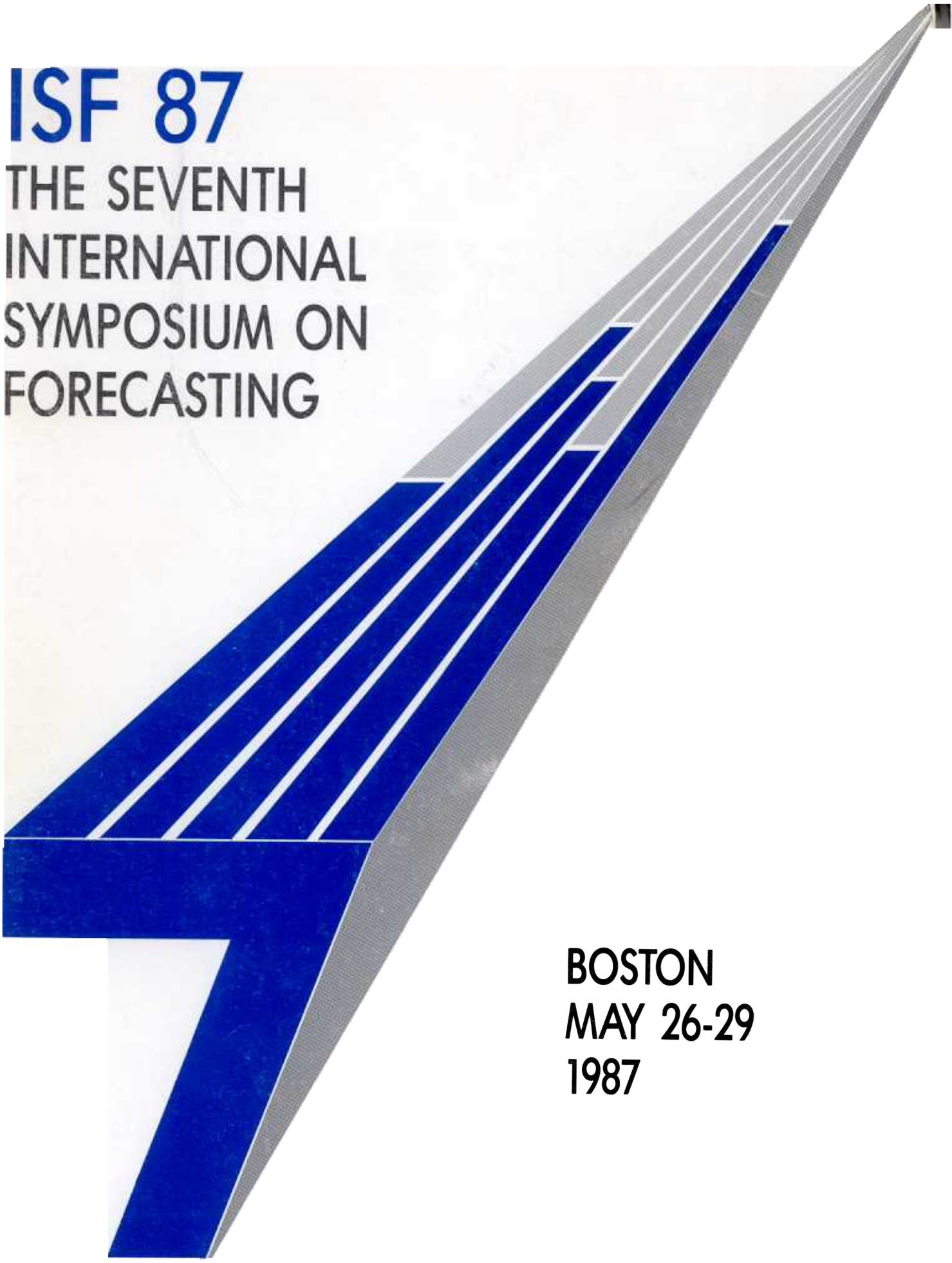
ISF 87

THE SEVENTH INTERNATIONAL SYMPOSIUM ON FORECASTING



BOSTON
MAY 26-29
1987

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ISF 87 IS SPONSORED BY THE

INTERNATIONAL INSTITUTE OF FORECASTERS

The International Institute of Forecasters (IIF) was founded in 1981 to promote forecasting as a multi-disciplinary activity. IIF, a non-profit organization devoted to unifying the field of forecasting, brings together, from all nations, decision makers, forecasters, and researchers involved with forecasting in the management, social, engineering, and behavioral sciences. Major aims of IIF are to bridge the gap between the theory and practice of forecasting, and to make forecasting useful and relevant to decision making. The IIF was founded with support from INSEAD, the Manchester Business School, IMEDE, Laval University, and the Wharton School.

BENEFITS

The IIF provides information on:

- new forecasting methods
- assessments of forecasting methods
- data sources
- computer programs
- methods to assess uncertainty in forecasts
- uses and abuses of forecasting
- ways to implement new forecasting methods
- methods to gain acceptance of forecasts

The IIF has the following vehicles for providing information:

— The **International Journal of Forecasting** (published quarterly and received by all members)
— The **International Symposium on Forecasting** (an annual conference)
— Career Placement Service, and a
— Consultant's Clearinghouse

DIRECTORS

INTERNATIONAL JOURNAL OF FORECASTING (IJF)

The IJF is the official journal of the IIF. As with our previous journal, the *Journal of Forecasting*, the IJF is supported by an outstanding board of Associate Editors. Papers are typically reviewed by 3 referees. The journal is abstracted by key services. The papers published are among the most highly cited in the social sciences. A heavy emphasis is placed on empirical and applied work that is reported in an understandable manner.

INTERNATIONAL SYMPOSIUM ON FORECASTING (ISF)

The annual ISF is the primary vehicle for bringing research to the attention of practitioners. Based on a follow-up survey, the symposium has been rated as highly successful by academics and practitioners. Previous symposiums, begun in 1981, have been held in Quebec, Istanbul, Philadelphia, London, Montreal, and Paris.

PLAN FOR NEXT YEAR → The 8th Annual International Symposium on Forecasting (ISF 88), will be held in **Amsterdam** on June 12–15, 1988:

Contact the: Symposium Secretariat
Europaplein 12
1078 GZ Amsterdam
The Netherlands
Phone: (31) 20-440807

or write to: Dr. Jan G. de Gooijer
Faculty of Economics
University of Amsterdam
Jodenbreestraat 23
1011 NH Amsterdam
The Netherlands

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MESSAGE FROM THE GENERAL CHAIRPERSON

General Chairperson
J. Scott Armstrong
Wharton School
U. of Pennsylvania
Philadelphia, PA 19104
Phone: (215) 898-5087
Telex 7106700328

Program Chairperson
Robert L. Winkler
Fuqua School of Business
Duke University
Durham, NC 27706
Phone: (919) 684-5375
Telex 802 829

Exhibits Chairperson
Hans Levenbach
Core Analytic, Inc.
647 Route 202-206 North
Bridgewater, NJ 08807
Phone: (201) 234-2997

MIT Contact
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Sloan School, MIT
50 Memorial Drive
Cambridge, MA 02139
Phone: (617) 253-2651

Harvard Contact
Arthur Schleifer, Jr.
Harvard Business School
Soldiers Field
Boston, MA 02163
Phone: (617) 495-6313

European Contact
Robert Fildes
Manchester Business School
Booth Street West
Manchester MI5 6PB
England
Phone: (61) 273-8228
Telex: 668354

On behalf of the ISF 87 Committee and the International Institute of Forecasters, I welcome you to the Seventh Annual International Symposium on Forecasting.

The objectives of this symposium are to communicate research findings to people from different disciplines. In addition, we hope that you will establish new links that will further cooperative research or consulting. To help in achieving these objectives, we announce two innovations for the IIF members: the Placement Service and the Consultants' Clearing House. We look for your suggestions on how these can best meet your needs and we hope that you will participate in these new ventures.

This symposium provides an opportunity for you to meet with leading researchers from other fields. Take this opportunity to move outside from your normal area. Frequently, people in different fields experience similar types of problems. Review this program and you will see the names of many renowned researchers in a variety of disciplines having a common interest in forecasting.

As it is not possible to attend all of the sessions, we have arranged to have the sessions put on audiotape. Some keynote addresses will be videotaped. Copies of these tapes will be available shortly after the completion of each session. In addition, we hope to publish selected papers in the International Journal of Forecasting.

Scott

J. Scott Armstrong

Convention Hotel
Sheraton Boston

Sponsored by the
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THE ORGANIZING COMMITTEE FOR ISF 87

J. SCOTT ARMSTRONG

GENERAL CHAIRPERSON

ROBERT L.WINKLER

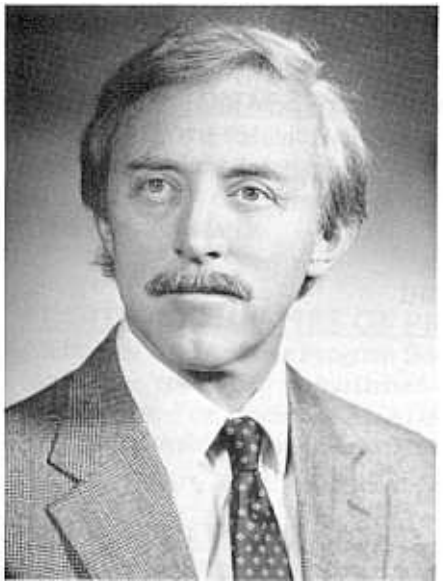
PROGRAM CHAIRPERSON

HANS LEVENBACH

EXHIBITS CHAIRPERSON

ESSAM MAHMOUD

EXHIBITS CO-CHAIR



TIMOTHY A. DAVIDSON

LOCAL ARRANGEMENTS

MUHITTIN ORAL

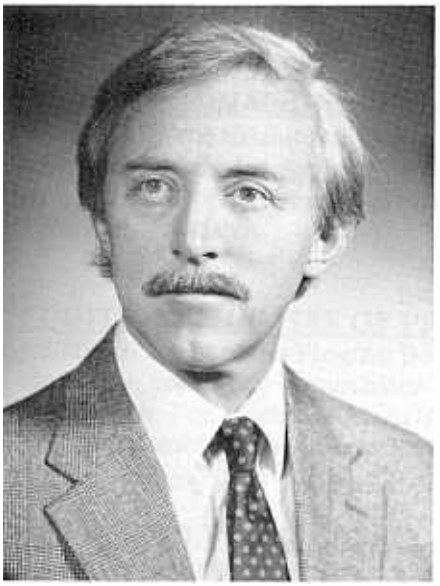
FINANCIAL

ARTHUR SCHLEIFER, JR.

HARVARD CONTACT

ROBERT FILDES

EUROPEAN CONTACT



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Harvard Business School
INSEAD, Fontainebleau, France
Manchester Business School, Manchester, England
Marketing Science Institute, Cambridge, MA
Sloan School of Management, M.I.T.
Université Laval, Quebec, Canada
Wharton School, University of Pennsylvania

In addition we thank the many individuals who have helped. Among these are:

David A. Belsley, of Boston College and M.I.T., for advice on numerous matters.

Rocco Camilli and Mary Tragus, of the University of Pennsylvania Publications Office, for their help in the publicity for ISF 87.

David Craig, for an excellent job of preparing this program booklet at Duke on a very tight schedule.

Jane Davidson, our Local Arrangements Manager, for her creativity, energy and resourcefulness on the social program, and for arranging local activities and services.

Steve McNees of the Federal Reserve Bank of Boston for his help with the program.

Stuart Neuman, administrator and problem solver in the Wharton office, at University of Pennsylvania.

Finally, in the development of the program, numerous individuals organized invited sessions. Special recognition should be given to those who contributed their time and effort to organize tracks of 2-7 sessions each:

Nick Bahmani
William L. Berry
Jay Christensen-Szalanski
Robert T. Clemen
Jehoshua Eliashberg
Gregory W. Fischer
Jeffrey E. Jarrett
Anne B. Koehler
John M. McCann
Allan H. Murphy
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ADMINISTRATIVE DETAILS

INTERNATIONAL INSTITUTE OF FORECASTERS (IIF)

Booth #20 in the Exhibit Hall is the center for information on IIF. Memberships, which include a subscription to the International Journal of Forecasting, can be obtained here. Information on the Eighth Annual International Symposium on Forecasting (ISF 88), which will be held in Amsterdam, June 12-15, 1988, is also available.

ADDITIONAL COPIES OF PROGRAM BOOK

Additional copies of this Program Book may be purchased for $10.00 at the Registration Desk. After the conference, copies may be purchased by writing to Muhittin Oral, Sciences de l'Administration, Université Laval, Sainte-Foy, Quebec, CANADA G1K 7PA. Include a check for $15.00 (for the book plus postage and handling), payable to the International Institute of Forecasters.

AUDIO AND VIDEO CASSETTES

Cassette recordings of the speeches, panels, and sessions will be available for purchase. Certain keynote speeches will be available on video cassette in VCR format. These tapes can be purchased in the lobby near the Symposium Registration Desk 1/2 hour after the session ends. Proceeds from these sales help to offset the costs of the symposium and to contribute to other non-profit activities of the International Institute of Forecasters. After the conference, look for an advertisement in the IJF or contact Muhittin Oral (address given above) for information on how to order these tapes.

COMPLIMENTARY COFFEE BREAKS

Coffee, tea and soft drinks will be available in the Exhibit Area at the mid-morning and mid-afternoon breaks on Wednesday and Thursday and at the mid-morning and late-morning breaks on Friday.

LUNCHES

Lunches will be held in the Grand Ballroom at the Sheraton Boston. Lunch schedule begins at 11:30 a.m. REMEMBER TO BRING YOUR MEAL TICKET!! Additional lunch tickets may be purchased for $20 at the Symposium Registration Desk (space permitting).

REGISTRATION

The Symposium Registration Desk is located on the Second Floor of the Sheraton Boston in the Constitution Foyer. Desk hours are:

Tuesday	May 26	1:00 p.m.-10:00 p.m.
Wednesday	May 27	7:30 a.m.-6:00 p.m.
Thursday	May 28	7:30 a.m.-6:00 p.m.
Friday	May 29	7:30 a.m.-2:00 p.m.

CONFERENCE STAFF

Conference assistants will be available throughout the Symposium to provide help. These aides can be identified by the red ISF 87 T-shirts they wear and their special "staff" badges.

BADGES

Your ISF 87 badge serves as a pass for all program sessions, exhibits, and special events. Security personnel will be monitoring admissions, so PLEASE WEAR YOUR BADGE AT ALL TIMES WHILE IN THE CONVENTION AREA.

CHECK-OUT REGULATIONS (PLANS I AND II)

Before leaving, all registered delegates must go to the checkout counter of the hotel. You may request a late checkout time. Delegates are personally responsible for expenses charged to their hotel room. Meals taken at locations other than those designated are not covered by symposium meal tickets.

MESSAGE CENTER

The Message Center is located near the registration area. This Bulletin Board will be provided for personal messages. Announcements or changes in program scheduling will be posted at the Message Center.

CRIMSON TRAVEL REPRESENTATIVE

There will be a Crimson Travel person near the Registration Desk during the morning and afternoon hours to help with questions about travel plans or sightseeing advice during and after the symposium.

PUBLIC TELEPHONES

Telephones are located on the first floor near the Hotel Registration Desk, on the second floor on the Promenade and on the third floor.

COPYING SERVICES

Copying services can be purchased at the ISF 87 office during normal daytime hours for the convenience of the conferees. Prices will be set at a minimum to cover costs. Additional, higher-priced copying services are provided by the hotel on the second floor.

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GUEST TOURS

Guest Tours will depart from the Sheraton Boston Hotel at the Dalton Street Exit. Wear your badge. If space allow extra guest tickets may be purchased near the registration desk where Crimson Travel will have a representative. ISF 87 assumes no liability of any kind in connection with these tours. Be sure to register for the tours as soon as possible so as to insure that space is reserved for you.

Since 1630, Boston has evolved into an international center for finance, trade, culture, the arts, medicine and education, making it a vibrant metropolis of beauty and charm. Boston is one of the few cities in which a fine blending exists between past and present, but not at the expense of the city's attractiveness and always in the tradition of New England's "Yankee" practicality. The result is a destination of which residents are proud and to which visitors are eager to return. Enjoy Yourself!

If not on tour, registered guests are welcome to join the participants for lunch. They may visit the exhibits or sit in on any of the sessions. Guests are invited to all three social events, listed in this program booklet.

Here is a brief description of the four 1/2 day tours:

The Battle Trail: Lexington and Concord

Follow the route of the American Revolutionary Paul Revere. Visit Harvard Yard, driving past "tory row" and the poet Longfellow's home. Stand on Lexington Green, and drive on to Concord where the embattled farmers stood and fired the" shot heard round the world."

