



APRIL 1990

WASHINGTON
STATISTICAL
SOCIETY

NEWSLETTER

April 5	Thursday	Indoor Radon Survey in 25 States
April 11	Wednesday	A Model for U.S. Inflation
April 23	Monday	The Impact of Errors of Measurement and Ability Bias on Estimates of Wage-Risk and Wage-Workers' Compensation Trade-Offs
May 2	Wednesday	Patterns in Chaotic Systems

ANNOUNCEMENTS

WSS Election Ballot Announced

The election of new officers for the 1990-91 program year will be conducted by ballot with the May Newsletter. The following have agreed to run for office:

For Vice-President and President-Elect:

Fritz Scheuren (Internal Revenue Service)
Joan R. Rosenblatt (National Institute of Standards and Technology)

For Methodology Program Chair:

Sam Slowinski (Board of Governors of the Federal Reserve System)
Sue Ahmed (National Center for Education Statistics)

For Representatives-at-Large: (two to be elected)

Greg Schwemer (Boehringer-Manheim Pharmaceuticals)
Michael P. Cohen (National Center for Education Statistics)
Mary Batchner (Internal Revenue Service)

Nancy Spruill (Office of the Secretary of Defense)

For Treasurer:

Virginia deWolf (Department of Transportation)

Candidates other than these may be nominated by petition of at least thirty (30) members of WSS, provided that such a petition is received by the Nominations and Elections Committee at least 2 weeks before balloting. Any petitions must be received by Rich Allen, USDA-NASS, Room 4133 South Building, Washington, D.C. 20250 by April 16, 1990.

Date of WSS Annual Dinner Announced

WSS members interested in attending this year's annual dinner, the highlight of our year's scheduled events, should keep **June 13th** open. Information on time, place, guest speaker, and other details will be provided next month.

WASHINGTON STATISTICAL SOCIETY PROGRAM CHAIRS

Agriculture & Natural Resources

Cynthia Clark 763-8558
Paul Gargiullo 586-1137

Social & Demographic Statistics

Harvey Schwartz 443-6990
John Czajka 484-9220

Short Courses

Glenn White 763-7524
Donald Gantz 764-6565
Brad Pafford 447-3623
Sid Schwartz 268-3490

Economics

John Ruser 523-1347
Neil Ericsson 452-3709

Methodology

Myron Katzoff 436-7047
Andrew White 436-7904

Public Health & Biostatistics

Ed Lakatos 496-5905
Jai Choi 436-7047

Physical Sciences & Engineering

Patricia Abel 883-6490
Refik Soyer 994-6794

Statistical Computing

Khalid Aboura 994-6794
Sylvia Leaver 272-2350

Quality Assurance

Stanley R. Freedman 586-2038
John Galvin 272-5066

Newsletter Editor

Michael Cohen 454-6193

Employment

Bill Arends 447-6812

PROGRAM ABSTRACTS

TOPIC: INDOOR RADON SURVEY IN 25 STATES

SPEAKER: Maureen Anderson Clifford, U.S. Environmental Protection Agency

DATE & TIME: Thursday, April 5, 1990; 1:30 to 3:30 p.m. (Note special time.)

LOCATION: Room 2736, GAO Building, 441 G Street, N.W., Washington, D.C.
(Sign in at guard desk and state purpose and room number of visit.)

ABSTRACT: Radon is an important public health and environmental concern. This talk will describe the cumulative results of 25 statewide radon surveys conducted from 1986 to 1989 as a joint effort between the Environmental Protection Agency and each state. Two-day screening Radon concentration measurements using charcoal canisters were made on the lowest livable level in approximately 35,000 randomly selected homes. Various aspects of the survey design are discussed. The Radon distributions are presented with mapping used to present some of the results.

TOPIC: A MODEL FOR U. S. INFLATION

SPEAKER: David H. Richardson, Great Falls Analytics

CHAIR: Harvey Schwartz, NCHSR & HCTA

DATE & TIME: Wednesday, April 11, 1990; 12:30 to 2:00 p.m.

LOCATION: Room 2437, BLS, 441 G Street, N.W., Washington, D.C.
(Sign in at guard desk and state purpose and room number of visit.)

