future Directions, Lecture Notes in Statistics, Vol. 122, T. G. Gregoire, D. R. Brillinger, P. J. Diggle, E. Russek-Cohen, W. G. Warren and R. D. Wolfinger (Eds.), Springer-Verlag, Berlin/New York
ModRelSurv	Lifetime Data Models in Reliability and Survival Analysis, N. P. Jewell, A. C. Kimber, M. -L. T. Lee and G. A. Whitmore (Eds.), Kluwer, Dordrecht, Netherlands

MSMChrDsEp	Modern Statistical Methods in Chronic Disease Epidemiology, S. H. Moolgavkar and R. L. Prentice (Eds.), John Wiley, New York
MultAnalVI	Multivariate Analysis VI, P. R. Krishnaiah (Ed.), North-Holland, Amsterdam
MultBehR	Multivariate Behavioral Research
MultEnvrSt	Multivariate Environmental Statistics, G. P. Patil and C. R. Rao (Eds.), North-Holland, Amsterdam
NatGen	Nature Genetics
NonparStRT	Nonparametric Statistics and Related Topics, A. K. Md. E. Saleh (Ed.), North-Holland, Amsterdam
NucMatM	Nuclear Materials Management
NvlRsrl	Naval Research Logistics
NZlndSta	The New Zealand Statistician
OptDesAExp	Optimal Design and Analysis of Experiments, Y. Dodge, V. V. Fedorov and H. P. Wynn (Eds.), North-Holland, Amsterdam
PacStatCon	Pacific Statistical Congress: Proceedings of the Congress, I. S. Francis, B. F. J. Manly and F. C. Lam (Eds.), North-Holland, Amsterdam
PakJSt	Pakistan Journal of Statistics
PakJStA	Pakistan Journal of Statistics, Series A
PakJStB	Pakistan Journal of Statistics, Series B
PBCenARC	Proceedings of the Bureau of the Census Annual Research Conference, Bureau of the Census, U. S. Department of Commerce, Washington, D. C., U. S. A.
PCmpScSt17	Computer Science and Statistics: Proceedings of the Seventeenth Annual Symposium on the Interface, D. M. Allen (Ed.), North Holland, Amsterdam
PCmpScSt20	Computer Science and Statistics: Proceedings of the Twentieth Annual Symposium on the Interface, E. J. Wegman (Ed.), American Statistical Association, Alexandria, Virginia
PCmpScSt21	Computer Science and Statistics: Proceedings of the Twenty First Annual Symposium on the Interface, K. Berk and L. Malone (Eds.), American Statistical Association, Alexandria, Virginia, U. S. A.
PCmpScSt24	Computer Science and Statistics: Proceedings of the Twenty Fourth Annual Symposium on the Interface, E. M. Keramidas (Ed.), Interface Foundation of North America, Fairfax Station, Virginia, U. S. A.
PCmpScSt26	Computer Science and Statistics: Proceedings of the Twenty Sixth Annual Symposium on the Interface, J. Sall and A. Lehman (Eds.), Interface Foundation of North America, Fairfax Station, Virginia, U. S. A.
PCmpScSt28	Computer Science and Statistics: Proceedings of the Twenty Eighth Annual Symposium on the Interface, L. Billard and N. I. Fisher (Eds.), Interface Foundation of North America, Fair Fax Station, Virginia, U. S. A.
PCmpScSt29	Computer Science and Statistics: Proceedings of the Twenty Ninth Annual Symposium on the Interface, D. W. Scott (Ed.), Interface Foundation of North America, Fairfax Station, Virginia, U. S. A.
PesAgrBra	Pesquisa Agropecuaria Brasileira