Cultural Tour: Boston Art Museums

This begins with a guided tour of the Isabella Steward Gardner Museum, home of a magnificent collection of Renaissance and Dutch art. It is followed by lunch at the Museum of Fine Arts, Boston's finest commitment to the Arts. Not to be missed here is a collection of Paul Revere's silver and the largest number of Monets outside of France.

From Rags to Riches: Shopping Excursion, Boston

This morning only tour will introduce you to the bargains and the boutiques in the city. World famous "Filene's Basement" will be the first stop and on to the haute couture of Back Bay's Newbury Street.

Boston and Cambridge City Tour

For a complete introduction to the old and new of Boston. This adventure begins with the 18th century stately Beacon Hill followed by the new monumental city hall. It continues past Faneuil Hall, the Boston Tea Party ship, Old North Church with architect Christopher Wren's famous church spire. It finally ends up along the banks of the Charles River in Cambridge, home of Harvard University and MIT.

IMPORTANT CORRECTION TO THE CRIMSON TRAVEL AGENCY BROCHURE ON 1/2 DAY TOURS AND THE TRAVEL REGISTRATION FORM "FREE SPOUSE PROGRAMS"

A guest may take as many tours as he/she wishes. There are four planned tours. As "Rags to Riches" is only a morning tour, one could do this before an afternoon tour and thus take two tours on one day. One could take as many as all four tours.

EXHIBITORS AT ISF 87

Booth #1: RCA Price Systems

RCA PRICE Systems, headquartered in Moorestown, New Jersey, develops, maintains, and supports a family of parametric cost and schedule estimating models. These models are the heart of decision support systems that include training courses supporting each model, technical, and administrative services for each customer, reference documentation, computer timesharing services, support consultation, and attendance privileges at all PRICE regional meetings. The PRICE family of models addresses estimating requirements from Hardware and Software acquisition to the support of systems throughout their operational lifetime. The PRICE Parametric System of estimating saves time, increases effectiveness, and offers a means to truly automate the estimating process. A committment to the PRICE methodology will enhance the flow of information within an organization and facilitate faster and more informed decisions.

Booth #2: WISARD Software Company

WISARD Software Company, its first time at the ISF show, is exhibiting its state-of-the-art time series forecasting software. The company offers 3 products: WISARD Forecaster, WISARD Professional Forecaster, and WISARD Commercial Forecaster. Come to the company booth to see a live demonstration of the programs. The original programming was done in a real world environment on a mainframe and brought down to a PC. WISARD Software Company was then formed to promote the software to the mass market. All 3 products contain the same advanced forecasting system, but are tailored to different forecasting needs.

Booth #3: 1,2,3 FORECAST!

1,2,3 FORECAST! publishes a series of business forecasting templates under the same name for Lotus 1-2-3 and Symphony. Originally designed for classroom teaching because of Lotus' superior CRT and printed graphics, over 5,000 copies have been sold to business, government and academia in the U.S. and abroad. Since first published in 1984, the $89.95 templates -- which support a wide array of time series and multiple regression models -- have been reviewed by PC World, Absolute Reference, PC Magazine, Lotus Magazine, Personal Computing, and a host of trade and specialized journals. The program's author and company president, Professor Bruce L. Gates, will demonstrate the modeling ease and power of 1,2,3 FORECAST!, including a preview of a soon-to-be-released template for curve fitting and sample statistical analysis.

Booth #4: SPSS

SPSS, Inc., will feature SPSS/PC PLUS Trends, a forecasting and time-series analysis option to the companies' Data Analysis software for the IBM PC/XT, PC/AT, and compatible microcomputers. The Trends option provides comprehensive modelling and forecasting capability ranging from widely used curve-fitting and smoothing procedures to sophisticated, state-of-the-art Box-Jenkins Method and Spectral analysis. SPSS is a leading developer and marketer of statistical analysis, data management and presentation software. Applications of its software include all forms of survey analysis for market research and product testing, forecasting, personnel evaluation, decision support and health care analysis.

Booth #8: Data Resources

Since 1968, Data Resources (DRI) has provided clients in business, finance, government, and academic institutions with the most comprehensive data bases, information products, and analytical software available anywhere. Our clients use these services to make more effective and profitable business decisions. DRI resources include: a professional staff of more than 750 men and women; a range of electronic delivery systems; the world's largest, private collection of computer-accessible data; and simulation and forecasting models for national, industrial, and financial sectors. At the conference, DRI is highlighting its advanded statistical software, the Economist Workstation for personal computers, and the DRI Model of the U.S. Economy for corporate and academic use. Also, stop by the booth to pick up your free copy of our new Data Base Catalog, a comprehensive reference guide to DRI's extensive economic and financial data bases.

Booth #9: Business Forecast Systems

Business Forecast Systems (BFS) is a new statistical firm primarily involved in software development and consulting in the forecasting field. The founders of BFS, Dr. Robert Goodrich and Mr. Eric Stellwagen, were formally with Scientific Systems where they authored the popular FORECAST MASTER program. BFS will introduce its new product, FORECAST PRO at the ISF conference. FORECAST PRO is an advanced time series forecasting package featuring exponential smoothing, Box-Jenkins and dynamic regression models. Features include: a built in expert system to select the optimal technique for any given data set, automatic parameter optimization, high resolution graphics and much more. The package is designed for the IBM PCs, interfaces with most major software, is completely menu driven and extremely easy to use.

Booth #10: Academic Press

Academic Press invites you to Booth #10 to see our books in economics, econometrics, and statistics. Of special interest will be the recently published Second Edition of the very popular and widely cited Forecasting Economic Time Series, by C.W.J. Granger and Paul Newbold. Other important titles include Seasonality in Regression, by Svend Hylleberg, and Applied Time Series and Box-Jenkins Models, by Walter Vandaele. We also have advance information about the eagerly awaited Second Edition of Macroeconomic Theory, by Thomas J. Sargent, due to be released in July. These and all of our books can be ordered at a special meeting discount.

Booth #11: Smart Software

Smart Software, Inc., a privately-held corporation founded in 1983, develops and markets sophisticated analytical tools based on expert system technology that taps the customer's business judgement and expertise. The professional background of its principals include management consulting and finance; software development and marketing; and university teaching and researching at Harvard, MIT, and RPI. SmartForecasts II, introduced in February 1986, combines an expert system for automatic statistical forecasting with interactive graphics for judgmental refinements. SmartForecasts II has uniformly received strong reviews in the computer trade press and other professional publications. It is the forecasting choice for users in Fortune 1000 corporations, small-to-medium size companies, and government agencies.

Booth #12: Scientific Computing Associates

Scientific Computing Associates (SCA) represents the collaborative interest and efforts of several recognized statistical experts. SCA is dedicated to the advancement of integrating statistics and computers into business and industrial applications and scientific research. The products of SCA currently concentrate in three major areas: Forecasting and time series analysis; General statistical analysis; and Quality and productivity improvement. Many of the methods in the SCA Statistical System are not readily available in other software; but, more importantly, SCA is the only software development organization who can offer the combination of these statistical techniques.

Booth #13: AFS

Automatic Forecasting Systems has special competence in the area of time-series analysis particularly the time domain methods of Box-Jenkins Modeling. AFS's products for the IBM-PC and compatibles have received rave reviews for their unique contribution to forecasting by incorporating "expert system" features (AUTOBJ, AUTOBOX). AFS has been providing software to universities and industry since 1976 and is proud to announce the availability of the first IBM-PC product for Vector ARIMA-MTS. Our booth will focus on this product and our new integrated product BOXX - which is designed for the classroom. AFS invites you to send us your data and we will provide a free analysis which will be delivered to you at the booth. Call for further details.

Booth #14: Lincoln Systems Corporation / Applied Decision Systems

Lincoln Systems Corporation supports and distributes ISP and will share Booth #14 with Applied Decision Systems, which supports and distributes PC/SIBYL and ADDATA. ISP is an economical and easy to use statistical program that is ideally suited for introductory statistics courses. ISP's extensive collection of statistical functions and pedagogical features is also useful in a wide variety of practical applications of statistics and forecasting as well as in the classroom and in a self-study mode. PC/SIBYL is a research tool which includes 18 time-series forecast modeling techniques with an expert advisory service to suggest which to employ. ADDATA forecasting is a production forecasting tool for routine generation of sales forecasts for manufacturing and financial planning. It includes a relational DBMs and strong applications development tools.

Booth #15: Core Analytic

CORE ANALYTIC, INC. is a consulting firm specializing in analytical solutions to management problems. Our Company's emphasis is on the use of computers in a corporate environment, the associated training for maximum productivity, and computer to computer communications. Specifically, our Forecasting Software - AUTOCaST and 4CaST/2, represent over 40 years of experience in this field. AUTOCaST is an automatic forecasting package that is menu driven, yet still sufficiently flexible for custom designed models. 4CaST/2 is a complete time-series and forecasting package with 30 of the most widely used techniques.

Booth #16: TMS Systems

TMS Systems, Inc. has considerable experience in the development of computer based marketing planning models for business and government organizations. Working with Dr. John T. Mentzer of Virginia Tech, TMS SYSTEMS has developed computerized forecasting systems for over twenty companies. The result of this experience is a forecasting software package, called EASY CASTER. EASY CASTER operates on an IBM-PC or compatible and contains 10 forecasting techniques, 4 data analysis techniques, and a sophisticated data management system. EASY CASTER has been favorably reviewed in numerous journals, used by many companies, and used in over 100 colleges and universities to teach forecasting.

Booth #17: The Economist

Booth # 18: Scientific Systems

Founded in 1976, Scientific Systems, Inc. (SSI) is an innovative research and development firm that offers products and services in the fields of computer-based training, advanced industrial control, systems engineering and statistical analysis and forecasting. Forecast Master is a comprehensive forecasting program developed by SSI for such applications as financial analysis, econometrics, utility and power demand forecasting, sales forecasting, inventory planning, scientific data analysis and engineering model building. The program is designed for use on an IBM-PC, and contains seven forecasting tools. Forecast Master is menu driven and contains an on-line help facility for guiding both novice and expert forecasters alike.

Booth #19: John Wiley & Sons

Booth #20: International Institute of Forecasters

Visit us to join the International Institute of Forecasters, obtain information on the ISF 88 in Amsterdam, find out how to submit a paper to the International Journal of Forecasting (IJF), obtain information about the special issues for the IJF, purchase copies of the Program Book for ISF 87 and also for previous symposiums, join the Consultants Clearing House, join the Placement Service, leave your suggestions on how to improve future symposiums, and submit your entry for the ISF 87 Forecasting Conference. You can also examine the list of registrants to see who is at this symposium.

Booth #21: The Sorities Group

The Sorities Group, Inc., of Springfield, VA, is exhibiting SORITEC, a problem-oriented fourth-generation language for econometric and statistical analysis. SORITEC includes linear and nonlinear regression, 2SLS, 3SLS, FIML, SUR. Autocorrelation correction techniques, Almon lags, Shiller lags, ridge regression, GLS, RLS, mixed estimation, probit, ARIMA, transfer functions, smoothing. Nonlinear, dynamic, simultaneous equation simulation. Crosstabs, correlation, ANOVA, discriminant analysis, descriptive statistics, nonparametric statistics, Matrix algebra operations, analytic differentiation, structured programming language, procedures, databanking. SORITEC applications include economic research; policy analysis; sales forecasting; market research; stock, bond, commodity price forecasting; production and cost function estimation.

Booth #23: Elsevier Science Publishing Co.

Elsevier Science Publishing Company is one of the world's leading publishers of scientific and technical books and journals. Free sample issues of our many outstanding journals are available at the booth including, Technological Forecasting and Social Change, Journal of Policy Modeling, and Journal of Economic and Social Measurement.

Booth #24: SYSTAT

SYSTAT is a comprehensive statistics, graphics and data management package. It is easy to use, flexible and very powerful. The broad range of statistical capabilities within SYSTAT includes descriptive statistics, regression, ANOVA, MANOVA, time-series analysis, nonparametrics, cross-tabulations, multidimensional scaling, cluster analysis, and nonlinear estimation. Extensive graphics and a full-screen editor encourage visual displays of data. Supplementary modules will write reports and do logit and probit analysis.

Booth #25: Ming Telecomputing

Ming Telecomputing Inc. distributes ySTAT, which integrates spreadsheet, statistics, forecasting and color graphics. It is the only stand-alone statistical spreadsheet program with full-fledged statistical/forecasting functions. ySTAT works like Lotus 1-2-3. It is easy to use even for first timers. And, if you are familiar with 1-2-3 or any other spreadsheet progarm, you are already familiar with ySTAT. The forecasting procedures include Box-Jenkins model, linear trend, quadratic trend, polynomial model, sinusoidal model, and simple, double and triple exponential smoothings, general exponential smoothings with seasonal indicators or trigonometric functions, Winters' additive and multiplicative procedures. Ex post evalution of forecasts is automatically built-in with all the above procedures. ME, MPE, MSE, MAE, and MAPE are provided for comparing alternative models. Forecasts and observed values can displayed as hi-res graphs.

Booth #26: Business Environment Risk Information (BERI)

Business Environment Risk Information (BERI) is the oldest country risk consulting firm in the U.S. BERI was founded in 1966 by Dr. F.T. Haner to advise corporations and banks about economic, financial, and political risks abroad. Country ratings cover a five-year forecast period and are calculated based on input provided by $\pm$200 panelists around the world. Twelve researchers back up these ratings with current information and forecasts for each country. The firm is large enough to provide comprehensive coverage of global trends and events, but small enough that it maintains close contact with its clients. BERI currently monitors 58 countries for more than 600 clients worldwide.

SCHEDULE OF KEYNOTE SPEAKERS

Wednesday, May 27, 8:30-9:30 a.m.

Donald G. Morrison
"SPORTS FORECASTING -- LUCK, SKILL, AND CREATIVE BENCHMARKS ALL HELP"
Republic

Jay W. Forrester
"FORECASTING WHAT - FUTURE EVENTS, OR POLICIES FOR SUCCESS?"
Independence

Wednesday, May 27, 8:30-9:30 a.m.

Paul A. Samuelson
"RANDOM REMARKS ON THE FORECASTING GAME"
Grand Ballroom

Thursday, May 28, 8:30-9:30 a.m.

Spyros Makridakis
"METAFORECASTING -- A WAY OF IMPROVING FORECASTING ACCURACY AND USEFULNESS"
Republic

Albert M. Wojnilower
"SPACESHIP NOT SATELLITE"
Independence

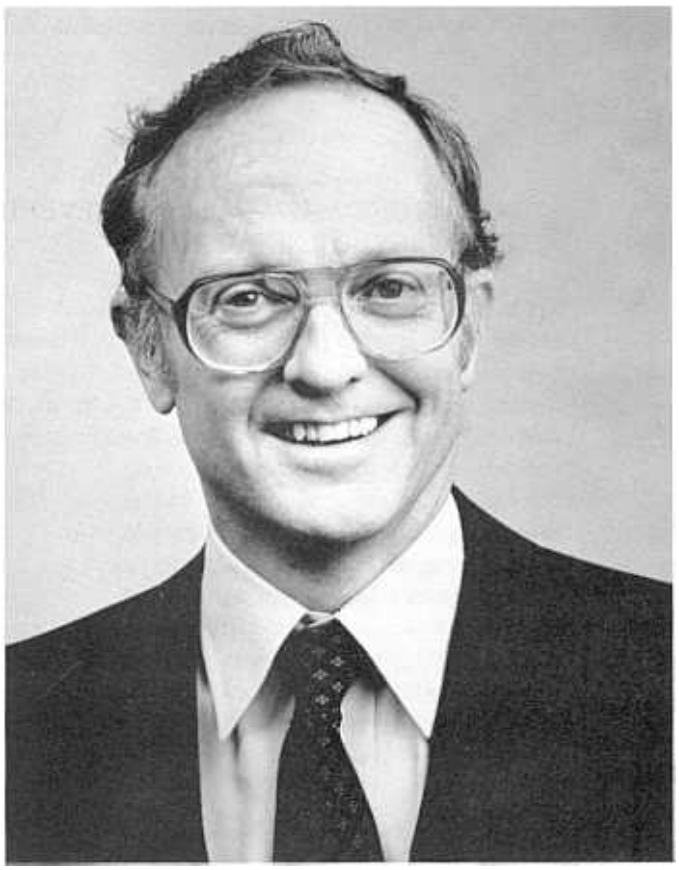
Friday, May 29, 8:30-9:30 a.m.

