

THE ANNALS

of

STATISTICS

**AN OFFICIAL JOURNAL OF THE INSTITUTE OF
MATHEMATICAL STATISTICS**

VOLUME 11

1983

CONTENTS OF VOLUME 11

Jerzy Neyman Memorial Lecture

- ROBBINS, HERBERT. Some thoughts on empirical Bayes estimation 713-723

Special Invited Papers

- DUMOUCHEL, WILLIAM H. Estimating the stable index α in order to measure tail thickness: a critique 1019-1031

Articles and Short Communications

- ANDERSSON, STEEN A., BRØNS, HANS K. AND TOLVER JENSEN, SØREN. Distribution of eigenvalues in multivariate statistical analysis 392-415
- ANSLEY, CRAIG F. AND KOHN, ROBERT. On the smoothness properties of the best linear unbiased estimate of a stochastic process observed with noise 1011-1017
- BABU, G. JOGESH AND SINGH, KESAR. Inference on means using the bootstrap 999-1003
- BAILEY, KENT R. The asymptotic joint distribution of regression and survival parameter estimates in the Cox regression model 39-48
- BAKSALARY, J.K. AND KALA, R. Estimation via linearly combining two given statistics 691-696
- BAR-LEV, SHAUL K. A characterization of certain statistics in exponential models whose distributions depend on a sub-vector of parameters only 746-752
- BARNARD, G. A. AND SPROTT, D. A. The generalised problem of the Nile: robust confidence sets for parametric functions 104-113
- BARNDORFF-NIELSEN, O. AND BLÆSILD, P. Exponential models with affine dual foliations 753-769
- BARNDORFF-NIELSEN, O. AND BLÆSILD, P. Reproductive exponential families 770-782
- BARTMANN, FLAVIO C., JEWELL, NICHOLAS P. AND BLOOMFIELD, PETER. Canonical correlations of past and future for time series: bounds and computation 848-855
- BEGUN, JANET M., HALL, W. J., HUANG, WEI-MIN, AND WELLNER, JON A. Information and asymptotic efficiency in parametric-nonparametric models 432-452
- BEHNEN, KONRAD AND NEUHAUS, GEORG. Galton's test as a linear rank test with estimated scores and its local asymptotic efficiency 588-599
- BEHNEN, KONRAD, NEUHAUS, GEORG AND RUYMGAART, FRITS. Two sample rank estimators of optimal nonparametric score-functions and corresponding adaptive rank statistics 1175-1189
- BEMIS, KERRY G. AND BHAPKAR, VASANT P. On BAN estimators for Chi squared test criteria 183-196
- BERGER, JAMES O. Discussion of "Construction of improved estimators in multiparameter estimation for discrete exponential families" 368-369

BERLINER, L. MARK. Improving on inadmissible estimators in the control problem	814-826
BHAPKAR, VASANT P. AND BEMIS, KERRY G. On BAN estimators for Chi squared test criteria	183-196
BHATTACHARYA, P. K. Justification for a K - S type test for the slope of a truncated regression	697-701
BHATTACHARYA, P. K., CHERNOFF, HERMAN AND YANG, S. S. Nonparametric estimation of the slope of a truncated regression	505-514
BLÆSILD, P. AND BARNDORFF-NIELSEN, O. Exponential models with affine dual foliations	753-769
BLÆSILD, P. AND BARNDORFF-NIELSEN, O. Reproductive exponential families	770-782
BLOOMFIELD, PETER, BARTMANN, FLAVIO C. AND JEWELL, NICHOLAS P. Canonical correlations of past and future for time series: bounds and computation	848-855
BLOOMFIELD, PETER, AND JEWELL, NICHOLAS P. Canonical correlations of past and future for time series definitions and theory	837-847
BRØNS, HANS K., TOLVER JENSEN, SØREN AND ANDERSSON, STEEN A. Distribution of eigenvalues in multivariate statistical analysis	392-415
BROWN, L. D., COHEN, ARTHUR AND SAMUEL-CAHN, E. A sharp necessary condition for admissibility of sequential tests—necessary and sufficient conditions for admissibility of SPRTs	640-653
BUTLER, RONALD W. Optimal properties of one-step variable selection in regression	219-224
CHEN, YUAN YAN, HOLLANDER, MYLES, AND LANGBERG, NAFTALI A. Testing whether new is better than used with randomly censored data	267-274
Correction to “Testing whether new is better than used with randomly censored data”	1267
CHENG, CHING-SHUI. Construction of optimal balanced incomplete block designs for correlated observations	240-246
CHENG, CHING-SHUI AND LI, KER-CHAU. A minimax approach to sample surveys	552-563
CHERNOFF, HERMAN, YANG, S. S. AND BHATTACHARYA, P. K. Nonparametric estimation of the slope of a truncated regression	505-514
CHOW, Y.-S., GEMAN, S., AND WU, L.-D. Consistent cross-validated density estimation	25-38
CLARKE, BRENTON R. Uniqueness and Fréchet differentiability of functional solutions to maximum likelihood type equations	1196-1205
COHEN, ARTHUR, SAMUEL-CAHN, E. AND BROWN, L. D. A sharp necessary condition for admissibility of sequential tests—necessary and sufficient conditions for admissibility of SPRTs	640-653
COLLINS, JOHN R. On the minimax property for R -estimators of location	1190-1195
COX, DENNIS D. Asymptotics for M -type smoothing splines	530-551