SPONSOR: Methodology Section

ABSTRACT: The need to identify and specify the appropriate model on the basis of the data is standard in econometric analysis. This model development results in extreme complications both in estimation and hypothesis testing. In addition, applied work suffers from the paucity of formal work in the methodology of econometric model building. Much of the published work is from the point of view of information theory and measures, e.g., Akaike's AIC or Mallows's C_p . Gale and Pregibon have developed Student, an expert modeler based on traditional artificial intelligence (AI) principles, which focuses on the properties of the residuals as indications of model (in)adequacy.

The issue of the causes of inflation in the United States has been much debated by political economists; some of the leading hypothesized causes are interest rates, the rate of increase of the money supply, the government deficit, and economic growth. Since time series of these variables are highly correlated, the identification and specification of an inflation model is quite challenging.

The author has recently developed Samuel, an AI model specification program, to routinely perform this task. Samuel is an expert program, emulating the decision-making process of an experienced analyst in search of the underlying economic structure, i.e., just which independent variables and which lags of those variables belong in the model. The search is based on rules for model building developed by the author. Samuel will be described and example analyses will be presented.

PROGRAM ABSTRACTS (continued)

TOPIC: **THE IMPACT OF ERRORS OF MEASUREMENT AND ABILITY BIAS ON ESTIMATES OF WAGE-RISK AND WAGE-WORKERS' COMPENSATION TRADE-OFFS**

SPEAKER: Michael Moore, Fuqua School of Business, Duke University

CHAIR: John Ruser, Office of Economic Research, Bureau of Labor Statistics

DISCUSSANT: Maureen Cropper, Department of Economics, University of Maryland and Resources for the Future

DATE & TIME: Monday, April 23, 1990; 3:00 to 4:30 p.m. (Note special time.)

LOCATION: Room 2437, GAO Building, 441 G Street, N.W., Washington, D.C.
(Sign in at guard desk and state purpose and room number of visit.)

SPONSOR: Economics Section

ABSTRACT: Estimates of compensating differentials for job risk are sometimes insignificant or wrong signed. Researchers often cite ability bias and errors of measurement in the industry average risk characteristics, which act as a proxy for the job-specific risk, as potential causes of the poor performance of the risk measures. This paper analyzes the impact of these two sources of bias on estimates of compensating risk differentials using the Panel Study of Income Dynamics, coupled with risk data from the National Traumatic Occupational Fatality Survey.

TOPIC: **PATTERNS IN CHAOTIC SYSTEMS**

SPEAKER: James A. Yorke, Institute for Physical Science and Technology, University of Maryland

CHAIR: Ed Lakatos

DATE & TIME: Wednesday, May 2, 1990; 2:00 to 3:30 p.m. (Note special time.)

LOCATION: National Institutes of Health, Building 31, Conference Room 10, C Wing, Bethesda, Maryland

SPONSORS: Methodology and Public Health and Biostatistics Sections

ABSTRACT: An introduction to some of the ideas of chaotic dynamics with emphasis on "embedding methods" for handling time series data will be presented.

ANNOUNCEMENTS (continued)

Notification of Open Board Meeting

Every year the Board of Directors of the Washington Statistical Society invites all members to a monthly meeting of the Board. This year the open meeting will be Tuesday, May 29th. The meeting will be held in the GAO Building, Room 2437, at 441 G Street, N.W. from 12:30 to 2:00 p.m. This meeting is an opportunity for those members who are interested in learning more about the WSS and for those interested in becoming more involved in the activities it sponsors. For regular board members, this notice serves as a reminder

that the above location is also the new permanent location of the meeting of the Board of Directors of the WSS.

Notice: Editor No Longer Needed

The WSS is very fortunate to have enticed Stephanie Shipp into becoming the new editor of the newsletter. She will take over the reins for the September newsletter. Stephanie has been very active for several years in the WSS and the ASA. We are grateful to all those who offered their services.

ANNOUNCEMENTS (continued)

New Date for Quality Assurance in the Government Symposium

The Washington Statistical Society Short Course Committee is again sponsoring the Quality Assurance in the Government Symposium to be held on Monday, June 4, 1990 at the Jefferson Auditorium, U.S. Department of Agriculture, South Building, Washington, D.C. (Smithsonian stop on the blue/orange metro line). This year's conference will be a one-day format. The agenda is given as an insert of this newsletter.