Robert Fildes
"EFFICIENT USE OF SUBJECTIVE INFORMATION IN FORECASTING"
Republic

Allan H. Murphy
"EVALUATION OF FORECASTS"
Independence

DONALD G. MORRISON
Graduate School of Business
Columbia University
New York, NY 10027

Donald G. Morrison, a specialist in management science and marketing at Columbia Business School, is the Armand G. Erpf Professor of Business. A 1961 graduate of M.I.T. with a B.S. in mechanical engineering, Morrison earned a Ph.D. in operations research at Stanford University in 1965. He joined the Columbia Business School faculty the following year as assistant professor, served as associate professor from 1968 and was named professor of business in 1973. He has also served as visiting professor at Stanford and at the University of California, Berkely. Morrison directed Columbia Business School's doctoral program from 1972 to 1974. Over the past 15 years he has supervised the doctoral dissertations of a number of students who are now faculty members of other leading institutions. Morrison was the founding Editor of the professional journal, Marketing Science, and is Editor-in-Chief of Management Science. He has served as departmental editor or editorial board member of several other professional journals. He is the author or co-author of over 60 articles, in refereed journals, with special emphasis on marketing research and applied statistics. He has been an expert witness as a statistician in a number of legal cases and a consultant to industrial firms and governmental agencies.



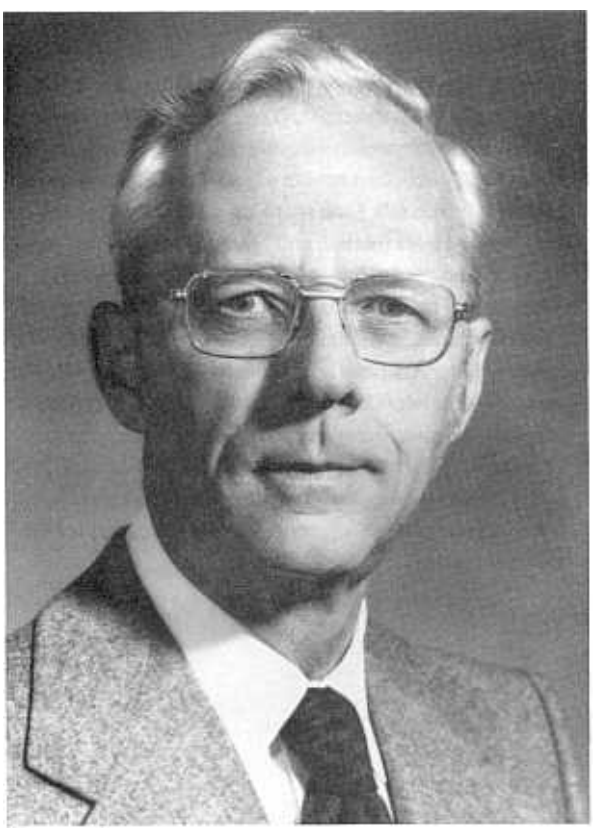
"SPORTS FORECASTING: LUCK, SKILL AND CREATIVE BENCHMARKS ALL HELP"

In his 1986 television pro football picks Jimmy the Greek was 35 percent correct against the spread. His NBC counterpart, Paul McGuire, was a dismal 1 for 7 against the spread in the playoffs. Sports Illustrated rank ordered the 26 baseball teams in the 1986 preseason. The rank order correlation with actual performance was only 0.1. What, if anything, do these 3 well-publicized results say about sports forecasting in general? In this talk I will try to shed some light on this question. Besides football and baseball, results from golf and tennis will be used. How well the various predictions, seedings and point spreads perform depends on using the correct "chance" benchmarks. The popular press often uses inappropriate benchmarks in identifying "experts." When a group of forecasters is being evaluated, the inter-expert correlations must be considered when evaluating the group as a whole. I learned this first hand when the best of 12 Columbia Business School professors could do no better than pick one division winner (the Mets of course) for the 1986 baseball season.

Chair: Robert L. Winkler
Fuqua School of Business, Duke University, Durham, NC 27706

JAY W. FORRESTER
Sloan School of Management
Massachusetts Institute of Technology
Cambridge, MA 02139

Jay W. Forrester, Germeshausen Professor at the Massachusetts Institute of Technology, directs the System Dynamics Program in the Sloan School of Management. The field of system dynamics has been developing since 1956 under Professor Forrester's leadership to evaluate how alternative policies affect growth, stability, fluctuation, and changing behavior in corporations, cities, and countries. He was the first president in 1983 of the International System Dynamics Society. From 1945 through 1956, Professor Forrester was a pioneer in early digital computer developments and holds the basic patent for invention of random-access, coincident-current magnetic storage which, for two decades, was the standard memory device for digital computers. He received the Inventor of the Year Award from George Washington University (1968); the Valdemar Poulsen Gold Medal from the Danish Academy of Technical Sciences (1969); the Medal of Honor (1972) and the Systems, Man, and Cybernetics Society Award for Outstanding Accomplishments (1972), both from the Institute of Electrical and Electronics Engineers; the New England Award (1972) of the Engineering Societies of New England; the Howard N. Potts Award (1974) from the Franklin Institute; Honorary Membership in the Society of Manufacturing Engineers (1976); the Harry Goode Memorial Award of the American Federation of Information Processing Societies (1977); was inducted into the National Inventors Hall of Fame (1979); received the Common Wealth Award of Distinguished Service (1979); and The Computer Pioneer Award from the IEEE Computer Society (1982); Jay W. Forrester Chair of Computer Studies, endowed by Thomas J. Watson, Jr. (1986) He is author of Industrial Dynamics (MIT Press, 1961), Urban Dynamics (MIT Press, 1969), Principles of Systems (MIT Press, 1968), World Dynamics (MIT Press, 1971; second ed., 1973), and Collected Papers of Jay W. Forrester (MIT Press, 1975).



"FORECASTING WHAT -- FUTURE EVENTS OR POLICIES FOR SUCCESS?"

Are forecasters striving toward the most useful goals? Should they be trying to outguess the future in a world with a large random component in its behavior? Or, should they forecast, not the particular future time path but, instead, the kind of organizational behavior that will follow from alternative policies? What role should a manager fill and how can the forecaster best assist that manager? By analogy to an aircraft, should the executive be the pilot or the airplane designer? The usual job of the forecaster is to predict turbulence in the future path so that the pilot/manager of an unstable aircraft/company can be forewarned. But, it can be far more effective to design the aircraft/policies so that turbulence has less impact. In other words, shift from forecasting the unforecastable, to forecasting which policies yield more robust growth and profitability.

Chair: J. Scott Armstrong
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

PAUL A. SAMUELSON
Department of Economics
Massachusetts Institute of Technology
Cambridge, MA 02139

Paul A. Samuelson is Institute Professor in the Department of Economics at Massachusetts Institute of Technology.. He received a B.A. from the University of Chicago and his M.A. and Ph.D. from Harvard University. He has won numerous prizes and awards, the foremost among them being the Alfred Nobel Memorial Prize in Economic Science for 1970. His work in economics has ranged from important highly theoretical contributions to his famous elementary economics textbook and his role as advisor to Presidents, Congress, and various government agencies.

"RANDOM REMARKS ON THE FORECASTING GAME"

Chair: Spyros Makridakis
INSEAD, Boulevard de Constance, 77305 Fontainebleau, FRANCE

SPYROS MAKRIDAKIS
INSEAD
Boulevard de Constance
77305 Fontainebleau
FRANCE

Spyros Makridakis is a Research Professor at INSEAD, Fontainebleau, France. His Ph.D. is from New York University. He has consulted worldwide in the area of forecasting and has held teaching positions with several European and Amerian institutions, including being a research fellow at IIM in Berlin, an ICAME fellow at Stanford University, and a Visiting Scholar at MIT and Harvard. He has co-authored many books, including Interactive Forecasting: Univariate and Multivariate Methods, 2nd edition (Holden-Day), Forecasting: Methods and Applications, 2nd edition (Wiley-Hamilton), The Handbook of Forecasting: A Manager's Guide, 2nd edition (Wiley). and The Forecasting Accuracy of Major Time Series Methods (Wiley). His book Forecasting Methods for Management (Wiley) is now in its 4th edition and has sold more than 65,000 copies. In addition, he has written articles in General Systems, Management Science, Journal of the Royal Statistical Society, American Statistician, International Journal of General Systems, Operational Research Quarterly, Journal of Marketing, Long Range Planning, Journal of Forecasting, International Journal of Forecasting, Omega, and other journals. He is an associate editor of Management Science and was the co-editor of a special issue of Management Science on Forecasting. He was the founding chief editor of the Journal of Forecasting and is the current editor-in-chief of the International Journal of Forecasting.

"METAFORECASTING: A WAY OF IMPROVING FORECASTING ACCURACY AND USEFULNESS"

Forecasting the future has a long history. An understanding of such history, coupled with the study of the empirical evidence now available, can provide us with invaluable information for improving the accuracy and usefulness of future predictions. Statistical methods suffer by their inability to predict systematic (non-random) changes from established patterns and/or relationships whilst people oscillate between ignoring and overreacting to them. Moreover, statistical methods do not utilize all historical information in the data while people are selective, biased and inconsistent in the way they use such information. Also, while statistical methods are objective people are influenced by personal and political considerations, wishful thinking and undue optimism or pessimism. In addition, both people and statistical methods underestimate future uncertainty in the great majority of cases. This paper deals with the above and their influence on forecasting. It discusses how statistical methods and judgmental predictions can be improved to increase forecasting accuracy. Furthermore, it proposes ways of improving accuracy and increasing usefulness by understanding mistakes made by statistical models and judgmental forecasters. Finally, it looks at the complementarity of judgmental and statistical forecasting and the need to marry them together in a systematic way by considering their relative advantages/drawbacks along with the benefits of accurate forecasts and the costs caused by uncertainty and errors.

Chair: Robert L. Winkler
Fuqua School of Business, Duke University, Durham, NC 27706

ALBERT M. WOJNILOWER
First Boston Corporation
Park Avenue Plaza
New York, NY 10055

Albert M. Wojnilower is a managing director and senior advisor of the First Boston Corporation, an international investment banking firm with headquarters in New York City. He is well known in the financial community for his interest rate forecasts which have frequently departed from the consensus but often turned out to be correct. Prior to joining First Boston, Dr. Wojnilower was an Economist for First National City Bank from 1963 to 1964 and Economist at the Federal Reserve Bank of New York from 1951 to 1963. At the Federal Reserve Bank he became Chief of the Financial Statistics and Domestic Research Divisions, having specialized at various times in foreign countries, United States business conditions, monetary economics, and Federal Reserve open-market operations. Dr. Wojnilower joined First Boston as an economist in 1964 and became a managing director in 1978. Dr. Wojnilower was a delegate to the President's Summit Conference on Inflation in 1974 and has been a Director of the American Finance Association. His essays and articles in the field of finance have been published, among others, by the Encyclopedia Britannica, National Bureau of Economic Research, Federal Reserve Bank of New York, and the Brookings Institution. He has been Adjunct Professor of Finance at New York University. His academic credits include B.A., M.A. and Ph.D. degrees from Columbia University; his Ph.D. was earned in 1960.

"SPACESHIP NOT SATELLITE"

Forecasting long-term interest rates is forecasting the market's forecast. Market participants, the public, and policymakers, being human, view the future not only on the basis of economic forecasts, but also are subject to social influence and biological constraints. Some speculations are offered about these interactions, and their heretical implications for fiscal and monetary policy as well as economic policy and analysis in general.

Chair: Stephen K. McNees
Federal Reserve Bank of Boston, 600 Atlantic Avenue, Boston, MA 02106

ROBERT FILDES
Manchester Business School
University of Manchester
Manchester M15 6PB
ENGLAND

Dr. Robert Fildes received his first degree in Mathematics from the Universtity of Oxford in 1966, and his Ph.D. in Statistics from the University of California, Davis, in 1971. Since then he has taught statistics, operations research, and forecasting at the University of Manchester Business School, where he is currently Academic Dean. He has published four books in forecasting and planning; most recently, The Forecasting Accuracy of Major Time Series Methods and A Bibliography of Business and Economic Forecasting. He was co-founder in 1981 of the Journal of Forecasting and in 1985 of the International Journal of Forecasting. He has published numerous articles in academic journals, including Economica, Management Science, and the Journal of the Operational Research Society. He has been a visiting professor at the University of British Columbia and Berkeley. In 1985 he was a Research Fellow at Bell Communications.

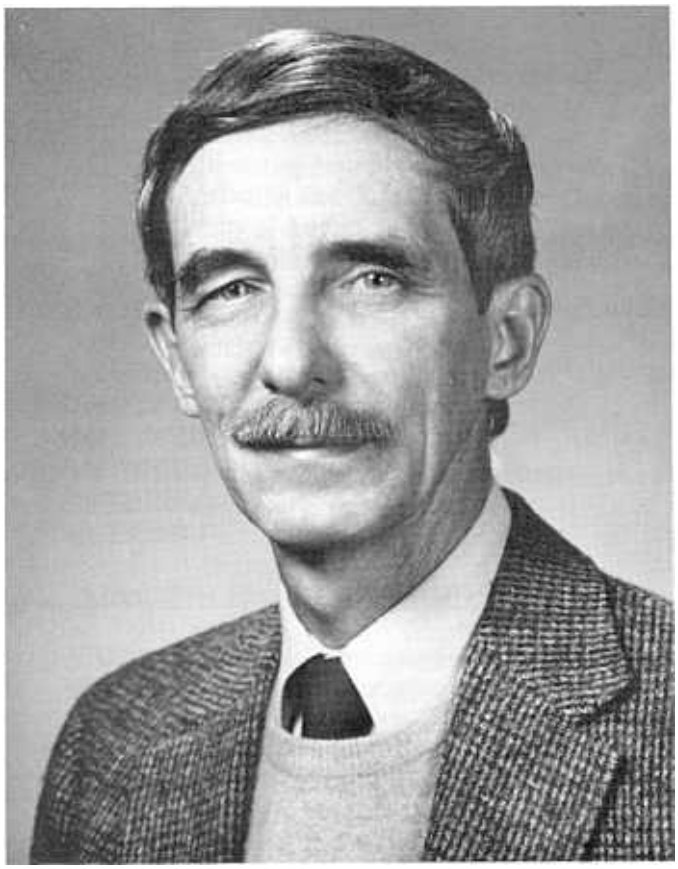
"EFFICIENT USE OF SUBJECTIVE INFORMATION IN FORECASTING"

The majority of business forecasts are made subjectively. Economists have argued that such forecasts incorporate information efficiently, A cliche of business forecasting is that the addition of subjective information necessarily improves the final forecasts. However social psychological research reveals consistent irrationality in subjective forecasting. This presentation will review alternative approaches to incorporating subjective information into the final forecast. Models of subjective forecast error are then proposed as an alternative to both 'bootstrapping' the forecaster or direct methods of modelling the forecaster (popular in the design of expert systems). Examples are given of forecasting company earnings (based on the use of analysts), and industry output (based on industry expertise). The presentation concludes with a discussion of how best to incorporate subjective forecasts into formal forecasting systems.

Chair: Estela Bee Dagum
Statistics Canada, R.H. Coats Building, Ottawa, Ontario K1A 0T6, CANADA

ALLAN H. MURPHY
Department of Atmospheric Sciences
Oregon State University
Corvallis, OR 97331

Allan H. Murphy is Professor of Atmospheric Sciences and Statistics at Oregon State University. He received a B.S. degree from MIT and M.S., M.A., and Ph. D. degrees from the University of Michigan. He has held visiting positions at the University of Colorado, the University of Vienna, and the International Institute for Applied Systems Analysis, as well as at various meteorological institutions in the United States and Europe. He is the author of numerous research papers published in the meteorological literature and the literature of several other fields, and coeditor of a recent book entitled Probability, Statistics, and Decision Making in the Atmospheric Sciences. His primary research interests include probability forecasting, forecast verification, and the use and value of forecasts. In 1980 he received the American Meteorological Society's Award for Outstanding Contributions to the Advancement of Applied Meteorology.