CONTENTS OF VOLUME 11

v

DARLING, DONALD A. On the asymptotic distribution of Watson's statistic	1263-1266
DARROCH, J. N. AND SPEED, T. P. Additive and multiplicative models and interactions	724-738
DEVROYE, LUC. The equivalence of weak, strong and complete convergence in L_1 for kernel density estimates	896-904
DEWET, T. AND KOUL, H. Minimum distance estimation in a linear regression model	921-932
DIACONIS, PERSI AND FREEDMAN, DAVID. On inconsistent Bayes estimates in the discrete case	1109-1118
DOES, RONALD J. M. M. An Edgeworth expansion for simple linear rank statistics under the null-hypothesis	607-624
DYNKIN, E. B. AND MANDELBAUM, A. Symmetric statistics, Poisson point processes, and multiple Wiener integrals	739-745
EATON, MORRIS AND KARIYA, TAKEAKI. Multivariate tests with incomplete data	654-665
EBERL, W., JR. Invariantly sufficient equivariant statistics and characterizations of normality in translation classes	330-336
EGUCHI, SHINTO. Second order efficiency of minimum contrast estimators in a curved exponential family	793-803
EL-BASSIOUNI, YAHIA AND SEELY, JUSTUS F. Applying Wald's variance component test	197-201
ESTY, WARREN W. A normal limit law for a nonparametric estimator of the coverage of a random sample	905-912
EVANS, MICHAEL. Estimating events	1218-1224
FELZENBAUM, ALEXANDER, HART, SERGIU AND HOCHBERG, JOSEF. Improving some multiple comparison procedures	121-128
FINSTER, MARK. Optimal stopping in the stock market when the future is discounted	564-568
FISHBURN, PETER C. Ellsberg revisited: a new look at comparative probability	1047-1059
FREEDMAN, DAVID AND DIACONIS, PERSI. On inconsistent Bayes estimates in the discrete case	1109-1118
FRIEDMAN, JEROME H. AND RAFSKY, LAWRENCE C. Graph-theoretic measures of multivariate association and prediction	377-391
FULLER, WAYNE A. AND MACPHERSON, BRIAN D. Consistency of the least squares estimator of the first order moving average parameter	326-329
GEMAN, S., WU, L.-D., AND CHOW, Y.-S. Consistent cross-validated density estimation	25-38
GHOSH, MALAY, HWANG, JIUNN TZON AND TSUI, KAM-WAH. Construction of improved estimators in multiparameter estimation for discrete exponential families. Discussions by James O. Berger, H. Malcolm Hudson and Carl Morris	351-376
GHOSH, MALAY AND MEEDEN, GLEN. Choosing between experiments: application to finite population sampling	296-305
GILL, RICHARD. Large sample behaviour of the product-limit estimator on the whole line	49-58

