

nection certain problems are also posed for mathematical statisticians which the author has not been able to solve so far.

24. On a Theorem in Jacobians with Statistical Applications. S. N. ROY, University of North Carolina.

If $F_i(y_1, \dots, y_m, x_1, \dots, x_{m+n}) = 0$ ($i = 1, 2, \dots, m+n$) are such that we could select any set of m x_i 's (to be called without any loss of generality x_1, x_2, \dots, x_m) and could find real values of (y_1, \dots, y_m) and of $(x_{m+1}, \dots, x_{m+n})$ for real values of (x_1, \dots, x_m) , then, assuming that the numerator and the denominator on the right-hand side of the equation below are nonvanishing, and assuming certain other restrictions, we would have $J(y_1, y_2, \dots, y_m; x_1, x_2, \dots, x_m) = -[\partial(F_1, \dots, F_{m+n})/\partial(x_1, \dots, x_{m+n})]/[\partial(F_1, \dots, F_{m+n})/\partial(y_1, \dots, y_m, x_{m+1}, \dots, x_{m+n})]$, where absolute values of the determinants are to be taken. Important special cases of this general theorem with various statistical applications are discussed in this paper.

25. The Inventory Problem. A. DVORETZKY, J. KIEFER, AND J. WOLFOWITZ, Cornell University.

The inventory problem is the general problem of what quantities of goods to stock in anticipation of future demand, where loss is caused by inability to supply demand or by stocking goods for which there is no demand. Let x_i be the initial stock of a given commodity in the i th interval ($i = 1, \dots, N$) before any ordering is done, and y_i the starting stock after an amount $y_i - x_i \geq 0$ has been ordered and instantaneously received by the stocking agency. The amount demanded in the i th interval is a chance variable with known distribution function F_i . $W_i(x_i, y_i, d_i)$ is the loss incurred in the i th interval when x_i is the starting stock, y_i the initial stock, and d_i is the amount demanded in this interval. F_i , W_i , and the expected value of W_i with respect to the demand may also be functions of the "past history" as given by $\beta_i = \{x_j, y_j, d_j : j < i\}$. An ordering policy Y is a set of functions $Y_i(x_i, \beta_i)$ ($i = 1, \dots, N$), where one orders an amount $Y_i(x_i, \beta_i) - x_i$ in the i th interval. With each Y and x_1 there is associated a quantity $A(Y | x_1)$ which is the total expected loss over all intervals (the loss in the i th interval being discounted by a factor $1 - \alpha_i$) when Y is used and x_1 is the initial stock in the first interval. An optimal (ϵ -optimal) policy is one which minimizes this quantity (within ϵ) for every x_1 . A method for constructing such policies is given. The case of an infinite number of intervals is similarly treated. Analogous results are obtained in more general cases, e.g., when there is a time lag between the ordering and delivery of goods, when there are several commodities, etc.

The second part of the paper deals with the case when the set of distributions F_i is known only to be a member of a certain class Ω . Constructive methods for obtaining Bayes solutions and complete classes are given. (This research was sponsored by the Office of Naval Research.)

NEWS AND NOTICES

Readers are invited to submit to the Secretary of the Institute news items of interest

Personal Items

Mr. Fred C. Andrews, Teaching Assistant and Research Assistant, Statistical Laboratory, University of California, Berkeley, was promoted to Lecturer and Research Assistant effective July 1, 1951.

Dr. Dorothy S. Brady, formerly Professor of Economics at the University of

Illinois, has returned to Washington as Consultant to the Commissioner on Costs and Standards of Living, Bureau of Labor Statistics.

Dr. C. West Churchman has taken a leave of absence for one year from Wayne University to accept a visiting professorship in the Engineering Administration Department, Case Institute of Technology, Cleveland, Ohio, to do work in operations research as applied to industry.

Mr. Edward L. Corton, Jr., formerly employed at the Naval Ordnance Training Station, China Lake, California, is now working as a meteorologist for the Navy Hydrographic Office, Washington, D. C.