PestFunct	Select Proceedings of the Symposium on Estimating Functions (IMS Lecture Notes Monograph/Series, Vol. 32) I.V. Basawa, V.P. Godambe and R. L. Taylor (Eds.), Institute of Mathematical Statistics, Hayward, California
PFedComRC1	Federal Committee on Statistical Methodology Research Conference, Vol. 1, U.S. Bureau of the Census, Suitland, Maryland.
PIBiomC12	Proceedings of the 12 <sup>th</sup> International Biometric Conference, Biometric Society, Washington, D. C.
PrMaStat	Probability and Mathematical Statistics (Poland)
ProbStaFAG	Probability and Statistics: Essays in Honor of F. A. Graybill; J. N. Srivastava (Ed.), North-Holland, Amsterdam
ProcBerkV2	Proceedings of the Berkeley Conference in Honor of Jerzy Neyman and Jack Kiefer, Vol. 2; L. M. Le Cam and R. A. Olshen (Eds.), Wadsworth, Monterey, California, U. S. A.
ProcBras	Proceedings of Seventh Brasov Conference on Probability Theory, M. Iosifescu (Ed.), Acad. Romania, Brasov .
ProcCOSCO1	The Frontiers of Statistical Computation, Simulation, and Modeling, Volume I. Proceedings of the ICOSCO-1 Conference, A. Özturk, E. C. van der Meulen, E. J. Dudewicz and P. R. Nelson (Eds.), American Sciences Press, Syracuse, New York
ProcCOSCO2	The Frontiers of Statistical Computation, Simulation, and Modeling, Volume II. Proceedings of the ICOSCO-1 Conference, A. Özturk, E. C. van der Meulen, E. J. Dudewicz and P. R. Nelson (Eds.), American Sciences Press, Syracuse, New York
ProcItlSS	Proceedings of the Italian Statistical Society, Società Italiana di Statistica (Italian Statistical Society), Salita dei Crescenzi, Roma, Italy
ProCliBioRsr	Progress in Clinical and Biological Research
ProcSIS332	Proceedings of the 33 <sup>rd</sup> Scientific Meeting of the Italian Statistical Society, Vol. 2, Societa Italiana di Statistica (Italian Statistical Society), Roma, Italy
ProcSIS341	Proceedings of the 34 <sup>th</sup> Scientific Meeting of the Italian Statistical Society, Vol. 1, Societa Italiana di Statistica (Italian Statistical Society), Roma, Italy
ProItlSS2	Proceedings of the 1998 Conference of the Italian Statistical Society, Vol. 2, Italian Statistical Society, Rome, Italy.
ProPacfsSt	Proceedings of the Third Pacific Area Statistical Conference, K. Matusita, M. L. Puri and T. Haya Kawa (Eds.), VSP, Zeist, The Netherlands
ProRSB	Proceedings of the Royal Society, Series B, (London)
ProSSC	Proceedings of the Survey Methods Section of the Statistical Society of Canada
ProWorConGen3	Proceedings of the Third World Congress on Genetics Applied to Livestock Production, Vol. XII, Agricultural Communications, University of Nebraska, Lincoln, Nebraska, U.S.A.
ProWorConGen6	Proceedings of the Sixth World Congress on Genetics Applied to Livestock Production, Vol. XXII, Agricultural Communications, University of Nebraska, Lincoln, Nebraska, U.S.A.
PrStD	Probability, Statistics and Design of Experiments, Proceedings of Symposium in Honour of R. C. Bose, R. R. Bahadur (Ed.), New Age International (P) Ltd., New Delhi, India

PrTampCon2	Proceedings of the Second International Tampere Conference in Statistics, T. Pukkila and S. Puntanen (Eds.), Department of Statistics, University of Tampere, Tampere, Finland
PsychBu	Psychological Bulletin
PsychMe	Psychological Methods
Psymtrka	Psychometrika
PTpLinStMA	Proceedings of the First International Tampere Seminar on Linear Statistical Models and Their Applications, T. Pukkila and S. Puntanen (Eds.), Department of Statistics, University of Tampere, Tampere, Finland
QstMaAp	Quaderni di Statistica e Matematica Applicata alle Scienze Economico-Sociali, University of Trento, Facolta' di Econ e Commercio, Dipartimento di Metodi Quantitativi, Libera Univ degli Studi di Trento, Trento, Italy
QuaEng	Quality Engineering
Qual&Qty	Quality and Quantity: International Journal of Methodology
QuaStEc	Quaderni di Statistica e Econometria
Questo	Questio (Barcelona, Spain)
QueSyTA	Queueing System: Theory and Applications
RBrzIPrS	Revista Brasileira de Probabilidade e Estatistica
RMaCo	Revista Matematica Complutense
RMaEs	Revista de Matematica e Estatistica
RobustRegn	Robust Regression: Analysis and Applications, K. D. Lawrence and J. L. Arthur (Eds.), Marcel Dekker, New York
RosMatK	Rostocker Mathematisches Kolloquium, Wilhelm-Pieck-Universitat, Rostock, Germany
RstAIP	Reports of Statistical Application and Research, Union of Japanese Scientists and Engineers, Tokyo, Japan
RStAIty	Rivista di Statistica Applicata
RStAJp	Reports of Statistical Application Research
RStApp	Revue de Statistique Appliques, Institut de Statistique, Universite de Paris, Paris, France
SankhyaA	Sankhya, Series A (Indian Journal of Statistics)
SankhyaB	Sankhya, Series B (Indian Journal of Statistics)
SAS.SUGI8	Proceedings of the 8th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
SAS.SUGI11	Proceedings of the 11th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
SAS.SUGI12	Proceedings of the 12th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
SAS.SUGI14	Proceedings of the 14th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
SAS.SUGI15	Proceedings of the 15th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.