GILSTEIN, C. ZACHARY. On the joint asymptotic distribution of extreme midranges	913-920
GLESER, LEON J. AND MOORE, DAVID S. The effect of dependence on Chi-squared and empiric distribution tests of fit	1100-1108
GORDON, LOUIS. Successive sampling in large finite populations ..	702-706
GRAMBSCH, PATRICIA. Sequential sampling based on the observed Fisher information to guarantee the accuracy of the maximum likelihood estimator	68-77
HALL, PETER. Inverting an Edgeworth expansion	569-576
HALL, PETER. Large sample optimality of least squares cross-validation in density estimation	1156-1174
HALL, PETER. Orthogonal series methods for both qualitative and quantitative data	1004-1007
HALL, W. J., HUANG, WEI-MIN, WELLNER, JON A. AND BEGUN, JANET M. Information and asymptotic efficiency in parametric-nonparametric models	432-452
HANNUM, ROBERT AND HOLLANDER, MYLES. Robustness of Ferguson's Bayes estimator of a distribution function	632-639
Correction to "Robustness of Ferguson's Bayes estimator of a distribution function".....	1267
HART, SERGIU, HOCHBERG, YOSEF, AND FELZENBAUM, ALEXANDER. Improving some multiple comparison procedures	121-128
HOCHBERG, YOSEF, FELZENBAUM, ALEXANDER, AND HART, SERGIU. Improving some multiple comparison procedures	121-128
HOLLANDER, MYLES AND HANNUM, ROBERT. Robustness of Ferguson's Bayes estimator of a distribution function	632-639
Correction to "Robustness of Ferguson's Bayes estimator of a distribution function".....	1267
HOLLANDER, MYLES, LANGBERG, NAFTALI A. AND CHEN, YUAN YAN. Testing whether new is better than used with randomly censored data	267-274
Correction to "Testing whether new is better than used with randomly censored data"	1267
HOOPER, PETER M. Simultaneous interval estimation in the general multivariate analysis of variance model	666-673
HOOTMAN, A. M. AND SPEED, T. P. Balance in designed experiments with orthogonal block structure	1069-1085
HUANG, WEI-MIN, WELLNER, JON A., BEGUN, JANET M. AND HALL, W. J. Information and asymptotic efficiency in parametric-nonparametric models	432-452
HUDSON, H. MALCOLM. Discussion of "Construction of improved estimators in multiparameter estimation for discrete exponential families"	370-371
HUFFMAN, MICHAEL D. An efficient approximate solution to the Kiefer-Weiss problem	306-316
HWANG, JIUNN TZON, TSUI, KAM-WAH, AND GHOSH, MLAY. Construction of improved estimators in multiparameter estimation for discrete exponential families. Discussions by	

CONTENTS OF VOLUME 11

vii

James O. Berger, H. Malcolm Hudson and Carl Morris	351–376
IACHAN, RONALDO. Asymptotic theory of systematic sampling	959–969
JACROUX, MIKE AND NOTZ, WILLIAM. On the optimality of spring balance weighing designs	970–978
JEWELL, NICHOLAS P. AND BLOOMFIELD, PETER. Canonical correlations of past and future for time series: definitions and theory	837–847
JEWELL, NICHOLAS P., BLOOMFIELD, PETER, AND BARTMANN, FLAVIO C. Canonical correlations of past and future for time series bounds and computation	848–855
JOAG-DEV, KUMAR AND PROSCHAN, FRANK. Negative association of random variables, with applications	286–295
JOHN, R. D. AND ROBINSON, J. Edgeworth expansions for the power of permutation tests	625–631
JUPP, P. E. AND SPURR, B. D. Sobolev tests for symmetry of directional data	1225–1231
KAKIGI, RICHARD. A note on discounted future two-armed bandits	707–711
KALA, R. AND BAKSALARY, J. K. Estimation via linearly combining two given statistics	691–696
KALLENBERG, WILBERT C. M. Intermediate efficiency, theory and examples	170–182
KALLENBERG, WILBERT C. M. On moderate deviation theory in estimation	498–504
KARIYA, TAKEAKI AND EATON, MORRIS. Multivariate tests with incomplete data	654–665
KEENAN, DANIEL MACRAE. Limiting behavior of functionals of the sample spectral distribution	1206–1217
KENT, JOHN T. Identifiability of finite mixtures for directional data	984–988
KOHN, ROBERT AND ANSLEY, CRAIG F. On the smoothness properties of the best linear unbiased estimate of a stochastic process observed with noise	1011–1017
KOUL, H. AND DEWET, T. Minimum distance estimation in a linear regression model	921–932
KUNERT, JOACHIM. Optimal design and refinement of the linear model with applications to be repeated measurements designs	247–257
KUO, LYNN. Bayesian bioassay design	886–895
LAI, T. L. AND SIEGMUND, D. Fixed accuracy estimation of an autoregressive parameter	478–485
LANE, DAVID A. AND SUDDERTH, WILLIAM D. Coherent and continuous inference	114–120
LANGBERG, NAFTALI A., CHEN, YUAN YAN, AND HOLLANDER, MYLES. Testing whether new is better than used with randomly censored data	267–274
Correction to “Testing whether new is better than used with randomly censored data”	1267
LEE, CHU-IN CHARLES. The min-max algorithm and isotonic regression	467–477