Dr. Arthur M. Dutton, after receiving his degree in June from the Iowa State College, accepted a position with Professor S. L. Crump at the University of Rochester Atomic Energy Project, Rochester, New York.

Dr. Evelyn Fix, Instructor and Research Associate, Statistical Laboratory, University of California, Berkeley, was promoted to Assistant Professor and Research Associate, effective July 1, 1951.

Mr. Charles P. Gershenson accepted the position as Research Director of the Jewish Children's Bureau of Chicago after working for five and one-half years as Research Associate at the Institute of Psychological Research, Teachers College, Columbia University. His new job entails the development of a research program for evaluating the effectiveness of small residential units for the treatment of emotional disturbed children.

Dr. E. J. Gumbel has been appointed Consultant to the Applied Mathematics and Statistics Laboratory, Stanford University, Stanford, California, for work on industrial statistics.

Dr. Louis Guttman, formerly Professor of Sociology at Cornell University, has accepted a position with the Israel Institute of Applied Social Research, Shell Building, Julian's Way, Jerusalem.

Dr. Paul R. Halmos will be on leave of absence from the University of Chicago for the academic year 1951-1952. He will serve as Visiting Professor of Mathematics at the University of Montevideo under the auspices of the State Department's Division of International Exchange of Persons.

Dr. J. L. Hodges, Jr., Assistant Professor and Research Associate, Statistical Laboratory, University of California, Berkeley, will be on leave of absence in a visiting capacity at the University of Chicago during the academic year 1951-1952.

Mr. Daniel G. Horvitz has accepted an assistant professorship of Biostatistics at the University of Pittsburgh School of Public Health.

Mr. William C. James has left Washington to serve with the National Office of Vital Statistics, Public Health Service, in Lima, Peru. Last fall he was appointed as international consultant in vital statistics under the international vital statistics cooperation program of this department and was in Washington for several months training for this work.

Mr. T. A. Jeeves, Lecturer and Research Associate, Statistical Laboratory, University of California, Berkeley, has been promoted to Instructor and Research Associate, effective July 1, 1951.

Mr. Jack Kiefer will be an Instructor in Mathematics at Cornell University during 1951-1952.

Dr. Erich L. Lehmann, Assistant Professor and Research Associate, Statistical Laboratory, University of California, Berkeley, has been promoted to Associate Professor and Research Associate, effective July 1, 1951. During the academic year 1951-1952 Professor Lehmann will be in a visiting capacity at Stanford University, on leave from the University of California.

Mr. Edward M. Schrock, formerly Division Engineer, General Electric Co., Erie, Pennsylvania, is now Supervisor of Quality Control, Lukens Steel Company, Coatesville, Pennsylvania.

Dr. Elizabeth L. Scott, Instructor and Research Associate, Statistical Laboratory, University of California, Berkeley, was promoted to Assistant Professor and Research Associate, effective July 1, 1951.

Dr. Irving H. Siegel has left Johns Hopkins University, where he served as Lecturer in Political Economy and as Director of Productivity Studies in the Operations Research Office, to become Director of the American Technology Study for the Twentieth Century Fund in Washington.

Dr. Andrew Sobczyk is on leave of absence from Boston University to serve as a Staff Member at Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico.

Mr. Robert F. Tate, Associate and Research Assistant, Statistical Laboratory, University of California, Berkeley, was promoted to Lecturer and Research Assistant, effective July 1, 1951.

Dr. Shanti A. Vora has resigned his assistant professorship in the Department of Statistics, Stanford University, to accept a position as Statistician with the Standard-Vacuum Oil Co., India Division Office, Bombay.

Awards for Post-doctoral Study in Statistics at the University of Chicago

The Committee on Statistics (a department) of the University of Chicago has established, under a five-year grant from the Rockefeller Foundation, a program of Post-doctoral Awards to provide training and experience in statistics for scholars whose main interests lie outside that field. There will be three Awards per year, to holders of the doctorate or equivalent in the biological, the physical, and the social sciences. Each Award will be \$4000 or slightly more, office space will be provided, and \$600 to \$1000 will be available for clerical, computational, and research assistance. There will be no tuition charges.