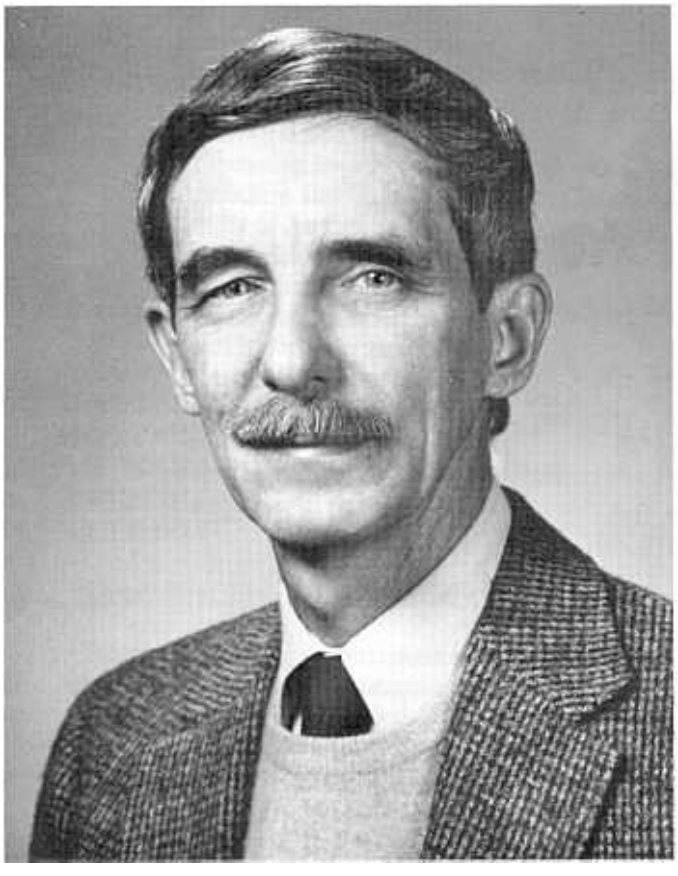
"EVALUATION OF FORECASTS"

Forecast evaluation is the process of assessing the quality of forecasts - a process traditionally accomplished by comparing forecasts and observations. This process can - and should - play an important role in the development and subsequent refinement of forecasting systems. However, forecast evaluation is frequently performed in a routine, unimaginative manner, by computing a few simple overall statistics. As a result, the potential benefits of the evaluation process are seldom realized. This state of affairs may be due in part to the fact that neither a coherent body of evaluation methodology nor a truly diagnostic approach to evaluation currently exists. A general framework for forecast evaluation will be described. This framework, which is based on the joint distribution of forecasts and observations, provides a means of identifying fundamental properties (desirable and undesirable) of the forecasts and of formulating appropriate measures of these properties. The framework also leads to more diagnostic and potentially useful evaluation procedures. These measures and procedures will be illustrated by evaluating several types of weather forecasts.

Chair: J. Scott Armstrong
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

ALLAN H. MURPHY
Department of Atmospheric Sciences
Oregon State University
Corvallis, OR 97331

Allan H. Murphy is Professor of Atmospheric Sciences and Statistics at Oregon State University. He received a B.S. degree from MIT and M.S., M.A., and Ph. D. degrees from the University of Michigan. He has held visiting positions at the University of Colorado, the University of Vienna, and the International Institute for Applied Systems Analysis, as well as at various meteorological institutions in the United States and Europe. He is the author of numerous research papers published in the meteorological literature and the literature of several other fields, and coeditor of a recent book entitled Probability, Statistics, and Decision Making in the Atmospheric Sciences. His primary research interests include probability forecasting, forecast verification, and the use and value of forecasts. In 1980 he received the American Meteorological Society's Award for Outstanding Contributions to the Advancement of Applied Meteorology.



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The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

SCHEDULE OF REGULAR SESSIONS

Wednesday, May 27, 10:00-11:30 a.m.

WB1	Problem-Solving Session	EXETER
WB2	What Is the Best Method of Forecasting?	GARDNER
WB3	The Implementation of Forecasting Projects	DALTON
WB4	Judgmental Methods and Processes in Forecasting	CLARENDON
WB5	Efficient Utilization of Information Contained in Subjective and Time Series Forecasts	BERKELEY
WB6	Marketing Forecasting	HAMPTON
WB7	Software for Statistical Analysis and Forecasting	BEACON A
WB8	Micro Political Risk Forecasting for the Direct Foreign Investment Decision	BEACON B
WB9	Business and Economic Forecasting	BEACON C
WB10	Technology Forecasting: Better Information for Managers	BEACON F
WB11	Forecasting Stock Prices	BEACON G
WB12	Seasonal Models	BEACON H
WB13	Population Forecasting	LIBERTY A
WB14	Teaching Forecasting	LIBERTY B
WB15	Applications	LIBERTY E

Wednesday, May 27, 2:00-3:30 p.m.

WC1	Problem-Solving Session	EXETER
WC2	Strategic Planning	GARDNER
WC3	Implementation of Futures Forecasting	DALTON
WC4	Irrational Expectations and Behavior in Markets	CLARENDON
WC5	Current Approaches to Sales Forecasting	BERKELEY
WC6	Medical Forecasting Models for Policy Makers and Patients	HAMPTON
WC7	Probability and Interval Forecasts	BEACON A
WC8	Multicriteria Decision Models as a Framework for Forecasting	BEACON B
WC9	Economic Forecasting	BEACON C
WC10	Forecasting Implications of Life Cycle Costing	BEACON F
WC11	Exchange Rate Forecasting	BEACON G
WC12	Autoregression Models	BEACON H
WC13	Management of Forecasting	LIBERTY A
WC14	Applications	LIBERTY B
WC15	Forecasting in Accounting and Finance	LIBERTY E

Wednesday, May 27, 4:00-5:30 p.m.

WD1	Problem-Solving Session	EXETER
WD2	Scenario Analysis	GARDNER
WD3	Implementation of Futures Forecasting	DALTON
WD4	Probability Models and Expert Judgment	CLARENDON
WD5	The Diffusion of Innovation in Competitive and Uncertain Environments	BERKELEY
WD6	Medical Forecasting Track	HAMPTON
WD7	What Software Developers Should Know About Business Forecasting	BEACON A
WD8	Multicriteria Decision Models as a Framework for Forecasting	BEACON B
WD9	Economic Forecasting	BEACON C
WD10	Technological Forecasting	BEACON F
WD11	Exchange Rate Forecasting	BEACON G
WD12	Exponential Smoothing	BEACON H
WD13	Forecasting for Manufacturing and Distribution Planning	LIBERTY A
WD14	Strategic Planning	LIBERTY B
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WD14	Strategic Planning	LIBERTY B
WD15	Applications	LIBERTY E

Thursday, May 28, 10:00-11:30 a.m.

TB1	Energy Applications	EXETER
TB2	Tutorial: An Introduction to Decision Analysis for Forecasting	GARDNER
TB3	The Implementation of Sales Forecasting Systems	DALTON
TB4	Behavioral Forecasting	CLARENDON
TB5	Methodological Approaches to Exchange Rate Forecasting	BERKELEY
TB6	Risk Analysis	HAMPTON
TB7	Advances in Forecasting Software	BEACON A
TB8	Forecasting Software with Expert System Characteristics	BEACON B
TB9	Indicators and Economic Forecasting	BEACON C
TB10	Practical Aspects of Forecasting for Inventory Control	BEACON F
TB11	Financial Forecasting	BEACON G
TB12	Time Series Models	BEACON H
TB13	Marketing Forecasting	LIBERTY A
TB14	Business Forecasting	LIBERTY B
TB15	Applications	LIBERTY E

Thursday, May 28, 2:00-3:30 p.m.

TC1	Public Sector Forecasting	EXETER
TC2	Decision Analysis Approaches to the Combination of Forecasts	GARDNER
TC3	Weather Forecasting	DALTON
TC4	Behavioral Forecasting	CLARENDON
TC5	Forecasting New Product Demand with Choice Models	BERKELEY
TC6	Prediction and Communication in Clinical and Health Policy Decisions	HAMPTON
TC7	Utility of Automatic Forecasting Systems	BEACON A
TC8	The Revision of Macroeconomic Forecasts	BEACON B
TC9	Econometric Models	BEACON C
TC10	Forecasting Systems	BEACON F
TC11	Cash Flow Forecasts	BEACON G
TC12	Time Series Models	BEACON H
TC13	Forecasting Inflation	LIBERTY A
TC14	Industry Evolution	LIBERTY B
TC15	Expert Systems, Artificial Intelligence, and Forecasting	LIBERTY E
TC16	Applications	LIBERTY F

Thursday, May 28, 4:00-5:30 p.m.

TD1	Employing Environmental Scenarios for Strategic Decision Making	EXETER
TD2	Probabilistic Forecasting: Techniques and Applications	GARDNER
TD3	Weather Forecasting	DALTON
TD4	Judgmental Forecasting	CLARENDON
TD5	Forecasting Models in Marketing: State-of-the-Art Examples	BERKELEY
TD6	Diagnostic Judgment: Some Inconsistencies with Normative Forecasting Models	HAMPTON
TD7	Market Share Forecasting	BEACON A
TD8	Expert System Applications	BEACON B
TD9	Macroeconomic Forecasts	BEACON C
TD10	Forecasting and Production	BEACON F
TD11	Forecasting Costs	BEACON G
TD12	Time Series Models	BEACON H
TD13	Forecasting Methods	LIBERTY A
TD14	Applications	LIBERTY B
TD15	Telecommunications Forecasting	LIBERTY E

Friday, May 29, 10:00-11:30 a.m.

FB1	System Dynamics -- Advances and Applications	EXETER
FB2	Probability Assessment and Modeling	GARDNER
FB3	Combining Forecasts	DALTON
FB4	Obtaining Judgments from Groups	CLARENDON
FB5	Forecasting Demand for New Products	BERKELEY
FB6	Forecasting: Modeling and Evaluation	HAMPTON
FB7	Forecasting Using State Space Methods and Forecastmaster	BEACON A
FB8	Expert Systems in ARIMA Modeling	BEACON B
FB9	Economic Forecasting	BEACON C
FB10	Short-Term Forecasting	BEACON F
FB11	Financial Forecasts in the Strategic Decision-Making Process	BEACON G
FB12	Growth Models	BEACON H
FB13	Financial Forecasting	LIBERTY A
FB14	Legal Aspects	LIBERTY B
FB15	Forecasting Energy Consumption	LIBERTY E

Friday, May 29, 12:00-1:30 p.m.

FC1	Evaluation of Forecasting Methods	EXETER
FC2	Panel Discussion: Risk Assessment and Insurability Issues	GARDNER
FC3	Combining Forecasts	DALTON
FC4	Financial Forecasting	CLARENDON
FC5	Marketing Forecasting	BERKELEY
FC6	Forecasting Methods and Evaluation	HAMPTON
FC7	Current and Future Developments in Forecasting Software: The Prospects for Expert Systems	BEACON A
FC8	Expert Systems in ARIMA Modeling	BEACON B
FC9	Regional Economic Forecasting	BEACON C
FC10	The Forecasting Process	BEACON F
FC11	Financial Forecasts in the Strategic Decision-Making Process	BEACON G
FC12	Forecasting Demand	BEACON H
FC13	Telecommunications Forecasting	LIBERTY A
FC14	Applications	LIBERTY B
FC15	Energy Price Forecasting	LIBERTY E

Session WB1 Wednesday
EXETER 10:00-11:30

PROBLEM SOLVING SESSION

Chair: Jeffrey E. Jarrett
Department of Management Science, University of Rhode Island, Kingston, RI 02881

The Problem Solving Sessions bring together practitioners with researchers. These contacts may lead to immediate solutions or to collaboration beyond this period. Participants have an opportunity to present their forecasting problems. The panel of experts will propose solutions. Among the panel members are:

Robert G. Brown
Materials Management Systems, Inc., PO Box 332, Norwich, VT 05055

Lawrence Brown
School of Management, State University of New York-Buffalo, Buffalo, NY 14214

Timothy Davidson
Applied Decision Systems, Temple, Barker & Sloane, Inc., 33 Hayden Ave., Lexington, MA 02173

Hans Levenbach
Core Analytic, Inc., 674 Route 202-206 North, Bridgewater, NJ 08807

Robert McLaughlin
PO Box H, 450 Riverside Drive, Cheshire, CT 06410

SUBJECTS MAY INCLUDE:

- Inventory Control
- Strategic Planning
- Financial Management
- Investment and Portfolio Management
- Political Events
- Marketing
- Personnel Administration
- Gaining Acceptance of Forecasts
- Assessing Uncertainty
- Computer Techniques

WHAT IS THE 'BEST' METHOD OF FORECASTING?

Chair: Robert Fildes
Manchester Business School, University of Manchester, Manchester M15 6PB, ENGLAND

Speaker: Chris Chatfield
School of Mathematical Sciences, University of Bath, Bath, Avon, BA2 7AY ENGLAND

The rich variety of time-series forecasting methods are reviewed, with emphasis on recent developments. The tutorial level of presentation is designed for a general forecasting audience, although the research specialist should also find something of interest. Time-series methods may be classified as univariate, multivariate or judgemental, and also by whether an automatic or non-automatic approach is adopted. Methods covered include exponential smoothing, Box-Jenkins, structural modelling, ARARMA, FORSYS and the use of regression, econometric and VAR models. The choice of "best" method depends on a wide variety of considerations. Forecasting competitions are discussed. Some recommendations are made. Several examples are included.

Session WB3
DALTON

Wednesday
10:00-11:30

THE IMPLEMENTATION OF FORECASTING PROJECTS

Chair: Dennis P. Slevin
Graduate School of Business, University of Pittsburgh, Pittsburgh, PA
Jeffrey K. Pinto
College of Business Administration, University of Cincinnati, Cincinnati, OH

The Ten Factor Model developed by Slevin and Pinto will be presented. This model identifies the critical success factors that are predictive of project implementation success. Following the theoretical presentation, session participants will be asked to share their experience in the implementation of forecasts. Thus, the session will have both a theoretical and a practical orientation as we attempt to demonstrate the pragmatic utility of some of the models of the implementation process.

Participants:

Dennis P. Slevin
Graduate School of Business, University of Pittsburgh, Pittsburgh, PA

Jeffrey K. Pinto
College of Business Administration, University of Cincinnati, Cincinnati, OH

Robert Allio
Robert Allio Associates, Duxbury, MA

R.W. Kimball
Manager, Contract Negotiations, Automation Division, Westinghouse Electric Corp., Pittsburgh, PA

J. Robert White
Controller, Industry Services Divisions, Westinghouse Electric Corp., Pittsburgh, PA

MARKETING FORECASTING

Chair: Cynthia Webster
School of Business and Administration, St. Mary's University, One Camino Santa Maria, San Antonio, TX 78284

"AN EXAMINATION AND COMPARISON OF THREE METHODS OF IMPROVING THE FORECASTING ACCURACY OF CONJOINT ANALYSIS"

Cynthia Webster
School of Business and Administration, St. Mary's University, One Camino Santa Maria, San Antonio, TX 78284

This paper presents an examination and a comparative analysis of alternative methods which may be used to improve the accuracy of conjoint analysis in the prediction of consumer preferences for multiattribute products and services. Specifically, one optimal weighting method of Q-type factor analysis will be compared to the overlapping clustering method (when generalizing optimal weighting) and the standard non-overlapping clustering method. As a final result, the method which establishes the most accurate forecast of consumer preferences will be identified.

"PREDICTING PURCHASE PROSPECTS USING QUEUEING MODELS IN A COGNITIVE CONTEXT"

Ercan Tirtiroglu, Matt Elbeck
Graduate School of Management, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618

We propose that an individual's purchase behavior constitutes a cognitive framework such that an appropriate choice of queueing model could effectively be used for describing the individual's buyer profile, and for predicting his/her purchase prospects. Accordingly, we consider that the surfacing of a need corresponds to an arrival to this cognitive queue mechanism, while a satisfactory purchase competion to a departure from it. Operating characteristics are examined for predictive ~~purchases.~~

"INTERVENTION ANALYSIS USING CONTROL GROUPS AND EXOGENOUS VARIABLES IN A TRANSFER FUNCTION MODEL"

Lakshman Krishnamurthi
J.L. Kellogg Graduate School of Management, Northwestern University, Evanston, IL
Jack Narayan
Department of Mathematics, State University of New York, Oswego, NY 13126
S.P. Raj
School of Management, Syracuse University, Syracuse, NY

This paper shows how a control group can be used to obtain more accurate estimates of the impact of interventions. The intervention analysis using the ARIMA time series method is extended to an experimental design context using multiple input transfer function analysis. The study combines the analytic rigor of time series analysis with the careful controls provided by an experiment involving a test and a control group. The data are from an ADTEL field experiment with test and control panels connected to a split - cable TV system.

Session WB4
CLARENDON

Wednesday
10:00-11:30

JUDGMENTAL METHODS AND PROCESSES IN FORECASTING

Chair: John Carroll
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139

"THE SCENARIO APPROACH TO STRATEGIC THINKING"

Paul Schoemaker
Graduate School of Business, University of Chicago, Chicago, IL 60637

This presentation contrasts the scenario method with other forecasting approaches, and highlights its cognitive benefits. Scenarios are viewed as an important tool for thinking as well as communication. A brief example will illustrate the basic steps in scenario construction. Key issues in its methodology will be addressed, including the distinction between trends and uncertainties. Apart from cognitive and methodological issues, important organizational aspects will be discussed. This will in part be based on the presentor's 20 month sabbatical with the corporate planning group of Royald Dutch/Shell in London, which has extensive experience with the scenario method.