International Conference on Measurement Errors in Surveys Seeks Contributed Papers

The field of research in measurement errors in surveys spans a number of disciplines including sociology, psychology, statistics, communication science, business, and economics. To document the current state of the field, to report the findings of new research, and to promote interdisciplinary and cross-cultural interchanges, an *International Conference on Measurement Errors in Surveys* will be held November 11-14, 1990, in Tucson, Arizona, at the Sheraton El Conquistador Hotel. The Conference is jointly sponsored by the American Statistical Association (Section on Survey Research Methods), the American Association for Public Opinion Research, the American Marketing Association and the International Association for Survey Statisticians.

The Conference will bring professionals together from different disciplines and from around the world to share approaches to modeling, assessing, and reducing measurement errors in surveys. Approximately 60 invited papers and 125 contributed papers will be presented during the three-day conference. An edited monograph of the best papers will be published as part of the project and sent to each registrant. Information on registration will be published in the newsletters of the four sponsoring organizations.

Abstracts for contributed papers are sought on the following topics:

- The questionnaire as a source of measurement error (e.g., effects of question wording and question order, the role of pilot tests, experiments in questionnaire development);
- The respondent as a source of measurement error (e.g., memory effects, proxy vs. self response,

effects on the respondent's mood);

- Measurement errors due to data collectors and data collection (e.g., effects of interviewer training and education, reinterviews, evaluation of interviewer performance);
- The respondent-interviewer interaction (e.g., sensitive questions, structured vs. nonstructured interviewing); and
- Modeling measurement errors and their effects on estimation and data analysis.

Review papers and descriptive papers on methods for dealing with measurement errors may be appropriate if they illustrate widely applicable methods. However, the papers most sought are those containing empirical data.

Send two copies of a 1-2 page abstract to arrive by May 1, 1990, to: Lee Decker, American Statistical Association, 1429 Duke Street, Alexandria, VA 22314. A \$100 non-refundable "submission fee" must accompany the abstract (no purchase orders, please). If the abstract is accepted, the \$100 will be applied to the \$365 conference registration fee. Contributors will be notified of acceptance by June 1. If the abstract is not accepted, the submission fee will be returned.

For more program information, contact Paul P. Biemer, Chair of the Organizing Committee, Experimental Statistics Department, Box 30003, Dept. 3130, New Mexico State University, Las Cruces, NM 88003-0003. For information on registration, contact Lee Decker at the ASA.

Tentative Schedule of SIGSTAT Meetings

SIGSTAT is the Special Interest Group in Statistics in the Capital PC User Group. The tentative schedule of events through May is as follows:

- 4/18/90 Advanced features in Systat
- 5/9/90 Demo of BASS - BASS programs "look like" SAS programs. A comparison with the much more comprehensive SAS system will be made.

All meetings are scheduled for Wednesdays from 12:30 to 1:30 p.m. in Room B-14, 1301 New York Avenue, N.W. The building is located midway between the Metro Center and McPherson Square Metro stops. If this is your first SIGSTAT meeting, call Charlie Hallahan, 786-1507, and leave your name in order to gain entry into the building.

ANNOUNCEMENTS (continued)

USDA Graduate School Offers New Courses on Survey Methods and Total Quality Management

Taught by experts known throughout the survey community, a course on Advanced Topics in Survey Methods will be offered this spring quarter by the USDA Graduate School Evening and Weekend Programs. In addition, a new course, Total Quality Management, also will be offered.

Robert D. Tortora, an expert in the field of statistical research, will be the seminar coordinator of Survey Methods. Tortora, chief of the statistical research division, Bureau of the Census, and Robert M. Groves, from the University of Michigan and the Bureau of the Census, will start off the first night of class.

Some of the topics to be presented and discussed during the ten-week seminar are: questionnaire development, interviewer training, computer-assisted telephone interviewing, cognitive aspects of survey research, longitudinal survey data, and missing data.

The seminar will meet in Capital Gallery, 600 Maryland Avenue, S.W., from 6:00 to 8:00 p.m. on Tuesdays, April 17 - June 19. Tuition, which includes course materials, is \$269.

* * *

Since World War II, Japanese industries have successfully employed the American concepts of total quality management (TQM) and statistical process control in the revitalization of their economy.

Tom O'Rourke, who serves as the TQM facilitator for the joint data system support center of the Defense Communications Agency, will be the instructor of the USDA Graduate School course on Total Quality Management. Students will learn the basic concepts, methods, and processes of TQM.