The purpose of the Awards is to give statistical training to a few scientists who may be expected to employ it both to the direct advance of their specialties and to the enlightenment of their colleagues and students by example, by consultation, and by formal instruction. The development of the field of statistics has been so rapid that problems of communication are a serious obstacle to its full exploitation. The amount and quality of instruction available to young students is constantly increasing, but there is a real need, which these Awards seek to fill, for making appropriate instruction available to already established

scientific workers who give promise of immediate applications of statistics to their special fields.

Recipients of the Awards must have received the doctor's degree prior to commencing the program, except in the case of recognized research workers whose experience and accomplishments are clearly the equivalent. Candidates whose mathematical preparation includes less than the usual sophomore year of calculus, or its equivalent, will not ordinarily be considered, but previous training in statistics is not required or expected. Candidates having under way research programs in their own fields will be preferred, and the department of the University of Chicago concerned with a candidate's specialty will be asked to participate in evaluating his application. Recipients must spend eleven months studying statistics at the University of Chicago, and will be expected to pursue a number of regular courses.

Applications, or requests for further information, should be sent to: Committee on Statistics, University of Chicago, Chicago 37. Applications for the academic year 1952-53 should arrive by April 1, 1952.

Proceedings of the Second Berkeley Symposium

The Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability, 1950, contains forty-six articles on mathematical statistics, probability, and their applications to astronomy, biometry, econometrics, physics, traffic engineering, and wave analysis, by the following authors: T. W. Anderson, K. J. Arrow, E. W. Barankin, D. M. Belmont, J. Berkson, D. S. Berry, D. Blackwell, G. W. Brown, K. L. Chung, W. G. Cochran, H. Cramér, B. de Finetti, J. L. Doob, A. Dvoretzky, P. Erdős, W. Feller, R. P. Feynman, T. W. Forbes, R. Fortet, M. A. Girshick, T. E. Harris, L. G. Henyey, J. L. Hodges, Jr., W. Hoeffding, P. G. Hoel, H. Hotelling, M. Kac, S. Kakutani, J. Kampé de Fériet, H. W. Kuhn, R. S. Lehman, E. L. Lehmann, V. F. Lenzen, P. Lévy, H. W. Lewis, B. Lindblad, M. Loève, J. Marschak, A. M. Mood, G. Placzek, H. Robbins, P. Rudnick, L. J. Savage, E. L. Scott, H. R. Seiwell, O. Struve, R. J. Trumpler, A. W. Tucker, A. Wald, W. A. Wallis, J. Wolfowitz, A. Zygmund.

The price of this volume of 666 pages is \$11.00. Orders for the Proceedings should be addressed to University of California Press, Berkeley 4, California.

New Members

The following persons have been elected to membership in the Institute

(June 1, 1951 to August 22, 1951)

Allen, Stephen G., Jr., M.A. (Univ. of Chicago), Research Associate, Applied Mathematics and Statistics Laboratory, Stanford University, Stanford, California.

***Amundsen, Mrs. Herdis T.**, Aktuarkandidat (Univ. of Oslo), Lecturer in Mathematical Statistics, University of Oslo, Oslo, Norway.