LI, KER-CHAU. Minimaxity for randomized designs: some general results	225-239
LI, KER-CHAU AND CHENG, CHING-SHUI. A minimax approach to sample surveys	552-563
LINDSAY, BRUCE G. Efficiency of the conditional score in a mixture setting	486-497
LINDSAY, BRUCE G. The geometry of mixture likelihoods: a general theory	86-94
LINDSAY, BRUCE G. The geometry of mixture likelihoods, part II: the exponential family	783-792
LIU, T. P. AND THOMPSON, M. E. Properties of estimators of quadratic finite population functions: the batch approach	275-285
LORDEN, GARY. Asymptotic efficiency of three-stage hypothesis tests	129-140
MACPHERSON, BRIAN D. AND FULLER, WAYNE A. Consistency of the least squares estimator of the first order moving average parameter	326-329
MAJUMDAR, DIBYEN AND NOTZ, WILLIAM I. Optimal incomplete block designs for comparing treatments with a control	258-266
MALLEY, JAMES D. Statistical and algebraic independence	341-345
MANDELBAUM, A. AND DYNKIN, E. B. Symmetric statistics, Poisson point processes, and multiple Wiener integrals	739-745
MARDEN, JOHN I. Admissibility of invariant tests in the general multivariate analysis of variance problem	1086-1099
MARRON, JAMES STEPHEN. Optimal rates of convergence to Bayes risk in nonparametric discrimination	1142-1155
MARTINSEK, ADAM T. Second order approximation to the risk of a sequential procedure	827-836
MASON, DAVID M. A minimax criterion for choosing weight functions for L -estimates of location	317-325
MASON, DAVID M. AND SCHUENEMEYER, JOHN H. A modified Kolmogorov-Smirnov test sensitive to tail alternatives	933-946
MCCULLAGH, PETER. Quasi-likelihood functions	59-67
MORRIS, CARL N. Discussion of "Construction of improved estimators in multiparameter estimation for discrete exponential families"	372-374
MORRIS, CARL N. Natural exponential families with quadratic variance functions: statistical theory	515-529
MOORE, DAVID S. AND GLESER, LEON J. The effect of dependence on Chi-squared and empiric distribution tests of fit	1100-1108
MEEDEN, GLEN AND GHOSH, MALAY. Choosing between experiments: applications to finite population sampling	296-305
NEUHAUS, GEORG AND BEHNEN, KONRAD. Galton's test as a linear rank test with estimated scores and its local asymptotic efficiency	588-599
NEUHAUS, GEORG, RUYMGAART, FRITS, AND BEHNEN, KONRAD. Two sample rank estimators of optimal nonparametric score-functions and corresponding adaptive rank statistics	1175-1189