The evening course will meet in the General Services Administration Building, 7th and D Streets, S.W., April 17-June 19, on Tuesdays from 6:00 to 9:00 p.m. Tuition for the course is \$139.

For more information about these courses and registration information, please call Evening Programs at 202/447-5885.

COPAFS to Host Seminar on Quality of Federal Data

In 1975, the Office of Management and Budget [OMB] organized the Federal Committee on Statistical Methodology. Comprised of individuals selected by OMB for their expertise and interest in statistical methods, the committee has during the past fifteen years determined areas that merit investigation and discussion, and overseen the work of subcommittees organized to study particular issues. Since 1978, fifteen Statistical Policy Working Papers have been published under the auspices of the Committee.

On May 23-24, 1990, the Council of Professional Associations on Federal Statistics will host a "Seminar on the Quality of Federal Data." Developed to capitalize on work undertaken during the past dozen years by the Federal Committee on Statistical Methodology and its subcommittees, the seminar will focus on a variety of topics that have been explored in the Statistical Policy Working Paper series. The subjects to be covered will include:

- Survey Quality Profiles
- Statistical Uses of Administrative Records
- Federal Longitudinal Surveys
- Disclosure-Avoidance Techniques
- Approaches to Developing Questionnaires
- Survey Coverage Evaluation
- Data Editing
- Telephone Data Collection
- Computer Assisted Statistical Surveys
- Cognitive Labs
- Quality in Business Surveys
- The Employer Reporting Unit Match Study

Each of these topics will be considered in a two-hour session that will feature formal papers and discussion, followed by informal dialogue among all speakers and attendees.

Seminar participants will include federal statisticians, economists, and managers, as well as others in the broader statistical community who share an interest in the quality of federal data.

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ANNOUNCEMENTS (continued)

COPAFS to Host Seminar on Quality of Federal Data *(continued from page 5)*

Users and producers of federal statistics who participate in the seminar will have the opportunity to share experiences and ideas, discuss technical issues, and consider future policy initiatives.

The cost for the two-day seminar will be \$90 per person. Registration will be limited to 200 participants. For further information, contact Katherine Wallman in the COPAFS' office [703/836-0404].

Reports Available in the Statistical Policy Working Paper Series:

- Report on Statistics for Allocation of Funds
- Report on Statistical Disclosure and Disclosure-Avoidance Techniques
- An Error Profile: Employment as Measured by the Current Population Survey
- Glossary of Nonsampling Error Terms: An Illustration of a Semantic Problem in Statistics

- Report on Exact and Statistical Matching Techniques
- Report on Statistical Uses of Administrative Records
- An Interagency Review of Time-Series Revision Policies
- Statistical Interagency Agreements
- Contracting for Surveys
- Approaches to Developing Questionnaires
- A Review of Industry Coding Systems
- The Role of Telephone Data Collection in Federal Statistics
- Federal Longitudinal Surveys
- Workshop on Statistical Uses of Microcomputers in Federal Agencies
- Quality in Establishment Surveys

Copies of these working papers may be ordered from NTIS Document Sales, 5285 Port Royal Road, Springfield, VA 22161 [703/487-4650].

EMPLOYMENT COLUMN

The Washington Statistical Society Newsletter provides a service of notification of employment opportunities and descriptions of those seeking employment here in Washington. Readers are encouraged to take advantage of this feature of the newsletter. Deadline for inserting notices is 5 (five) weeks before the publication date. Those interested should write to: Bill Arends, USDA-NASS, Room 4133 South Building, Washington, D.C. 20250-2000, Phone 447-6812.

JOB OPENINGS

Statistical Programmers

Westat, Inc., an employee-owned survey research and computer applications company, has several openings at its headquarters in Rockville, Maryland and on site in Research Triangle Park, North Carolina.

All positions require a BS degree or the equivalent and a minimum of 3 years of programming experience with a statistical package (SAS or SPSS) in a research related environment. An advanced degree in Epidemiology, Biostatistics or Statistics, programming in a higher level language (C, PL/I, PASCAL, etc.), and microcomputer experience are desirable but not necessary.

Westat is a leading research company with \$60 million in annual revenue and thirty years of steady growth. Westat offers advanced computing facilities in a highly professional atmosphere and provides excellent opportunities for advancement.