- Appel, Frederick W.**, Ph.D. (Univ. of Chicago), Executive Secretary, Public Health and Experimental Therapeutics Study Sections, Division of Research Grants, National Institutes of Health, Public Health Service, *3450 - 38th Street, N.W., Washington 16, D. C.*
- Berg, William D.**, Ph.D. (Univ. of Iowa), Assistant Professor, University of Ohio, *Box 285, Gambier, Ohio.*
- Botzum, Rev. William A.**, Ph.D. (Univ. of Chicago), Instructor, Department of Education, University of Notre Dame, Notre Dame, Indiana.
- Davison, George H.**, Secretary, The United Steel Companies, Ltd., Research & Development Department, Swinden House, Moorgate, Rotherham, England.
- de Agrisqueta, Francisco**, Ph.D. (Univ. de Deusto, Bilbao, Spain), Acting Secretary General of Inter American Statistical Institute, *1801 Clydesdale Place, N.W., Apartment 209, Washington 9, D. C.*
- de la Garza, Andres**, B.S., Statistician, *105 Pacific, Oak Ridge, Tennessee.*
- Foscue, Augustus W., Jr.**, M.B.A. (Stanford Univ.), Professor of Accounting and Statistics and Chairman of Statistics Department, School of Business Administration, Southern Methodist University, Dallas 5, Texas.
- Fritz, Edward**, M.S. (Univ. of Michigan), Research Engineer, Franklin Institute, *4025 Girard Avenue, Philadelphia, Pennsylvania.*
- Goulden, Cyril H.**, Ph.D. (Univ. of Minnesota), Chief, Cereal Division, Experimental Farm, Ottawa, Canada.
- Grant, J. Douglas**, M.A. (Stanford Univ.), Clinical Psychologist, U. S. Naval Retraining Command, Mare Island, Vallejo, California.
- Green, Bert F., Jr.**, Ph.D. (Princeton), Staff Member, Research Laboratory of Electronics, Room 22A-233c, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.
- Hadden, Stuart T.**, M.A. (Temple Univ.), Chemical Engineer and Senior Technologist, Research and Development Department, Socony-Vacuum Oil Co., Inc., Paulsboro, New Jersey, *416 S. Jackson Street, Woodbury, New Jersey.*
- Hildreth, Clifford**, Ph.D. (Iowa State College), Associate Professor, Cowles Commission for Research in Economics, University of Chicago, Chicago 37, Illinois.
- Howe, William G.**, B.A. (Univ. of Rochester), Statistician, Color Control Department, Kodak Park, Eastman Kodak Company, Rochester, New York.
- Jackson, Patricia L.**, Ph.D. (Columbia Univ.), Employment Manager, Alexander's Department Stores, Inc., Grand Concourse & Fordham Road, Bronx, New York.
- Kaelin, Alois**, Dipl. Math. (Eidgenossischen Technischen Hochschule, Zurich), *Waldistr. 5, Zurich 7/32, Switzerland.*
- Kibbey, Milton E.**, B.A. (Univ. of Michigan), Development Engineer and Member of Statistical Analysis Group, *351 W. Outer Drive, Oak Ridge, Tennessee.*
- Kuffner, Peter K.**, B.S. (Univ. of Chicago), Student, Department of Mathematics, University of Chicago, *4002 S. Brighton Place, Chicago 32, Illinois.*
- Kurkjian, Badrig M.**, S.B. (Mass. Inst. of Tech.), Mathematician, Room 300, Building 92, National Bureau of Standards, *217 Webster Street, N.E., Washington, D. C.*
- Lewlsley, Bernard J.**, B.S. (Birmingham Univ., England), Research and Development Engineer, General Electric Company, Ltd., *72 Ansty Road, Coventry, England.*
- Marans, Frances A.**, B.S. (Wilson Teachers College, Wash., D. C.), Mathematical Statistician, Office of the Statistical Consultant, Division of Manpower and Employment Statistics, Bureau of Labor Statistics, Department of Labor, *1336 Missouri Avenue, N.W., Apt. 218, Washington 11, D. C.*
- Mitten, Loring G.**, M.S. (Mass. Inst. of Tech.), Instructor, Department of Industrial Engineering, Ohio State University, Industrial Engineering Building, Columbus 10, Ohio.
- Möonan, William J.**, M.A. (Univ. of Minnesota), Instructor in Statistics Laboratory, College of Education, University of Minnesota, *23 E. 54th Street, Minneapolis, Minnesota.*