CONTENTS OF VOLUME 11

ix

NIEDERHAUSEN, HEINRICH. Sheffer polynomials for computing Takács's goodness-of-fit distributions	600–606
NOTZ, WILLIAM AND JACROUX, MIKE. On the optimality of spring balance weighing designs	970–978
NOTZ, WILLIAM I. AND MAJUMDAR, DIBYEN. Optimal incomplete block designs for comparing treatments with a control.	258–266
PÖTSCHER, B. M. Order estimation in ARMA-models by Lagrangian multiplier tests	872–885
PRENTICE, ROSS L. AND SELF, STEVEN G. Asymptotic distribution theory for Cox-type regression models with general relative risk form	804–813
PROSCHAN, FRANK, AND JOAG-DEV, KUMAR. Negative association of random variables, with applications	286–295
PUKELSHEIM, F. AND TITTERINGTON, D. M. General differential and Lagrangian theory for optimal experimental design	1060–1068
RAFSKY, LAWRENCE C. AND FRIEDMAN, JEROME H. Graph-theoretic measures of multivariate association and prediction	377–391
RAMKARAN. The robustness of Stein's two-stage procedure	1251–1256
RAMLAU-HANSEN, HENRIK. Smoothing counting process intensities by means of kernel functions	453–466
RICE, JOHN AND ROSENBLATT, MURRAY. Smoothing splines: regression, derivatives and deconvolution	141–156
RISSANEN, JORMA. A universal prior for integers and estimation by minimum description length	416–431
ROBINSON, J. AND JOHN, R. D. Edgeworth expansions for the power of permutation tests	625–631
ROSENBLATT, MURRAY AND RICE, JOHN. Smoothing splines; regression, derivatives and deconvolution	141–156
RUKHIN, ANDREW L. Convergence rates of estimators of a finite parameter: how small can error probabilities be?	202–207
RUYMGAArt, FRITS, BEHNEN, KONRAD, AND NEUHAUS, GEORG. Two sample rank estimators of optimal nonparametric score-functions and corresponding adaptive rank statistics	1175–1189
SAKAI, HIDEAKI. Covariance matrices characterization by a set of scalar partial autocorrelation coefficients	337–340
SAMUEL-CAHN, E., BROWN, L. D., AND COHEN, ARTHUR. A sharp necessary condition for admissibility of sequential tests—necessary and sufficient conditions for admissibility of SPRTs	640–653
SCHILLING, MARK F. An infinite-dimensional approximation for nearest neighbor goodness of fit tests	13–24
SCHILLING, MARK F. Goodness of fit testing in \mathbb{R}^m based on the weighted empirical distribution of certain nearest neighbor statistics	1–12
SCHUENEMEYER, JOHN H. AND MASON, DAVID M. A modified Kolmogorov-Smirnov test sensitive to tail alternatives	933–946
SEELY, JUSTUS F. AND EL-BASSIOUNI, YAHIA. Applying Wald's variance component test	197–201
SELF, STEVEN G. AND PRENTICE, ROSS L. Asymptotic distribution	

CONTENTS OF VOLUME 11

theory for Cox-type regression models with general relative risk form	804–813
SIEGMUND, D. AND LAI, T. L. Fixed accuracy estimation of an autoregressive parameter	478–485
SIMONOFF, JEFFREY, S. A penalty function approach to smoothing large sparse contingency tables	208–218
SINGH, KESAR AND BABU, G. JOGESH. Inference on means using the bootstrap	999–1003
SMALL, CHRISTOPHER G. Characterization of type from maximal invariant spectra	979–983
SPEED, T. P. AND DARROCH, J. N. Additive and multiplicative models and interactions	724–738
SPEED, T. P. AND HOUTMAN, A. M. Balance in designed experiments with orthogonal block structure	1069–1085
SPROTT, D. A. AND BARNARD, G. A. The generalised problem of the Nile: robust confidence sets for parametric functions	104–113
SPURR, B. D. AND JUPP, P. E. Sobolev tests for symmetry of directional data	1225–1231
SUDDERTH, WILLIAM D. AND LANE, DAVID A. Coherent and continuous inference	114–120
SZATROWSKI, TED H. Missing data in the one-population multivariate normal patterned mean and covariance matrix testing and estimation problem	947–958
TANIGUCHI, MASANOBU. On the second order asymptotic efficiency of estimators of Gaussian ARMA processes	157–169
TANNER, MARTIN A. A note on the variable kernel estimator of the hazard function from randomly censored data	994–998
TANNER, MARTIN A. AND WONG, WING HUNG. The estimation of the hazard function from randomly censored data by the kernel method	989–993
THOMPSON, M. E. AND LIU, T. P. Properties of estimators of quadratic finite population functions: the batch approach	275–285
TIAO, GEORGE C. AND TSAY, RUEY S. Consistency properties of least squares estimates of autoregressive parameters in ARMA models	856–871
TITTERINGTON, D. M. AND PUKELSHEIM, F. General differential and Lagrangian theory for optimal experimental design	1060–1068
TOLVER JENSEN, SØREN, ANDERSSON, STEEN A. AND BRØNS, HANS K. Distribution of eigenvalues in multivariate statistical analysis	392–415
TSAY, RUEY S. AND TIAO, GEORGE C. Consistency properties of least squares estimates of autoregressive parameters in ARMA models	856–871
TSUI, KAM-WAH, GHOSH, MALAY AND HWANG, JIUNN TZON. Construction of improved estimators in multiparameter estimation for discrete exponential families. Discussions by James O. Berger, H. Malcolm Hudson and Carl Morris	351–376
TYLER, DAVID E. A class of asymptotic tests for principal compo-	