"INTUITIVE FORECASTING OF COMPLEX DYNAMIC SYSTEMS: EXPERIMENTAL RESULTS"

John Sterman
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139

In recent years laboratory experiments have shed significant light on the behavior of economic agents in a variety of microeconomic contexts such as auction markets and preference elicitation. Despite successes in the micro domain, there has been little work on the behavior of decisionmakers in larger organizational structures such as the dynamics of whole industries or the macroeconomy. This paper presents a laboratory experiment in which subjects play the role of managers in a simple macroeconomic context, specifically a model of aggregate capital investment. The subjects must anticipate changing conditions in the simulated economy so as to balance supply and demand. The behavior of subjects is far from optimal. A decision rule based on the theory of bounded rationality and the anchoring and adjustment heuristic is proposed as a model of the decision process used by the subjects.

"MYCIN CERTAINTY FACTORS AND FUZZY REASONING AS DESCRIPTIVE MODELS OF HUMAN JUDGEMENT"

Gregory W. Fischer
Department of Social and Decision Sciences, Carnegie-Mellon University, Pittsburgh, PA 15213
Max Henrion
Department of Engineering and Public Policy, Carnegie-Mellon University, Pittsburgh, PA 15213

AI researchers have proposed using Mycin certainty factors and fuzzy probabilities as substitutes for Bayesian subjective probabilities. Defenders of these new approaches make two claims: first, that they are more computationally tractable than probability models yet afford reasonable approximations to subjective probability; and second, that they are better descriptive models of actual human cognition than are Bayesian methods. In this paper, we survey a number of well-known findings regarding human judgment under uncertainty and use these findings to evaluate the descriptive validity of the Mycin and fuzzy probability representation. Implications for AI and expert systems approaches to forecasting will be examined.

Session WB5
BERKELEY

Wednesday
10:00-11:30

EFFICIENT UTILIZATION OF INFORMATION CONTAINED IN SUBJECTIVE AND TIME SERIES FORECASTS

Chair: Mark M. Moriarty
Krannert School of Management, West Lafayette, IN 47907

"THE FORECASTING PERFORMANCE OF PRODUCTION SURVEY EXPECTATIONS"

Dominique M. Hanssens
Graduate School of Management, UCLA, Los Angeles, CA 90024
Piet Vanden Abeele
Catholic University of Louvain, Louvain, Belgium

This research examines the forecasting value of survey reported production expectations of European manufacturers in the consumer, investment and intermediate sector. A time-series framework using Granger causality assesses whether or not the manufacturers reveal something about tomorrow's economy that cannot be predicted using statistical extrapolation of historical production data. We also assess to what extent the manufacturers' expectations are based on an efficient use of all available information. The research design involves over twelve years of monthly data for five European countries.

"FORECASTING MARKET DEMAND: A VECTOR AUTOREGRESSIVE APPROACH"

V. Kumar
College of Business Administration, University of Iowa, Iowa City, IA 52242
Robert P. Leone
School of Business, The University of Texas, Austin, TX 78712

This paper demonstrates the usefulness of using consumer sentiment data in forecasting demand for several aggregate categories (durables, nondurables, services, automobiles, etc.). Rather than using either a regression approach or a univariate time series approach, a vector autoregressive approach is used to investigate the relationships between all demand categories in a simultaneous framework. The performance of the model developed is compared to forecasts generated by various methods using standard summary measures, as well as, the model's ability to capture turning points.

"CALIBRATION OF SUBJECTIVE FORECASTS: A SYNTHESIS, WITH IMPLICATIONS FOR MARKETING"

Sunil Gupta
Graduate School of Business, Columbia University, New York, NY 10027
Peter C. Wilton
School of Business, University of California, Berkeley, CA 94720

This paper attempts to review and synthesize existing approaches to calibrating subjective forecasts, with particular attention to the problems of marketing management. Theoretical foundations and empirical evidence on alternative calibration procedures will be examined in order to identify a set of normative properties for the calibration of forecasts in marketing under varying restrictions. Procedures developed to satisfy these normative properties (for selected conditions) will be presented and discussed.

"THE INFORMATION CONTENT OF INDIVIDUAL FORECASTS IN THE COMBINATION OF FORECASTS"

Mark M. Moriarty
Krannert School of Management, Purdue University, West Lafayette, IN 47907

The literature in forecasting has focused attention on the subject of forecast method accuracy, an attribute of prime importance in the selection of a forecasting method. Many studies conclude that there is little consistency with which one forecasting method outperforms other methods. More recently, attention has turned to improving forecasting by developing combinations of individual forecast methods (sometimes labeled, "composite forecasting"). In this context, the research described here documents the conditions under which individual forecasts based on different methods can be effectively combined. Specifically, the following issues will be addressed in the context of marketing forecasting: (1) development of appropriate definitions of the sources of information content of individual forecasting methods, (2) documentation of the analytical relationships among the sources of information content, and (3) empirical demonstration of the relevance of the information sources to the selection of individual forecasting methods.

MARKETING FORECASTING

Chair: Cynthia Webster
School of Business and Administration, St. Mary's University, One Camino Santa Maria, San Antonio, TX 78284

"AN EXAMINATION AND COMPARISON OF THREE METHODS OF IMPROVING THE FORECASTING ACCURACY OF CONJOINT ANALYSIS"

Cynthia Webster
School of Business and Administration, St. Mary's University, One Camino Santa Maria, San Antonio, TX 78284

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"INTERVENTION ANALYSIS USING CONTROL GROUPS AND EXOGENOUS VARIABLES IN A TRANSFER FUNCTION MODEL"

Lakshman Krishnamurthi
J.L. Kellogg Graduate School of Management, Northwestern University, Evanston, IL
Jack Narayan
Department of Mathematics, State University of New York, Oswego, NY 13126
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Session WB7 Wednesday
BEACON A 10:00-11:30

SOFTWARE FOR STATISTICAL ANALYSIS AND FORECASTING

Chair: Robert F. Nau
Fuqua School of Business, Duke University, Durham, NC 27706

"ISP (INTERACTIVE STATISTICAL PROGRAMS): A NEW APPROACH TO TEACHING STATISTICS AND FORECASTING"

Spyros Makridakis
INSEAD, Boulevard de Constance, 77305 Fontainebleau Cedex, France

This paper describes a new approach to teaching statistics and forecasting using ISP, a user-friendly software package. The computer is used extensively in the classroom with a projection screen, making it possible to illustrate concepts on-line with current data of interest to the students. ISP is also easy for students to use themselves and contains numerous pedagogical features as well as the usual computational aspects of a software package designed for statistics and forecasting.

"AUTOMATIC FORECASTING METHODS: A COMPARATIVE STUDY"

Pamela Texter
College of Business Administration, University of South Carolina, Columbia, SC 29208
J. Keith Ord
College of Business Administration, Pennsylvania State University, University Park, PA 16802

Automatic model selection techniques may prove to be an effective and efficient method of forecasting in certain business situations. The purpose of this study is to examine the potential of these automated methods by comparing them to a manual analysis. Both univariate and multivariate techniques are utilized. For the multivariate cases, ex ante and ex post forecasts for the input series are compared. Ten pairs of selected indicator, industry, and international macroeconomic series are used to evaluate forecasting performance. The results of this research show that for these series the automatic techniques perform as well as the manual methods.

"FORECASTING SOFTWARE: LICENSING CONSIDERATIONS"

Agnes S. Lefas Daub
Box 25, Commerce Court West, Toronto, Canada M5L 1A9
Mervin Daub
School of Business, Queen's University, Kingston, CANADA K7L 3N6

This paper extends an earlier one on general liability and intellectual property considerations related to forecasting given at last year's Symposium. In particular, it considers the practical and legal aspects of the licensing of forecasting software. Subjects considered include issues such as liability, protection, and nondisclosure, using Canadian law as an example.

BUSINESS AND ECONOMIC FORECASTING

Chair: Herman O. Stekler
Industrial College of the Armed Forces, National Defense University, Fort Lesley J. McNair, Washington, D.C. 20319

"REVISIONS OF ECONOMIC FORECASTS"

Herman O. Stekler
Industrial College of the Armed Forces, National Defense University, Fort Lesley J. McNair, Washington, D.C. 20319

This paper examines the revisions in the U.S. GNP and real GNP forecasts that were made over the period 1972-1983. The first section of the paper questions whether these forecasts have been successful in the sense of reducing the magnitude of the absolute errors. The second section develops a model of the revision process which is then tested to determine whether the observed data fit this model.

"THE ACCURACY OF INDUSTRY OUTLOOK SURVEYS"

Iris Mohr, Steven P. Schnaars
Baruch College, City University of New York, 17, Lexington Ave., New York, NY 10010

This study evaluates the accuracy of the Business Week Insustry Outlook Survey since it was first published as a cover story. It examines whether these surveys are truly able to foresee the future, as the magazine claims, or whether they merely make for entertaining reading. It also offers fresh evidence on the value of judgmental forecasts – since it examines the conscientious efforts of industry experts, rather than the ability of naive students to perform contrived tasks. The findings show that the surveys provided a fairly accurate overall outlook -- although they were often overly optimistic, and specific, quantitative forecasts many times proved less than perfect.

"MANAGEMENT EARNINGS FORECAST INFORMATION: IMPLICATIONS FOR SHIFTS IN EARNINGS EXPECTATIONS AND RISK PERCEPTIONS"

Michael J. Gift
Graduate School of Business, Indiana University, Bloomington, IN 47405

This study investigates the information content of management e.p.s. forecasts. In particular it tests the impact on security prices of two variables: the change in earnings expectations occasioned by the release of a mangement forecast and the change in the perceived riskiness (implied variance of returns) of the company's stock over the time of the forecast release. Using a traditional partitioning approach, the change in earnings expectations exhibited a significant positive relationship with security returns while the change in perceived riskiness indicated a consistently negative but weak relationship.

Session WB10 Wednesday
BEACON F 10:00-11:30

TECHNOLOGY FORECASTING: BETTER INFORMATION FOR MANAGERS

Chair: James R. Bright
The Industrial Management Center, Inc., RR1, Box 256, N. Edgecomb, ME 04556

"TECHNOLOGY FORECASTING: TALES FROM THE TRENCHES"

John H. Vanston
Technology Futures, Inc., 6034 W. Courtyard Dr., Suite 380, Austin, TX 78730

Technology forecasting is prognostication in faded blue jeans. Forecasts are done by real people to help real companies make real decisions. In this session, participants will examine several cases in which companies and government agencies used technology forecasting to help them solve pressing problems. The session leader will discuss the nature of the problems addressed, the forecasting techniques utilized, and the results achieved in each case. In addition, he will show how the lessons learned in each case can be used by participants to improve their own problem-solving efforts.

"WHAT THE MANAGER OUGHT TO EXPECT FROM THE TECHNOLOGY FORECASTER"

James R. Bright
The Industrial Management Center, Inc., RR 1, Box 256, N. Edgecomb, ME 04556

Four key questions concerning the manager and the organization's technical health can be answered through technology forecasts. Significant examples based on trend extrapolation, monitoring, and relevance trees will be discussed along with some limitations.

Session WB11
BEACON G

Wednesday
10:00-11:30

FORECASTING STOCK PRICES

Chair: Peg Young
School of Business Administration, George Mason University, Fairfax, VA 22030

"FORECASTING HONG KONG STOCK PRICES"

T.C.E. Cheng
Department of Actuarial and Management Sciences, University of Manitoba, Winnipeg, Canada R3T 2N2

Over the recent decade the financial markets in Hong Kong have developed rapidly. There have been many empirical studies on the behavior of the stock market. Our objective in this study is to develop multiple regression models to supplement "fundamental analysis". It is found that trade balance, money supply and consumer price index all lead the Heng Sang Index significantly. But the models are not sophisticated enough to provide forecasts with high accuracy and further improvement is needed for real investment purposes.

"USE OF TRANSFER FUNCTIONS IN FORECASTING STOCK PRICES"

Timothy M. Dawson, Camille D. Weicker, Peg Young,
School of Business Administration, George Mason University, Fairfax Virginia 11030

This study analyzes the impact of external economic and internal corporate variables on the time series data set of stock prices from selected U.S. companies. The economic and corporate variables are translated into transfer functions on intervening variables; they are then modelled onto the ARIMA models of the individual stock price time series of approximately 35 major U.S. corporations that represent the various industrial groups. By treating these independent variables as transfer functions, structure is found in some of the ARIMA models. It is indicated that such usage of transfer functions can improve on the traditional random walk of the stock prices.

"RESPONSE OF STOCK PRICES TO CHANGES IN MONEY STOCK: AN EVALUATION OF FORECASTING METHODS"

Nozar Hashemzadeh, Philip Taylor
College of Business and Economics, Radford University, Radford, Virginia

This paper uses vector auto-regression techniques to analyze the statistical relationship which is said to exist between the supply of money and stock price levels, between the supply of money and the level of interest rates and stock price levels. The current literature [Kraft and Kraft (1977), Roseff (1974), and Cooper (1974)] offers differing opinions on each of the relationships cited above. A series of empirical tests based on Sims causality criterion are performed to shed more light on the debate.

Session WB12
BEACON H

Wednesday
10:00-11:30

SEASONAL MODELS

Chair: Stanley R. Schultz
College of Business Administration, Cleveland State University, Cleveland, OH 44115

"THE CHATFIELD - PROTHERO CASE STUDY REVISITED: OBJECTIVE ORDER DETERMINATION CRITERIA AND SEASONAL TIME SERIES"

Nader Nazmi
Department of Economics and Business, Lake Forest College, Lake Forest, IL 60045

The 'Sales of Company X' as studied by Chatfield and Prothero (1973) generated a fair amount of discussion on Box-Jenkins seasonal modelling. In recent years, objective order determination criteria such as AIC, BIC, Hannan-Quinn, Hannan-Rissanen and Hannan-Kavalieris have become increasingly popular in the identification stage of the process of model selection. However, the evidence on their performance for seasonal modelling is, as far as I know, virtually nonexistent. This paper attempts to compare the forecasting performance of various automatic order determination criteria when seasonal time series such as the 'Sales of Company X' of Chatfield-Prothero (1973) or Series G of Box-Jenkins (1976) are involved.

"ADAPTIVE SMOOTHING PREDICTION TECHNIQUE FOR SEASONAL MODEL WITH EXPONENTIAL TREND"

Luo Xinhong, Liu Qiaoliang
Decision Science Department, Management School, Jiao Tong University, Shanghai, P.R. China

An adaptive smoothing prediction technique for seasonal model with exponential trend is presented by using Brown's forecasting method. The smoothing vector and the variance of the forecast error in the model – formulating process are properly available. The explicit parameters of the model recursive formulas are deducted, so the parameters of the model can be updated without the use of matrix inversion. The initial estimation of the parameters and determination of the exponential growth parameter are also discussed. Finally, the prediction of passenger traffic capacity for a railway bureau is given as an example.

"UNSTABLE SEASONALITY"

Stanley R. Schultz
College of Business Administration, Cleveland State University, Cleveland, Ohio 44115
Robert E. Mazurak
Pickands Mather & Co., 1100 Superior Avenue, Cleveland, Ohio 44114

Seasonality may change suddenly, or it may change gradually. If it changes suddenly, the usual advice is to use only the later data (after the change). But the amount of remaining data may be unsatisfactory for modeling. If seasonality changes gradually throughout the series, the question is whether any well-known method will give adequate results for forecasting purposes. In this paper, problems of such changing seasonality are explored, with reference to the following methods in particular: decomposition; Winters; dummy variables; and univariate Box-Jenkins. Practical implications are suggested.

POPULATION FORECASTING

Chair: Peter Pflaumer
Universitat Dortmund, Postfach 50 05 00, D4600 Dortmund 50, W. Germany

"THE ACCURACY OF POPULATION PROJECTION METHODS UNDER DIFFERING AREA GROWTH PROFILES"

Maryann P. Feldman
Carnegie-Mellon University, Pittsburgh, PA 15213

This paper addresses the accuracy of alternative methods of projecting the population of sub-state areas. The critical premise underlying this paper is that the accuracy of the forecasting method is dependent upon the growth profile of the area. While comparative studies of this nature have based area grouping on population growth rates this paper proposes a scheme which integrates demographic and economic variables to classify the accuracy of the forecasting technique. Within this framework the accuracy of several alternative techniques is evaluated at 5, 10, 15 and 30 year forecast horizons.