Please send your resume and salary history to: **Westat, Inc., Department WSSN, 1650 Research Blvd., Rockville, MD 20850.** Westat is an affirmative action/equal opportunity employer.

JOB OPENINGS (continued)

The American University

Tenure track position available at the rank of Assistant Professor beginning Fall, 1990 in the Department of Mathematics and Statistics.

Qualifications: A Ph.D. in Statistics; evidence of teaching and scholarship and interest in applied statistics required.

Responsibilities: Graduate and undergraduate teaching, advising, scholarship and university service.

Salary competitive, commensurate with qualifications and experience. Position subject to final budgetary approval. Send curriculum vitae and three letters of recommendation to **Basil P. Korin, Chair, Dept. of Mathematics and Statistics, The American University, Washington, D.C. 20016.** An EEO/AA University; minority and women candidates encouraged to apply.

Statistician

The U.S. Postal Service Headquarters, Washington, D.C., has a position for a Senior level professional; opportunity to participate in the evaluation and development of statistical systems for postal volumetric measures. Activities include the design of sampling plans, estimation procedures and measures of precision. Graduate level training in mathematical statistics and experience in sampling, experimental design, and methods of statistical estimation required. Working knowledge of SAS/Lotus 1-2-3 and experience with an IBM operating system environment are advantageous.

Salary \$36,120 to \$48,252 plus \$1,290 cost of living adjustment depending on individual qualifications.

Apply with complete background history, including compensation requirements, to: **U.S. Postal Service, Headquarters Personnel, VA 11470, Attn: Team D, 475 L'Enfant Plaza, S.W., Washington, D.C. 20260-4264.** AN EQUAL OPPORTUNITY EMPLOYER.

MATHEMATICAL STATISTICIANS (GS11/12/13)

The Biometrics Branch of the Center for Veterinary Medicine, Food and Drug Administration, is seeking two Ph.D. mathematical statisticians to provide mathematical and statistical support to the research and regulatory activities of the Center. The positions involve reviewing and evaluating mathematical and statistical methods, procedures and concepts involved with new animal drug applications along with supporting tests, research, and clinical data. Oral and written communication skills are important. Proficiency in the use of personal computers and knowledge of SAS is helpful. Send SF-171 application forms and resume to: **Dr. Anna Nevius, Biometrics Branch, Center for Veterinary Medicine, Food & Drug Administration, Room 6B-21, 5600 Fishers Lane, Rockville, MD 20857** or call 301/443-1580 for additional information.

JOB OPENINGS (continued)

STATISTICIAN (Service Fellow-equivalent to GS 11/12/13)

The Agency for Health Care Policy and Research (AHCPR) is seeking a statistician to join the statistical staff of the National Medical Expenditure Study. The position is available for a Ph.D. in statistics/biostatistics or a M.S. with experience in sample design, survey research, sampling, weights development, data analysis for complex surveys, imputation procedures and matching techniques. Familiarity with statistical software packages (SAS, SPSS) is required. Send SF-171 application forms and resume to: **Dr. Steven B. Cohen, Senior Research Manager, Agency for Health Care Policy and Research, Room 18A-55, 5600 Fishers Lane, Rockville, MD 20857**, or call him at (301) 443-4836 for additional information.

Program Officer Epidemiology/Biostatistics

The INSTITUTE OF MEDICINE, NATIONAL RESEARCH COUNCIL, is seeking a staff officer for studies on follow-up of HIV-infected Korean Hemorrhagic fever-infected servicemen. Responsibilities include preparing draft data base and data collection plans, participating in quality control efforts and data collection, performing analyses of data bases, identifying and obtaining relevant data and citations from other studies, preparing draft reports, and assisting in proposal preparation. Requires an MA/MS or equivalent training in epidemiology and biostatistics, at least 5 years epidemiological research experience, data collection, analyses, and data base management in both a mainframe and PC environment (including PC software such as SAS), and demonstrated communication skills. Familiarity with military personnel, health, and clinical records desired. We offer a salary commensurate with experience and an exceptional benefits package. Please send resume in confidence to: **IOM/HA 372 (BP), 2101 Constitution Avenue, N.W., Washington, D.C. 20418. EOE.**