CONTENTS OF VOLUME 11

xi

nent vectors	1243–1250
TYLER, DAVID E. The asymptotic distribution of principal component roots under local alternatives to multiple roots	1232–1242
VAN DER PLAS, ADRIAAN P. On the estimation of the parameters of Markov probability models using macro data	78–85
VAN EEDEN, CONSTANCE. On the asymptotic relation between L -estimators and M -estimators and their asymptotic efficiency relative to the Cramér-Rao lower bound	674–690
WANG, SONG-GUI AND WU, C. F. J. Further results on the consistent directions of least squares estimators	1257–1262
WEERAHANDI, S. AND ZIDEK, J. V. Elements of multi-Bayesian decision theory	1032–1046
WELLNER, JON A., BEGUN, JANET M., HALL, W. J. AND HUANG, WEI-MIN Information and asymptotic efficiency in parametric—nonparametric models	432–452
WIJSMAN, ROBERT A. Monotonicity in the noncentrality parameter of the ratio of two noncentral t -densities	1008–1010
WITHERS, C. S. Expansions for the distribution and quantiles of a regular functional of the empirical distribution with applications to nonparametric confidence intervals	577–587
WONG, WING HUNG. On the consistency of cross-validation in kernel nonparametric regression	1136–1141
WONG, WING HUNG AND TANNER, MARTIN A. The estimation of the hazard function from randomly censored data by the kernel method	989–993
WU, C. F. J. On the convergence properties of the EM algorithm	95–103
WU, C. F. J. AND WANG, SONG-GUI. Further results on the consistent directions of least squares estimators	1257–1262
WU, L.-D, CHOW, Y.-S., AND GEMAN, S. Consistent cross-validated density estimation	25–38
YANDELL, BRIAN S. Nonparametric inference for rates with censored survival data	1119–1135
YANG, S. S., BHATTACHARYA, P. K. AND CHERNOFF, HERMAN. Nonparametric estimation of the slope of a truncated regression	505–514
ZIDEK, J. V. AND WEERAHANDI, S. Elements of multi-Bayesian decision theory	1032–1046

Notes and Corrections

BASAWA, I. V. Correction to “Remarks on Bahadur efficiency of conditional tests”	347
CHENG, CHING-SHUI AND WU, CHIEN-FU. Correction to “Balanced repeated measurements designs”	349
HALL, W. J. AND LAMBERT, D. Correction to “Asymptotic lognormality of P -values”	348
HANNAN, E. J., HONG-ZHI, AN AND ZHAO-GUO, CHEN. Correction to “Autocorrelation, autoregression and autoregressive approximation”	1018

HONG-ZHI, AN, ZHAO-GUO, CHEN AND HANNAN, E. J. Correction to "Autocorrelation, autoregression, and autoregressive approximation"	1018
KADANE, JOSEPH B. AND SIMON, HERBERT A. Correction to "Optimal strategies for a class of constrained sequential problems"	346
LAMBERT, D. AND HALL, W. J. Correction to "Asymptotic lognormality of P -values"	348
SIMON, HERBERT A. AND KADANE, JOSEPH B. Correction to "Optimal strategies for a class of constrained sequential problems"	346
WU, CHIEN-FU JEFF AND CHENG, CHING-SHUI. Correction to "Balanced repeated measurements designs"	349
ZHAO-GUO, CHEN, HANNAN, E. J. AND HONG-ZHI, AN. Correction to "Autocorrelation, autoregression and autoregressive approximation"	1018