- Moore, Cordell B.**, M.S. (Univ. of Kentucky), Instructor, Department of Mathematics, University of Kentucky, Lexington, Kentucky.
- Sachs, David, A.B.** (Columbia Univ.), Student, Department of Mathematical Statistics, Columbia University, 75 Central Park West, New York 23, New York.
- Smith, Cecil W.**, Analysis Officer, No. 3 Line, British Overseas Airways Corporation, 107 Pembroke Road, Clifton, Bristol 8, England.
- Stalnaker, John M.**, M.A. (Univ. of Chicago), Director of Studies, Association of American Medical Colleges, 1075 Elm Street, Winnetka, Illinois.
- Swalm, R. O.**, B.S. (Univ. of Pa.), Assistant Professor of Industrial Engineering, Syracuse University, 9 Wyncrest Drive, East Syracuse, New York.
- Thomson, Kenneth F.**, Ph.D. (Ohio State Univ.), Assistant Project Director, Richardson, Bellows, Henry & Co., 439 Madison Avenue, New York City, 25 Burbank Street, Yonkers 2, New York.
- Titman, Richard H.**, B.S. (Univ. of Wash.), Statistician, General Electric Co., Nucleonics Division, 711 Stanton, Richland, Washington.
- Vinci, Felice**, Doctor Juris. (Univ. of Palermo, Italy), Professor of Statistics and Director of Instituto di Scienze Economiche e Statistiche, University of Milan, Via Lamarmora 42, Milano, Italy.
- White, Aubrey, B.A.** (Univ. of Toronto), Consulting Actuary and member of Ostheimer & Co., 1500 Chestnut Street, Philadelphia, Pennsylvania.
- White, John S.**, M.A. (Univ. of Minnesota), Graduate Student, University of Minnesota, 134 West 62nd Street, Minneapolis 19, Minnesota.
- Whitney, Alfred G.**, Ed.M. (Harvard), Research Associate, Life Insurance Agency Management Association, 855 Asylum Avenue, Hartford 5, Connecticut.
- Winer, Ben J.**, M.S. (Univ. of Oregon), Research Associate, Personnel Research Board, Ohio State University, Columbus, Ohio.
- Wittenborn, J. R.**, Ph.D. (Univ. of Illinois), Research Associate in Psychology, Yale University, 33 Cedar Street, New Haven, Connecticut.
- Zobel, Sigmund P.**, M.B.A. (Univ. of Buffalo), Lecturer in Statistics, School of Business Administration, also Assistant in Preventive Medicine and Public Health, School of Medicine, University of Buffalo, 105 Landon Street, Buffalo 8, New York.

REPORT OF THE MINNEAPOLIS MEETING OF THE INSTITUTE

The thirteenth summer meeting and forty-eighth meeting of the Institute of Mathematical Statistics was held at the University of Minnesota, September 4-7, 1951, in conjunction with the summer meeting of the Mathematical Association of America, the summer meeting of the American Mathematical Society and the Minneapolis meeting of the Econometric Society. The meeting was attended by the following one hundred and six members of the Institute:

G. E. Albert, R. L. Anderson, T. W. Anderson, K. J. Arnold, W. D. Baten, Helen P. Beard, Agnes Berger, Joseph Berkson, Jean Bronfenbrenner, Irwin Bross, Hobart Bushey, Maria Castellani, Herman Chernoff, A. G. Clark, T. F. Cope, A. H. Copeland, Sr., L. M. Court, E. L. Cox, J. F. Daly, G. B. Dantzig, W. J. Dixon, J. L. Doob, Aryeh Dvoretzky, P. S. Dwyer, Churchill Eisenhart, Lillian Elveback, H. P. Evans, C. H. Fischer, Evelyn Fix, J. S. Frame, Robert Gage, H. M. Gehman, L. A. Goodman, John Gurland, P. C. Hammer, T. E. Harris, H. L. Harter, Clifford Hildreth, J. L. Hodges, Jr., Wassily Hoeffding, J. F. Hofmann, Robert Hogg, Harold Hotelling, H. M. Hughes, S. L. Isaacson, P. O. Johnson, Walbert Kalinowski, Leo Katz, Harriet J. Kelly, O. Kempthorne, M. G. Kendall, Jack Kiefer, W. M. Kincaid, T. C. Koopmans, C. F. Kossack, R. L. Kozelka, William Kruskal,