NATIONAL RESEARCH COUNCIL

Mathematical/Health Statisticians GS-11/12/13

The Statistics Branch of the Center for Devices and Radiological Health (CDRH) of the Food and Drug Administration (FDA) has immediate openings for full-time mathematical (GS-1529) or health (GS-1530) statisticians to provide statistical support for the regulatory and research activities of CDRH. These positions are at the GS-11/12/13 levels depending on qualifications and experience. They are also open to qualified Commissioned Officers in the U.S. Public Health Service. Responsibilities include: evaluating manufacturer's analyses of clinical trials submitted to establish safety and effectiveness of new medical devices; providing risk assessments of medical device or radiation health hazards; and collaborating with scientists and engineers on research projects. Interested applicants should contact: **Harry F. Bushar, Ph.D., Chief, Statistics Branch, CDRH, FDA, 12200 Wilkins Avenue, Rockville, MD 20852** or call (301) 443-7224 for additional information. The FDA is an Equal Opportunity Employer.

JOB OPENINGS (continued)

Survey/Health Statisticians

The Division of Hazard Analysis, Directorate for Epidemiology, of the U.S. Consumer Product Safety Commission has vacancies in the following positions:

Position: STATISTICIAN (Health), GS-1530-13.

The incumbent of this position serves as a statistician responsible for designing, initiating, monitoring and reviewing surveys and special studies that are conducted for injury data analysis for the Agency's Hazard Programs. Plans data editing and processing for computer input, retrieval, and report generation. Uses available computer software, frequently making modifications to create special data files and generate charts, tables, and other graphic displays. Analyzes statistical and related data to identify hazard patterns. Writes reports for assigned projects using the information from this analysis. Serves as expert consultant or advisor in subject matter areas to other Agency units and other agencies.

Position: STATISTICIAN (Survey), GS-1530-9/11/12.

Incumbent develops, implements and administers systematic management, communications, and other procedures between the Divisions within the Directorate for Epidemiology to ensure appropriate statistical studies and reports to support the Agency decision making. In collaboration and consultation with statisticians, epidemiologists, medical officers, and researchers; plans, initiates, directs, and coordinates special studies of injuries attributable to the use of specific consumer products. Uses statistical theories, techniques, and methods to gather and interpret quantified information. Develops national hazard analyses and reports based on the specific environmental, mechanical, and behavioral factors associated with the victim and the product involved.

Interested applicants should call: **Robert E. Frye, Director, Division of Hazard Analysis, Directorate for Epidemiology** at (301) 492-6470, for additional information on the requirements of these positions and how to apply.

STATISTICIANS

Westat is an employee-owned corporation headquartered in the suburbs of Washington D.C. (Rockville, Maryland). We provide statistical consulting and survey research to the agencies of the U.S. Government and to a broad range of business and institutional clients. With a strong technical and managerial staff and a long record of quality research, our company has become one of the leading survey research and statistical consulting organizations in the United States.

Our company was founded nearly 29 years ago by three statisticians. The current staff of more than 500 includes statisticians, survey researchers, psychologists, medical researchers, sociologists, economists, market research and behavioral analysts, computer systems analysts, programmers, and support staff. The professional staff is supported by survey field supervisors, coders and interviewers. The atmosphere is open, progressive, and highly conducive to professional growth.

Our statistical efforts continue to expand in areas such as the environment, energy, health, education, human resources, and teaching courses in statistical methods. Several positions are currently available which require a graduate degree in statistics:

Survey Sampling. Experience required in sample design and selection, frames development, weighting, and variance estimation. Must have Masters degree or PhD in statistics program.

Industrial Consulting. Teach statistical process control and consult with clients in industry. Must have consulting and teaching experience, willingness to travel.

To insure proper consideration, interested applicants should indicate one of the above areas and send resume with current salary to:

WESTAT

Personnel Director

1650 Research Boulevard, Dept. DM

Rockville, Maryland 20850

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JOB APPLICANTS

CODE #90-04

Objective: Position as Applied Mathematician, specializing in Statistical Analysis
Preference: Private Industry in Northern Virginia or D.C. Metropolitan area

Professional Experience: Seasonal Adjustment of Time Series data (2 years)
Econometric Forecasting (2 years)
Mathematical Optimization Techniques (3 years)
Reliability of Computer Systems (1 year)

Computer Skills: TSO, JCL, and WYLBUR on IBM mainframe
Micro computer communication packages Crosstalk and PcLink
SAS (5 years) on mainframe and micro computer

Education: B.A. in Mathematics With Specialization In Statistics
Connecticut State University



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