"FORECASTING THE U.S. POPULATION WITH THE BOX-JENKINS APPROACH"

Peter Pflaumer
Universitat Dortmund, Postfach 50 05 00, D4600 Dortmund 50, West Germany

The utility of the Box-Jenkins technique for forecasting U.S. population size is discussed. ARIMA (2,2,0)-models seem to provide fairly adequate representations of population trajectories in different periods. In judging forecasting accuracy, it is shown that the Box-Jenkins approach produces population forecasts which are at least as reliable as more traditional demographic methods.

"MICRO LEVEL POPULATION FORECASTS AND THE LOG-LINEAR APPROACH"

Kusum Ketkar
W. Paul Stillman School of Business, Seton Hall University, South Orange, NJ 07079

This paper uses log-linear model techniques to obtain a detailed breakdown of the Bureau of the Census aggregate population forecasts into various strata. Each strata of households is identified by several characteristics like age of the households, its region of location, etc. The expected number of housefolds in each group estimated under this methodology is the result of joint influence of expected number of total households, the number of households in each age group, region, etc. and due to interaction among these characteristics. The proposed methodology is found to give better approximation to the observed data than other approaches currently in use.

Session WB14 Wednesday
LIBERTY B 10:00-11:30

TEACHING FORECASTING

Chair: James E. Cox, Jr.
Department of Marketing, Illinois State University, Normal, IL 61761

"TEACHING FORECASTING: MISTAKES TO AVOID"

James E. Cox, Jr.
Department of Marketing, Illinois State University, Normal, IL 61761

Forecasting is more than teaching students how to plug numbers into "black boxes" and getting numbers back out. There are principles of learning that can be used to enhance the student's education experience. Ten common mistakes that forecasting instructors make which violate these principles are discussed. Recommendations are given for improvement.

"A SURVEY OF EDUCATIONAL PRACTICES IN FORECASTING"

J. Thomas Yokum
DePaul University, Chicago, IL

Forecasting is a neglected area in marketing education. It is often thought that forecasting strategy and implementation are covered superficially in marketing courses, while quantitative courses briefly cover some techniques and methods. However, exactly what colleges of business and marketing departments actually do in educating students about forecasting is unknown. The purpose of this paper is to describe a recent survey of selected educational institutions concerning forecasting education. Emphasis is placed on courses offered, course content and structure, textbook adoption, and use of forecasting packages. Also described is forecasting instructors, their training and professional activity.

"MULTIPLE REGRESSION ANALYSIS AND REALITY-BASED TEACHING METHODOLOGIES"

Edward S. Balian
Division of Business and Computer Systems, Madonna College, Livonia, MI 48150

Teaching multiple regression forecasting is often difficult for a myriad of reasons. Teaching it in a way in which students can view it as "relevant in the real world" can be even more difficult. And teaching it by methods that can actually motivate students into higher levels of critical thinking may often seem merely a Utopian dream of the statistics professor. Yet, we can do these things in the teaching of multiple regression analysis with a specific, time-tested approach. Included will be a presentation of teaching with relevancy, the "Who Cares" syndrome, data base size and structure, data base availability, important statistical concepts, problem-solving techniques, pragmatic interpretations of output, and communicating results.

Session WB15
LIBERTY E

Wednesday
10:00-11:30

APPLICATIONS

Chair: William M. Holmes
Center for Applied Social Research, Northeastern, Boston, MA 02115

"STRUCTURAL EQUATION TIME SERIES ANALYSIS AND THE FORECASTING OF CRIME"

William M. Holmes
Center for Applied Social Research, Northeastern University, Boston, MA 02115

This paper presents a new forecasting procedure, Structural Equation Time Series Analysis (SETSA). This procedure merges time series analysis with confirmatory factor modeling. The new approach uses the trend handling capacity of ARIMA models with the measurement and structural equation modeling capacity of confirmatory factor analysis. Strengths and limitations of this procedure are discussed. An example is provided using multiple indicator time series data from the FBI Uniform Crime Reporting System. Problems and benefits of using SETSA are illustrated.

"FORECASTING MANPOWER REQUIREMENTS OF A COMMERCIAL BANK AT A CORPORATE LEVEL"

Om Sharma
St. John's University, New York

An approach for forecasting manpower requirements of a commercial bank in a developing economy, e.g., India, has been developed in this paper. A number of activities like deposits, credits, investments, etc. of a bank were studied in order to identify associated factor/factors for forecasting manpower requirements. The total deposits was found to be a single factor which could be used for the purpose for several reasons. Deposit-manpower ratios for the last 10 years were worked out for trend analysis. A linear regression model was used for projecting the deposit-manpower ratio for the target years which was applied to the planned deposits growth of the bank in those years. The projected total manpower was broken down into various categories of manpower, i.e., officers, clerks and subordinate staff, on the basis of the prevailing pattern as shown by an analysis of the past data.

"COMPARING THE FORECASTING ACCURACY OF ECONOMETRIC AND TIME SERIES METHODS: A CASE STUDY OF LABOR DEMAND"

Julius C. Chang
8450 Clover Leaf Dr., McLean, VA 22102

A structural econometric model estimated over 1962-79 was used to forecast the demand for workers and hours in the U.S. auto industry for 1980-84, assuming perfect knowledge of auto output. The results were compared with the forecasts generated by various time series models, one of which was derived directly from the structural model. The comparisons show that the structural model performed better, but the time series models that took the cue from the structural model also did well. The study thus provides some empirical evidence on the relationships between the two modelling methods.

Session WC1
EXETER

Wednesday
2:00-3:30

PROBLEM SOLVING SESSION

Chair: Jeffrey E. Jarrett
Department of Management Science, University of Rhode Island, Kingston, RI 02881

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J. Scott Armstrong
Wharton School, U. of Pennsylvania, Philadelphia, PA 19104

Estela Bee Dagum
Statistics Canada, R.H. Coats Building, Ottawa, Ontario, CANADA HIA 0T6

Essam Mahmoud
School of Management, University of Michigan-Flint, Flint, MI 48502-3160

Richard DeRoeck
GM Corporation, 767 Fifth Avenue, New York, NY 10153

SUBJECTS MAY INCLUDE:

- Inventory Control
- Strategic Planning
- Financial Management
- Investment and Portfolio Management
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- Gaining Acceptance of Forecasts
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Session WC1
EXETER

Wednesday
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- Strategic Planning
- Financial Management
- Investment and Portfolio Management
- Political Events
- Marketing
- Personnel Administration
- Gaining Acceptance of Forecasts
- Assessing Uncertainty
- Computer Techniques

STRATEGIC PLANNING

Chair: Muhittin Oral
Sciences de l'Administration, Université Laval, Sainte-Foy, Quebec, G1K 7P4 CANADA

"CAN PROFITS BE FORECAST?"

Graham Hall
Manchester Business School, University of Manchester, Booth Street West, Manchester M156PB, UK

A current fashion in strategic management bases proscriptive conclusions on results of empirical analysis. If, for example, market share, accumulated output, advertising stock or capital expenditure are found to be statistically correlated with profitability, it may be argued that increasing the former would lead to an increase in the latter. Arguing that this view is nonsense, the paper underlines the multiplicity of explanations for any set of industry-related statistical relations. Each of these explanations may have different strategic implications. Hence it may prove impossible to predict the outcome in profitability from changing the level of the pertinent strategic variables.

"A MODEL-BASED APPROACH TO STRATEGIC PLANNING FOR COMPETITIVE ADVANTAGE"

Muhittin Oral
Sciences de l'Administration, Université Laval, Sainte-Foy, Quebec, G1K 7P4 CANADA

The increasingly important role of competition in shaping long-term strategies of industrial firms has been more and more recognized by managers and academicians alike, prompting an increase in the number of studies that explicitly link strategy and competition. Most of the studies done in this area however are either too firm-specific to make them useful in other settings or too general and/or too descriptive to make them operational for the purpose of strategic planning in order to improve and sustain the firm's competitive position.

"ANALYTICAL MODELS IN STRATEGIC PLANNING"

Howard Thomas
Department of Business Administration, University of Illinois, Champaign, IL 61820

This paper uses the decision analysis approach to review various models which have been suggested in strategic planning. They include economic analysis, game theory, risk analysis, portfolio models, diversification and merger models, market share models, and forecasting and planning models. Suggestions will be made for future research examining the role of analytical models in strategic planning.

Session WC3
DALTON

Wednesday
2:00-3:30

IMPLEMENTATION OF FUTURES FORECASTING I

Chair: Harvey Nussbaum
Department of Management & Organization Sciences, Wayne State University, Detroit, MI

"PROBLEMS WITH THE IMPLEMENTATION OF FUTURES PROGRAMS"

Diane Kasunic
Ameritech Publishing and FuScan, Troy, MI

Futures research has become an increasingly popular methodology in today's progressive corporations. This research takes on many names: environmental analysis, environmental scanning, issues management and strategic research. It typically evolves around projected trends or trends beginning to take place which relate to the PEST (political, economic, social, technological) factors. These grossly macro factors can inhibit organizations from committing to, or managing these functions. Once a program is in progress, corporations struggle to find usefulness for the uncovered data. They find difficulty developing implementation plans and then achieving approval for the implementation process. The question of return on investment becomes a key challenge to determine. Interpretation and tailored strategies are critical variables in the success of this process.

"TECHNOLOGY TRANSFER -- LEADING EDGE AND BOTTOM LINE"

Nate R. Borofsky
Center for Urban Studies, Wayne State University, Detroit, MI

"Technology transfer" is a relatively new phrase for a venerable idea -- having the leading edge of science and technology serve more efficiently and quickly the "bottom line" of an economy, i.e., income and employment. Several public research universities in Michigan are now joined in an effort to accelerate such transfer. This paper assesses the potential of the program to drive technology, create economic opportunity, solve problems, build new firms, start new industries and invent the future. It suggests that technology transfer alters the conventional wisdom by making invention the mother of necessity and cautions that the promise of technology is dependent on the management of human resources in the near term.

"ISSUES MANAGEMENT AS A MAJOR COMPONENT OF STRATEGIC IMPLEMENTATION"

John F. Mahon
School of Management, Boston University, Boston, MA

It is clear that corporate success is a function of both formulation and implementation of issues and strategic management. Yet it is the formulation and issues identification side that has received the most attention in the literature. The focus of this paper/discussion is on the role of issues management in successful implementation of strategy. A model will be proposed identifying key elements and important links between strategy and issues management in implementation. Examples of successful implementation will be presented to highlight key elements and to make material come alive. Finally, a discussion of the interface and balance between issues formulation and issues and strategy implementation will be addressed in light of the forecasting needs of the organization given alternate futures and scenario modelling.

Session WC4
CLARENDON

Wednesday
2:00-3:30

IRRATIONAL EXPECTATIONS AND BEHAVIOR IN MARKETS

Chair: Colin Camerer
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

"SON OF WINNER'S CURSE: BIDDER BEHAVIOR AND PUBLIC INFORMATION IN SECOND PRICE COMMON VALUE AUCTIONS"

John H. Kagel, Ronald M. Harstad, Dan Levin
Department of Economics, University of Houston, Houston, TX 77004

A series of second price common value auction experiments using experienced subjects are reported. The results replicate those found in a parallel series of first price common value auction experiments. Differences between first and second price auction outcomes are reported and analyzed. The ability of second price auctions to isolate errors in item valuation effects are discussed, along with suggestions (from the auctions with public information) that ascending price oral auctions will lead to elimination of the winner's curse.

"DO IRRATIONAL INDIVIDUALS MAKE MARKETS IRRATIONAL? EXPERIMENTAL EVIDENCE"

Colin Camerer
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

There is much evidence that people do not intuitively use Bayes' rule in integrating prior and sample information. However, markets can be rational (i.e., prices may equal Bayesian expected values) even if most people err systematically in applying Bayes' rule. We test whether this is so in market experiments. Generally, prices and allocations are slightly (but significantly) irrational. However, the degree of irrationality diminishes when subject have experience and when subjects are allowed to sell short to discipline non-Bayesian traders.

"STATUS QUO BIAS IN DECISION MAKING"

Richard Zeckhauser
Kennedy School of Government, Harvard University, Cambridge, MA 02138
William Samuelson
School of Management, Boston University, Boston, MA 02215

In both empirical phenomena and experiments we observe that individuals tend to stick with status quo choices even though the transition costs are trivial. We discuss the implications of this phenomenon for markets.

CURRENT APPROACHES TO SALES FORECASTING

Chair: Douglas MacLachlan
School of Business Administration, University of Washington, Seattle, WA 98195

"FORECASTING BRAND SALES FROM CONSUMER PERCEPTIONS"

Gordon Bechtel
College of Business Administration, University of Florida, Gainesville, FL 32611
Chezy Ofir
Hebrew University of Jerusalem, Jerusalem, Israel
Jose Ventura
School of Business and Public Administration, University of Missouri, Columbia, MO 65201

The present paper attempts to develop richer linkages between consumer perception and demand than those provided by previous multidimensional methods. First, a market segment's demand scale (over brands) is considered to be dependent on specified and unspecified perceptual scales. Then, an unspecified scale will be extracted from demand residuals in an approach that combines aspects of internal and external multidimensional scaling. In addition to embracing internal and external approaches simultaneously the analysis can also track a varying relationship between perception and demand over distinct market segments. This relational segmentation prevails when demand scales are differentially dependent on perceptual scales in separate target groups.

"FORECASTING PURCHASES FROM CONSUMER SENTIMENTS"

James B. Wiley
School of Business, Temple University, Philadelphia, PA 19912
Douglas MacLachlan
School of Business Administration, University of Washington, Seattle, WA 98195

A recursive procedure for analyzing repeated survey or panel data is developed and illustrated in this paper. Two key features of the procedure are that a) new data can be added to an ongoing study without reestimating previously reported parameters and b) the pooled data can be used to predict purchase.

"ESTIMATING DYNAMIC MARKET RESPONSE FUNCTIONS: HOW A 'SMART' STATISTICIAN AND SIMPLE STATISTICS CAN AUGMENT MANAGERIAL JUDGMENT"

Dipankar Chakravarti
School of Business, University of Arizona, Tucson, AZ
Richard Staelin
Fuqua School of Business, Duke University, Durham, NC 27706

This paper examines how simple statistical analysis can augment managerial judgment in estimating market response to mix decisions in complex, non-linear and dynamic environments. Using advertising decisions and outcome data generated in a marketing game we find that even with a mis-specified model, limited data and autoregressive error, Ordinary Least Squares analysis provides useful insights for separating current and carryover effects of advertising. A heuristic analysis approach is proposed for such situations and its robustness is tested using simulated data incorporating different levels of error.

MEDICAL FORECASTING MODELS FOR POLICY MAKERS AND PATIENTS

Chair: Jay Christensen-Szalanski
Department of Management Sciences, University of Iowa, Iowa City, IA 52242

"CAN*TROL: A COMPUTER MODEL FOR DESIGNING NATIONAL CANCER CONTROL PROGRAMS"

David M. Eddy
Center for Health Policy Research and Education, Duke University, Durham, NC 27706

Designing cancer control programs is complicated by the large number of possible interventions (prevention, screening, treatment), and large number of cancers. CAN*TROL is an interactive computer program that enables a policy maker to describe populations and subpopulations, define a variety of control programs, and calculate the effects on morbidity, mortality, and cost for future years. CAN*TROL was developed for the World Health Organization, has been used by the governments of India and Chile to design national cancer control programs, and is the basis of the US National Cancer Institute's model for designing its cancer control objectives for the year 2000.

"THE CORONARY HEART DISEASE POLICY MODEL: FORECASTING MORTALITY, MORBIDITY, AND MEDICAL CARE COST"

Milton C. Weinstein
Harvard School of Public Health, Boston, MA 02115

A compartmental simulation model was developed to project the future morbidity, mortality, and cost of coronary heart disease (CHD) in the US population. The model consists of three integrated submodels: a modified Markov system that projects subsequent events and costs; a Demographic-Epidemiologic Model; and a Bridge Model, which classifies new cases of CHD and computes 30-day mortality and costs. If risk factors and the use and efficacy of CHD interventions remain constant, then by the year 2010, the aging of the population will increase annual CHD prevalence and deaths with a corresponding 40% increase in annual cost. Simulations in using this model revealed that substantial reductions in body weights, blood pressure, serum cholesterol levels, and cigarette smoking in people turning 35 years after 1980 would only partially offset the population-driven CHD growth observed in the baseline simulations.