- SAS.SUGI16 Proceedings of the 16th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI17 Proceedings of the 17th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI18 Proceedings of the 18th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI19 Proceedings of the 19th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI20 Proceedings of the 20th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI23 Proceedings of the 23rd SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- SAS.SUGI24 Proceedings of the 24th SAS Users Group International Conference, SAS Institute, Inc., Cary, North Carolina, U. S. A.
- ScandActJ Scandinavian Actuarial Journal
- ScandJSt Scandinavian Journal of Statistics
- SearleFest Proceedings of the Conference in Honor of Shayle R. Searle, Biometrics Unit, Cornell University, Ithaca, N. Y., U. S. A.
- SIAMMtAn SIAM Journal on Matrix Analysis and Application
- SIAMSSC SIAM Journal on Scientific and Statistical Computing
- SilvGene Silvae Genetica
- SISARS Societa Italiana di Statistica, Atti della Riunione Scientifica della Societa Italiana, Roma, Italy
- SMaHngry Studia Scientiarum Mathematicarum Hungarica (Budapest, Hungary)
- SmallArea Small Area Statistics: An International Symposium, J. N. K. Rao, C. E. Sarndal, M. P. Singh and R. Platek (Eds.), John Wiley, New York.
- SMAMoam Sakhharthvelos SSR Mecnierbatha Akademis Moambe (also called Soobscenija Akad Nauk Gruzinskoi SSR), Akad Nauk Gruzinskoi SSR, UI Dzerzhinskogo 8, Tbilisi, USSR
- SoAfrStJ South African Statistical Journal
- SocioMethd Sociological Methodology, Jossey-Bass, Inc., San Francisco, California, U. S. A.
- SocMethR Sociological Methods and Research
- SqltAnly Sequential Analysis
- SrvyStComp Survey and Statistical Computing, A. Westlake, R. Banks, C. Payne and T. Orchard (Eds.), North-Holland, Amsterdam
- St&DecSI Statistics & Decisions Supplement Issue
- St&Decsn Statistics & Decisions
- StADns Statistique et Analyse des Donnees (Paris)
- StAnFStrCh Statistical Analysis and Forecasting of Economic Structural Change, P. Hackl (Ed.), Springer-Verlag, Berlin/New York
- StatApprsl Statistics: An Appraisal, H. A. David and H. T. David (Eds.), Iowa State University Press, Iowa, U. S. A.

StatComp	Statistics and Computing
StatMed	Statistics in Medicine
StatMedRes	Statistical Methods in Medical Research
StatModel6	Statistical Modeling: Papers from the Sixth International Workshop on Statistical Modeling, P. G. M. van der Heijden, W. Jansen, B. Francis and G. U. H. Seber (Eds.), North-Holland, Amsterdam
StatModel10	Statistical Modelling: Proceedings of the Tenth International Workshop on Statistical Modelling, Lecture Notes in Statistics, Vol. 10, G. U. H. Seber, B. J. Francis, R. Hatzinger and G. Steckel-Berger (Eds.), Springer-Verlag, Berlin/New York
StatModel16	Statistical Modelling: Proceedings of the Sixteenth International Workshop on Statistical Modelling, B. KLEIN and L. Korsholm (Eds.), Springer-Verlag, Berlin/New York
StatRelTtp	Statistics and Related Topics, M. Csörgö, D. A. Dawson, J. N. K. Rao, A. K. Md. E. Saleh (Eds.), North-Holland, Amsterdam
StatSci	Statistical Science
Statstca	Statistica
Statstcs	Statistics
StCandSymp	Statistics Canada Symposium, Statistics Canada, Ottawa, Ontario, Canada
StDAIndExp	Statistical Design and Analysis of Industrial Experiments, S. Ghosh (Ed.), Marcel Dekker, New York
StDatAnInf	Statistical Data Analysis and Inference, Y. Dodge (Ed.), North-Holland, Amsterdam
StHefte	Statistischen Hefte/Statistical Papers
StMod	Statistical Modelling
StNeerla	Statistica Neerlandica
Stoch	Stochastics
StocProc	Stochastic Processes and Computing
StPrLet	Statistics and Probability Letters
StrEqMod	Structural Equation Modeling
StSinica	Statistica Sinica
Ststcian	The Statistician
StTh&DAnal2	Statistical Theory and Data Analysis, Vol. 2, K. Matusita (Ed.), North-Holland, Amsterdam
SurvAnal	Survival Analysis: State of the Art, J. P. Klein and P. K. Goel (Eds.), Kluwer, Dordrecht
SurvyM	Survey Methodology
SurvyR	Survey Review
TaMoMaPu	Tatra Mountains Mathematical Publications
Technmcs	Technometrics
Test	Test
ThApGene	Theoretical and Applied Genetics
ThPopBio	Theoretical Population Biology

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ThProbAp	Theory of Probability and Its Applications
TOnderwR	Tijdschrift Voor Onderwijs Research, Inst Onderwijskunde, Erasmuslaan 40, Nijmegen, The Netherlands
TrabEs	Trabajos de Estadistica y de Investigacion Operation
UndStat	Understanding Statistics
UtilMath	Utilitas Mathematica
WaterReB	Water Resources Bulletin (American Water Resources)
WGCImpctSt	W. G. Cochran's Impact on Statistics, P. S. R. S. Rao and J. Sedransk (Eds.), John Wiley, New York
WuDaX	Wuhan University Journal (Natural science)
YaTUJ	Yantai Teachers University Journal
ZAngMaMK	Zeitschrift fuer Angewandte Mathematik und Mechanik Ingenieurwissenschaftliche Forschunggarbeiten, Akademie-Verlag, Berlin, Germany
ZastApMa	Zastosowania Matematyki Applicationes Mathematicae (Warsaw, Poland)
ZeitTierZüch	Zeitschrift für Tierzuchitung und Züchtungsbiologie
ZVerm	Zeitschrift fur Vermessungswesen