"CLINICAL DECISION ANALYSIS IN INDIVIDUAL PATIENTS"

Stephen G. Pauker
Division of Clinical Decision Making, New England Medical Center, Boston, MA 02111

Since 1978, decision analysis consultations have been offered to help physicians manage particularly vexing clinical problems. to carry out these consultations, standard techniques were used, including decision tree models, Bayes' theorem, Markov analysis, and utility assessment, but old approaches were modified to adapt decision analysis to individual patient problems. This experience demonstrates that decision analysis can be carried out effectively on a consultative basis for individual patients. A consultation service can also train analysts in decision-making and drive research in problem solving.

Session WC7
BEACON A

Wednesday
2:00-3:30

PROBABILITY AND INTERVAL FORECASTS

Chair: John Kling
McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903

"PROBABILITY ASSESSMENT FOR ECONOMIC FORECASTING"

John L. Kling
McIntire School of Commerce, University of Virginia, Charlottesville, VA 22903
David A. Bessler
Department of Agricultural Economics, Texas A&M University, College Station, TX 77843

Most economic forecasts are simply point estimates of future values of economic variables. Rarely do such forecasts include an explicit probability statement expressing the forecaster's degree of certainty. The deficiencies of deterministic forecasts seem well recognized in some of the other disciplines. In our research we extend and test (for several economic variables) a procedure for generating well-calibrated predictive distributions from statistical time-series models. We calculate measures of resolution and refinement for the probability forecasts and compare these measures across models (multivariate vs. univariate) and across the various time series.

'CONFIDENCE INTERVALS: AN EMPIRICAL INVESTIGATION FOR THE SERIES IN THE M-COMPETITION'

Spyros Makridakis, Michele Hibon
INSEAD, 77305 Fontainebleau, France
Ed Lusk
Wharton School, University of Pennsylvania, Philadelphia, PA 19104
Moncef Belhadjali

This paper empirically evaluates the uncertainty of forecasts. It does so using the 1001 series of the M-Competition. The study indicates that although in model fitting the percentage of observations outside the confidence intervals is very close to that postulated theoretically, this is not true for forecasting. In the latter case the percentage of observations outside the confidence intervals is much higher than that postulated theoretically. This is so for the great majority of series, forecasting horizons and methods. The main reasons for larger than expected percentages falling outside the confidence intervals is attributed to pattern changes in real-life time series and violation of the assumptions (unbiasness, normality, independence, homoscedasticity) required to build confidence intervals.

"EMPIRICALLY GENERATED PREDICTION INTERVALS"

Kenneth O. Cogger
School of Business, University of Kansas, Lawrence, Kansas 66045

Probability limits for time series forecasts are usually calculated under strict assumptions of normality. Recently, empirical approaches have been devised which do not require such assumptions. In this paper, we investigate the use of autoregressive quantile estimation for the construction of prediction intervals. Results are reported for the 111 series in the M-Competition.

Session WC8
BEACON B

Wednesday
2:00-3:30

MULTICRITERIA DECISION MODELS AS A FRAMEWORK FOR FORECASTING

Chair: Nick Bahmani
School of Business Administration, Montclair State College, Upper Montclair, NJ 07043

"NEW PRODUCT EVALUATION AN APPLICATION OF A MULTI-CRITERIA DECISION MAKING APPROACH"

Rajshekhar G. Javalgi
Marquette University, Milwaukee, Wisconsin 53233
M. Sedaghat
Dept. of Information Systems and Sciences, School of Business Administration, Farleigh Dickinson, Teaneck, NJ 07666
N. Firoz
School of Business Administration, Montclair State College, Upper Montclair, NJ 07043

The Analytical Hierarchy Process (AHP) was used successfully in a new product evaluation case study on a New Jersey manufacturer of industrial packaging materials. It led to a clear quantifiable decision to go with one of five proposed products. Briefly, AHP structures any complex, multi-criteria problem hierarchically. Five major criteria (selling price, performance, life, availability, popularity) were structured by which potential new products were evaluated by key company personnel. In this manner, it organized intuition and logic into a framework for objective decision making. The model seemed both reliable and efficient given the number of key personnel involved.

"FORECASTING WITH MULTIPLE CRITERIA DECISION MODEL AND APPLICATION TO INTERNATIONAL INVESTMENTS"

A. Seddik Meziani, Kamrouz Pirouz, David Yamoah
School of Business Administration, Montclair State College, Upper Montclair, NJ 07043

This paper applies the Analytical Hierarchy Model to a multinational firm evaluating different sources of borrowing. The procedure consists of (1) constructing hierarchies by breaking down the problem ito its separate elements and levels (The first level defines the optimal instrument, the second identifies the amount and nature of the instrument, etc.); (2) establishing priorities by defining the impact of each element (type of financing) on the next higher level; (3) using logical consistency by including a mathematical test of coherent relationships (the consistency test indicates the priority of each element). Results show that the local loan is the preferred source of borrowing regardless of the nature of the investment.

"A TIME SERIES ANALYSIS OF BUDGET DEFICITS AND SHORT-TERM INTEREST RATES"

Theologos Homer Bonitsis
Department of Economics and Finance, New Jersey Institute of Technology
Farahmand Rezvani
Department of Economics, Montclair State College, Upper Montclair, NJ 07043

There is an extensive body of literature on the adverse affects of budget deficits on the financial markets. In essence, budgetary deficits result in government borrowings in the financial markets; this activity directly competes with private business borrowing requirements; and, ceteris paribus, the level of interest rates are pushed up contributing to a lower level of private investment and hence economic growth. We construct a bivariate time-series model based on the work of C.W.J. Granger to test for the existence of a causal nexus between the level of real quarterly budget deficits and level of three, six and twelve month risk-free interest rates.

Session WC9
BEACON C

Wednesday
2:00-3:30

ECONOMIC FORECASTING

Chair: S.G.B. Henry
National Institute of Economic and Social Research, 2 Dean Trench St., Smith Square, London SW1P 3HE, UK

"INVESTMENT: ITS RECENT BEHAVIOR AND SOME PROPOSED EXPLANATIONS"

S.G.B. Henry
National Institute of Economic and Social Research, 2 Dean Trench St., Smith Square, London SW1P 3HE, U.K.

In this paper the problem of explaining the behavior of manufacturing investment is addressed. The alternative models of investment are introduced, based on alternative measures of the cost of capital and measures of demand for output. These are contrasted with models based on Tobin's Q approach. Each model is estimated and its ability to account for the investment behavior of the past five years is assessed. Expectations play a considerable role in these models, and methods of obtaining empirical forward-looking prediction equations are described and implemented in the paper.

"FORECASTING THE LOCAL ECONOMY USING TIME SERIES AND SHIFT-SHARE TECHNIQUES"

James A. Kurre, Barry R. Weller
The Pennsylvania State University, The Behrend College, Station Road, Erie, PA 16563

Analysts of local and regional economies have used the shift-share technique to examine the performance of the local economy, industry by industry, relative to that of the nation. Some have used shift-share as a forecasting tool by making assumptions about the behavior of the share component, although the appropriate technique has been a subject of debate in the literature. This paper will combine time-series forecasting techniques with the shift-share approach in an attempt to devise a more accurate way of forecasting local economies. The results of this technique will be compared with those of other forecasting methods, based on analysis of employment in the Erie, Pennsylvania, MSA, over the period from 1959 through 1984.

"FORECASTING TAX REVENUES IN A POLITICAL ENVIRONMENT: SOME PRACTICAL CONSIDERATIONS"

Carl G. Brooking
Millsaps Colege, Jackson, MS 39210
William S. Triplett
Fiscal Management Board, State of Mississippi, Jackson, MS

The very nature of forecasting tax revenues for a public agency subjects the forecaster to scrutiny not often experienced by private company forecasters. In addition, a number of political factors impinge upon the ability of the forecaster to develop the most accurate and unbiased forecast possible. This paper presents and examines the practical issues and concerns related to forecasting in a public political environment.

Session WC10
BEACON F

Wednesday
2:00-3:30

FORECASTING IMPLICATIONS OF LIFE CYCLE COSTING

Chair: Unver Cinar
Shape Technical Centre, PO Box 174, 2501 CD The Hague, The Netherlands

"LIFE CYCLE COSTING AND FORECASTING"

Unver Cinar
Shape Technical Centre, PO Box 174, 2501 CD The Hague, The Netherlands

Life cycle cost is the total cost of ownership of a system over its lifetime. Life cycle costing is an estimation process that among others utilizes a set of forecasting techniques to support the system design and management decision making. This paper provides a discussion of life cycle phases, cost categories and a generalized life cycle costing methodology. The impact of forecasting on life cycle cost estimates and the use of life cycle costing as an integral part of design process are briefly discussed. It is concluded that life cycle costing is a management tool that enables system design decisions to be taken to provide a balance among design factors and costs during successive phases of system development and acquisition.

"LIFE CYCLE COST TREND ANALYSIS USING THE PRICE MODELS"

William E. Rapp, Earl W. King, William W. Kuhn
RCA/PRICE systems, 300 Rt. 38, Bldg. 146, Moorestown, NJ 08057

This paper demonstrates the use of the PRICE models to capture the trends in Life Cycle Costs from the vacuum tube technology of 1946 through the advanced integrated circuits of 1985. The trend gives a good basis for both forecasting costs and analyzing the effects of tradeoffs in development and support strategies utilizing the rapid response of computerized models.

"LIFE CYCLE COST IMPLICATIONS OF A VHSIC INSERTION PROGRAM"

Earl W. King, William W. Kuhn
RCA/PRICE systems, 300 Rt. 38, Bldg. 146, Moorestown, NJ 08057

The Very High Speed Integrated Circuit (VHSIC) technology program is forecast to have significant cost and technical impacts on present and future military avionics systems. Since VHSIC technology is on the leading edge of the state-of-the-art in microelectronics, the cost estimator is faced with an extremely difficult task. Due to the rapid advances made in integrated circuits, it is difficult to use historical costs as a basis for forecasting the costs of future systems incorporating VHSIC devices. This study examines the operational benefits of a VHSIC insertion program and the cost benefits associated with using VHSIC devices.

Session WC11 Wednesday
BEACON G 2:00-3:30

EXCHANGE RATE FORECASTING

Chair: Stephan S. Thurman
International Affairs Unit, Congressional Budget Office, U.S. Congress, Washington, D.C. 20515

"THE OUT-OF-SAMPLE FORECASTING PERFORMANCE OF EXCHANGE RATE MODELS WHEN COEFFICIENTS ARE ALLOWED TO CHANGE"

Gary J. Schinasi, P.A.V.B. Swamy
Board of Governors of the Federal Reserve System, Washington, D.C. 20551

This study examines the out-of-sample forecasting performance of models of exchange rate determination without imposing the restriction that coefficients are fixed over time. Both fixed and variable coefficient versions of conventional structural models are considered, with and without a lagged dependent variable. While our results on fixed coefficient models support most of the Meese and Rogoff conclusions, we find that when coefficients ar allowed to change, an important subset of conventional models of the dollar-pound, the dollar-deutsche mark, and the dollar-yen exchange rates can outperform forecasts of a random walk model.

"MONETARY/ASSET MODELS OF EXCHANGE RATE DETERMINATION IN THE 1980'S - A PERIOD OF GRADUAL CHANGE OR A JUMP PROCESS"

Don Alexander
Citicorp Investment Bank, New York, NY
Richard T. Baillie
Department of Economics, Michigan State University, East Lansing MI
Lee R. Thomas, III
Goldman, Sachs & Co., New York, NY

The purpose of this study is to evaluate the performance of stochastic coefficient models of exchange rate determination during the 1980's. The study is based on methodology developed by Meese and Rogoff (1983, 1985) and Alexander and Thomas (1987). The first part of the study uses a Kalman filter to see if changes in the coefficients can be broken down into a predictible and unpredictible component. A second part of the study looks at changes in the coefficients to see if the change is a gradual process or follows a jump process.

AUTOREGRESSION MODELS

Chair: J. Thomas Yokum
DePaul University, Chicago, IL

"PREDICTION WHEN TREND IS EXPLAINED BY A LOCAL AUTOREGRESSION"

Frederick P. Wheeler
University of Bradford, Management Centre, Emm Lane, Bradford BD9 4JL, U.K.

Retrospectively, a stochastic process with a long memory appears to follow a long term trend. Often it is possible to propose a local autoregressive model, that is a causal mechanism, which will generate a trend curve to match the historical behavior. Such models have intuitive appeal. Prospectively, trend extrapolation requires care since random disturbances are amplified through the causal mechanism. The present work considers the predictive distribution from a mechanico-statistical perspective and uses the idea, that the expected value of future increments is an autoregression, to provide the desired causal mechanism.

"FORECASTING MISSPECIFIED STOCHASTIC AR1 ERROR STRUCTURES: A SIMULATION ANALYSIS"

J. Thomas Yokum
DePaul University, Chicago, IL
Albert R. Wildt
University of Missouri, Columbia, MO

Autoregressive structures have the potential to cause efficiency and forecasting problems using even simple marketing response models such as the current effects or sales-advertising specification. A necessary assumption, usually not stated is that model coefficients are constant. In this research this is violated by generating current effects models with stochastic AR1 coefficient errors and investigating the estimation of an incorrect additive error specification. Simulation results show that an incorrect specification can lead to insignificant estimates of the AR1 parameter when the prespecified value is significant, opposite signed estimates, wrong structure assessment of autocorrelation, and serious forecasting implications.

Session WC13
LIBERTY A

Wednesday
2:00-3:30

MANAGEMENT OF FORECASTING

Chair: Jennifer Piesse
Manchester Business School, University of Manchester, Manchester M15 6PB, U.K.

"MANAGEMENT OF FORECASTING METHODS AND SYSTEMS: TWO CASE STUDIES"

Jay Nathan
School of Mangement, University of Scranton, Scranton, PA 18510

The objective of this research is to illustrate how two manufacturing organizations - one producting an industrial product and the other a consumer product - differ in their management of forecasting methods and systems. Some of the forecasting practices and their execution are somewhat unique to organizations and their products. This paper describes two case studies which show how one can adapt, improve, and implement forecasting systems using some of the well-known forecasting techniques.

"THE CONTRIBUTION OF STATE REVENUE FORECASTING: AN ECONOMIC PRODUCTION THEORY APPROACH"

Donald Elliott
Department of Economics, Southern Illinois University at Edwardsville, Edwardsville, IL 62026-1102

This paper uses economic production theory to model the use of forecasting resources in the development and management of the budget of a state government. The analysis considers the costs to the state government of different types of forecasts errors, as well as alternative strategies to minimize the costs of errors. The analysis assumes that the contribution of forecasting resources to the budget process is the reduction in the cost of forecast errors beyond that level expected from errors associated with simple, naive extrapolations of the state's revenue streams. A discussion of optimal forecasting budgets and strategies concludes the analysis.

"THE DEMAND FOR FORECASTING IN THE FINANCIAL SERVICES SECTOR"

Jennifer Piesse
Manchester Business School, University of Manchester, Manchester M15 6PB, UK

Recent evidence shows that banks and other financial institutions are increasingly employing forecasting methods in their planning, business and market research, and economics departments. This paper attempts to identify both the variables most likely to be the focus of prediction, and the forecasting techniques used, concentrating in the first instance, on the major UK clearing banks. In addition to the frequency of use of forecasting, patterns of communication emerge, illustrating the exchange of information within the bank. Comparisons are then made between the extent of the use of department specific forecasts, forecast information transmitted from other areas of the institution, and external or publically available forecasting models.

"A NEW CONCEPT OF COMBINING FORECASTS"

Bruce Pollack-Johnson
Mathematics Department, Oberlin College, Oberlin, Ohio 44074

The idea of combining forecasts has been shown to compare favorably to individual forecasting methods. These combinations have usually been based on simple averages or more complex weighted averages, and seem to work best when the methods are as different and independent as possible. In this paper, we consider two such complementary methods, regression and the Delphi method, and consider a different way of combining these in such a way that the shortcomings of each method are mitigated by the nature of the other method, resulting in a hybrid method that is more robust and accurate than either method alone.

Session WC14
LIBERTY B

Wednesday
2:00-3:30

APPLICATIONS

Chair: Richard S. Segall
Department of Mathematical Sciences, University of Lowell, Lowell, MA 01854

"FORECASTING FOR EMERGENCY ROOM VISITS"

Rajindar Koshal, Manjulika Koshal, Kahandas Nandola
Department of Economics, Ohio University, Athens, OH 45701
William A. Rau
The Mercy Hospital Corporation, Portsmouth, OH 45662

The efficient management of any hospital or emergency room has to rely in part on the institution's ability to project effective utilization. Without some knowledge of demand for the service of the emergency room, it is almost impossible to achieve an efficient level of resource utilization. Therefore, it is essential to develop some forecasting models for emergency room visits. This study attempts to develop a forecasting model which may be used to monitor demand for the service of the emergency room. Using daily observations this paper develops i) a time-series model and ii) an econometric model. The results of these models are compared to get insight into the forecasting ability of these two types of models.

"A MODEL FOR FORECASTING HOSPITAL BED REQUIREMENTS"

Richard S. Segall
Department of Mathematical Sciences, University of Lowell, Lowell, MA 01854
Edward J. Rising
Department of Industrial Engineering and Operations Research, University of Massachusetts at Amherst, Amherst, MA 01003

This paper describes mathematical models that can be used for forecasting capacity requirements of acute care facilities within a geographical region. There are two basic forms of these models. One is a patient flow model that describes the flow of patients between their homes (origins) and the locations where they receive hospital care (destinations). The other is a patient flow model that provides a systematic method for estimating the "attractiveness" of a hospital compared to its competitors on a service specific basis. Results of fitting the models to data from the State of Massachusetts are presented to illustrate their applicability to forecasting hospital bed requirements.

"FORECASTING THE DEMAND FOR TERTIARY EDUCATION USING ECONOMETRIC AND MARKOVIAN MODELS"

Miles G. Nicholls
Swinburne Institute of Technology, Hawthorn, Victoria, Australia

In this paper a model for the demand for tertiary education in Victoria by qualified students leaving secondary school is developed and estimated. The objective of obtaining short-term forecasts is hampered by projection difficulties associated with one of the main independent variables, the eligibles (i.e., the pool of potential tertiary students). In order to overcome these difficulties an absorbing markov chain incorporating changing transition proportions is derived and applied. This markov model coupled with more conventionally obtained projections of the remaining independent variables, is then used by the demand model to obtain the required forecasts.

Session WC15
LIBERTY E

Wednesday
2:00-3:30

FORECASTING IN ACCOUNTING AND FINANCE

Chair: Jay S. Holmen
Department of Accountancy, University of Wisconsin, Eau Claire, WI 54701

"A COMPARISON OF PREMIER ACCOUNTING FORECASTING MODELS USING SIMULATED QUARTERLY EARNINGS"

Jay S. Holmen
Department of Accountancy, University of Wisconsin, Eau Claire, WI 54701

This study evaluated the predictive ability of three "premier" forecasting models by using simulated earnings. In all situations, the Griffin-Watts [ARIMA (100)X(011)] model performed as well or better than Brown-Rozeff [ARIMA (100)X(010)] or Foster [ARIMA (011)X(011)] models. In five out of six cases, the Griffin-Watts model was significantly more accurate in forecasting, be it a one-quarter or an annual forecast. In the sixth case the Griffin-Watts model was at least as accurate as the Brown-Rozeff model. If there was little variability, there was no difference in the accuracy. If there was a moderate or large variability, the Griffin-Watts model was most accurate.

"THE ROLE, SCOPE AND LIMITATIONS OF CPAS IN FINANCIAL FORECASTING"

James H. Sellers
School of Business Administration, University of Texas at Tyler, Tyler, TX 75701

CPAs are intimately involved with financial forecasts made available to the public. Rules promulgated by the AICPA delineate the levels of assurance, the disclosures and the procedures that the CPA must use in his examination and report on financial forecasts and projections. This report examines "Statement on Standards for Accountants' Services on Prospective Financial Information" and its implications for the CPA, the client and the public in relation to forecasting techniques and the usefulness of those forecasts. The following topics will be covered: 1) the nature and techniques of financial forecasting, 2) the CPAs role in financial forecasting, 3) standards relating to forecasts and projections, and 4) an assessment of the standards and an evaluation of the CPAs role.

"AN ALTERNATIVE APPROACH TO INCORPORATING FIRMS' FINANCIAL CHARACTERISTICS IN THE FORECASTING PROCESS"

John Y. Lee
Department of Accounting, California State University, Los Angeles, CA
J. David Spiceland
School of Accountancy, Memphis State University, Memphis, TN 38152

Quantifiable characteristics of firms are most frequently incorporated in forecast models in the form of financial ratios and/or absolute values. A major problem encountered by a forecaster is the limited number of explanatory variables that a predictive model can incorporate, primarily due to multicollinearity among the variables. The article demonstrates empirically the operational feasibility of using "financial characteristic indexes" to incorporate financial characteristic data in multivariable models as a practical alternative to traditional trial-and-error procedures. Forecasting involving quantifiable firm information can be expedited by eliminating the tedious and intuitively inferior process of searching for the "best" set of uncorrelated predictive variables.

"FORECASTING: A COMPARISON OF THE CAPABILITIES OFFERED BY AUTOMATED ACCOUNTING PACKAGES"

Deborah Pavelka
College of Business Administration, University of Texas at El Paso, El Paso, TX 79968

As part of the process of automating their information system, businesses--small, medium and large--have often invested in accounting software. The forecasting capability of accounting software is often featured in the literature, but seldom demonstrated to the client. Several accounting software packages in current use will be compared in the following areas: 1) Forecasting capabilities, 2) Flexibility in being able to meet unanticipated requests for forecasting. Included in the comparison is a discussion of the forecasting methodology that must be applied by the users of the software and the preparation that is necessary to use the forecasting capabilities to the fullest extent available.

Session WD1
EXETER

Wednesday
4:00-5:30

PROBLEM SOLVING SESSION

Chair: Jeffrey E. Jarrett
Department of Management Science, University of Rhode Island, Kingston, RI 02881

The Problem Solving Sessions bring together practitioners with researchers. These contacts may lead to immediate solutions or to collaboration beyond this period. Participants have an opportunity to present their forecasting problems. The panel of experts will propose solutions. Among the panel members are:

Don Alexander
Citibank, 401 E. 89 Street (Apt. 8E), New York, NY 10028

Larry C. Peppers
School of Commerce, Economics, and Politics, Washington and Lee University, Lexington, VA 24460

Robert Fildes
Manchester Business School, Booth Street West, Manchester MI5 6PB, ENGLAND

Gordon M. Kaufman
Sloan School, Massachusetts Institute of Technology, Cambridge, MA 02139

Arthur Schleifer, Jr.
Harvard Business School, Soldiers Field, Boston, MA 02163

SUBJECTS MAY INCLUDE:

- Inventory Control
- Strategic Planning
- Financial Management
- Investment and Portfolio Management
- Political Events
- Marketing
- Personnel Administration
- Gaining Acceptance of Forecasts
- Assessing Uncertainty
- Computer Techniques

Session WD2
GARDNER

Wednesday
4:00-5:30

SCENARIO ANALYSIS

Chairs: Sathiadev Mahesh
Department of Management, University of New Orleans, New Orleans, LA 70148
Herbert Moskowitz
Krannert Graduate School of Management, Purdue University, West Lafayette, IN 47907

"THE EFFECT OF FEEDBACK ON THE PERFORMANCE OF PROBABILITY FORECASTERS"

P. George Benson, Dilek Yeldan
School of Management, University of Minnesota, Minneapolis, MN 55455

This research focuses on repetitive forecasting tasks where the forecaster is expected (1) to predict which of two possible outcomes will occur and (2) to report a subjective probability summarizing his/her degree of belief in the forecast. At issue is whether certain types of feedback affect the forecaster's performance. Past research has concentrated primarily on the effects of feedback on calibration. The current experiment investigates the effects of different types of feedback on several performance characteristics including calibration, resolution, and Yates' bias, slope, and forecast-outcome covariance measures.

"FORECASTING RARE EVENTS USING SCENARIOS"

Daniel G. Brooks
DIS Department, Arizona State University, Tempe, AZ 85687

An application of scenario structuring is presented which illustrates the assessment of probabilities of complex rare events. This approach allows for a combination of assessed and objective distributions from disparate sources, and sensitivity analysis indicates if more precise assessments are useful.

"THE EFFECT OF UNFORESEEN EVENTS IN DECISION MAKING"

Sathiadev Mahesh
Department of Management, University of New Orleans, New Orleans, LA 70148
Herbert Moskowitz
Krannert Graduate School of Management, Purdue University, West Lafayette, IN 47907

Unforeseen events occurring in the forecast period can render a forecast useless. Conventional approaches to decision trees cannot account for the effects of these events. A procedure is proposed to evaluate the immunity, or lack of susceptibility, of a decision tree to such unforeseen events. This procedure uses some elementary assumptions about the effects of such events and their probabilities. A surprise index, which provides a measure of the need for considering such events in determining the optimal decision, is described.

"DEVELOPMENT OF SCENARIOS FOR CAPACITY AND FINANCIAL PLANNING: A CASE STUDY"

Samuel C. Martin
Middle South Services, New Orleans, LA 70112

This paper deals with the development of scenarios for capacity and financial planning at a large utility holding company. Macro-economic inputs are provided by consultants and augmented with local data provided by many groups within the organization. Scenarios are subsequently developed for financial conditions and production/sales requirements.

IMPLEMENTATION OF FUTURES FORECASTING II

Chair: Harvey Nussbaum
Department of Management & Organization Sciences, Wayne State University, Detroit, MI

"BREAKTHROUGHS: HOW MANAGERS AND MAVERICKS CREATE COMMERCIAL MIRACLES"

John M. Ketteringham
Arthur D. Little, Inc., Cambridge, MA

Futures forecasting can be a useful adjunct to strategic planning for organizations concerned with remaining innovative in their fields. For example, when applied to a methodology we have pioneered at Arthur D. Little, Inc., which we call the Strategic Management of Technology, futures forecasting may suggest possible new markets for existing technologies, as well as new (or modified) technologies for existing markets. Futures forecasting is likely to be less helpful, however, in the case of the special kind of innovation we call a breakthrough, in which new technology creates a whole new market and dramatically affects the way people, society, or an industry behave. In a recent international study of 12 significant breakthroughs, we observed that breakthroughs are characterized by a startling lack of vision. Breakthrough developers failed to recognize either the magnitude or in many cases the very nature of their success -- that is, the new paradigm, the way in which the breakthrough was ultimately commercialized. Breakthroughs arise from an initial act of bisociation and are pursued to fruition by individuals and teams motivated by intense personal involvement with an intellectual problem, rather than by organizational or market incentives. Nonetheless, certain actions and attitudes on the part of managment may prove catalytic to new breakthroughs and conducive to breakthroughs-in-progress.

"IMPLEMENTATION OF FUTURES RESEARCH: THE EXPERIENCE OF THE FUTURES GROUP"

John Stover
The Futures Group, Glastonbury, CT

"A FUNNY THING HAPPENED TO ME ON THE WAY TO THE FUTURE: COMMENTS ON THE IMPLEMENTATION OF FUTURES FORECASTING"

Harvey Nussbaum
Wayne State University, Detroit, MI

The implementation of futures forecasting by various public organizations has been reported in the literature of the field for about two decades. Studies by TRW, Rand Corporation, General Electric, Bell of Canada and various government organizations have reached the pages of journals such as Technological Forecasting and Social Change, Business Horizons and various publications of the World Future Society. Often these studies report the use of Delphi or trend extrapolations as the major methodology employed. Reports usually refer to some type of implementation program employed by the organization. It is the writer's experience that much of the field of futures forecasting has been replete with research which did not reach the stage of implementation. Furthermore, much of the implementation has been less than successful. This paper will report on a case of an organization which failed to implement a futures forecast and an ex post facto consideration of the case revealed that had the organization implemented the finding of the research their ultimate survival would at least have been assured, rather than the ultimate demise of the organization. Examples of similar situations will also be covered.

Session WD4
CLARENDON

Wednesday
4:00-5:30

PROBABILITY MODELS AND EXPERT JUDGMENT

Chair: Max Henrion
Department of Engineering and Public Policy, Carnegie-Mellon University, Pittsburgh, PA 15213

"EXTERNAL CALIBRATION OF JUDGMENTAL CONFIDENCE INTERVALS"

Wilpen L. Gorr
School of Urban and Public Affairs, Carnegie-Mellon University, Pittsburgh, PA 15213

Judgmental confidence intervals are optimistically narrow. Experiments with almanac questions generally result in 40% or more surprises for 98% confidence intervals. Researchers have stressed internal calibration as a remedy, e.g., having judges think of scenarios leading to extreme values of the uncertain quantity, etc. None of these approaches has worked thus far. This paper reports on research for external calibration, i.e., adjustment factors that are applied to judges' confidence intervals to spread them out appropriately. Two results of the research are 1) 98% confidence intervals require an order of magnitude and adjustment while 50% intervals require only a 25% adjustment and 2) judges cannot spread their intervals out far enough when using the factors themselves, the adjustment must be done by a second party.

"PROBABILISTIC ASSESSMENT BY EXPERTS VS. NONEXPERTS"

Theresa M. Mullin
Decision Science Consortium, 7700 Leesburg Pike, Falls Church, VA 22043

In proposing designs for aids to probabilistic assessment and inference, often for use by rather experienced problem-solvers, it is common to cite shortcomings in human judgment under uncertainty found in experimental studies typically involving nonexpert assessments. The implications of these laboratory studies for the quality of real expert judgments has not been clear, however. To investigate whether there are any appreciable differences between experts and nonexperts, think-aloud probabilistic estimation protocols for these two types of assessors were compared. The results indicate that there may be significant differences in the approaches to probabilistic estimation used by experts versus nonexperts, including systematic differences in attitude, problem-solving approach, the use of anchoring and adjustment,and responses to debiasing.

"ARGUMENT STRUCTURING, EVIDENTIAL SUBTLETIES, AND THE BURDEN OF ELICITATION"

Dave Schum
Department of Operations Research, George Mason University, Fairfax, VA 22030

Drawing defensible conclusions from masses of evidence often requires more than one form of argument-structuring. Temporal structuring involves establishing the believed order in which reported events may have occurred; such structuring facilitates explanation. Relational structuring involves establishing chains of reasoning from observable evidence to major hypotheses/possibilities and relationships among elements of different reasoning chains; such structuring facilitates expression and exploitation of a number of their relationships, and what they have to tell us about the burden of eliciting judgments of uncertainty.

"A COMPARISON OF PROBABILISTIC AND RULE-BASED EXPERT SYSTEMS APPROACHES TO ENCODING UNCERTAIN KNOWLEDGE"

Max Henrion
Department of Engineering and Public Policy, Carnegie-Mellon University, Pittsburgh, PA 15213

Both decision analysis and rule-based expert systems provide tools and representations for "knowledge engineering", that is structuring and encoding uncertain expert knowledge into a form suitable for inference by automated procedures. Decision analysis is based on normative theory intended to improve intuitive decision making, whereas the expert systems approach is intended primarily to emulate human expertise. We report an initial experiment where both approaches were applied to the same problem of diagnosis and treatment. This illustrates many key differences in philosophy, methodology, goals, and the kinds of results obtainable.

THE DIFFUSION OF INNOVATION IN COMPETITIVE AND UNCERTAIN ENVIRONMENTS

Chair: Hubert Gatignon
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

"A DIFFUSION MODEL FOR FORECASTING SALES OF A NEW INDUSTRIAL PRODUCT AND PLANNING THE COMMUNICATION MIX"

Rabikar Chatterjee, Srinath Gopalakrishna
Krannert School of Management, Purdue University, West Lafayette, IN 47907

A diffusion model is developed for a new industrial product, incorporating the following considerations: (a) adoption by industrial firms is a multistage process; (b) potential buyers are influenced by personal selling, advertising and word-of-mouth; (c) the relative effectiveness of these sources of influence varies over different stages in the buying process; and (d) firms are heterogeneous (in terms of the degree of risk aversion, perceived relative advantage of the new product and other factors). A decision calculus approach is proposed for model calibration. The model may be employed for (1) planning the communications mix over time, in terms of expenditures on advertising and personal selling, and (2) forecasting the sales pattern over the planning horizon.

"THE EFFECTS OF COMPETITION ON THE DIFFUSION OF INNOVATIONS"

Philip M. Parker
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

This presentation will focus on an empirical evaluation of hypotheses concerning the dynamic effects of competition in a growing product category. The analysis, conducted at the brand level, investigates the changes in price and advertising elasticities associated with a number of similar brands entering into a new and growing product category. The econometric model is based on the Bass model and incorporates variables to measure relative changes across brands.

"THE ROLE OF UNCERTAINTY IN THE ADOPTION OF NEW TECHNOLOGIES IN A COMPETITIVE ENVIRONMENT: AN EXPERIMENT"

Hubert Gatignon, Thomas S. Roberton
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

The adoption and the diffusion of new technologies as for any innovation is typically analyzed within the diffusion theory research paradigm. The decision process itself, however, has not been central in the diffusion literature. This study investigates the role of the uncertainty about the value of an innovation and managers' attitude toward risk in the decision to adopt an innovation by an organization. The focus of interest of this study concerns the impact of the competitive environment on the adoption decision as the nature of competition is hypothesized to impact managers' uncertainty about the value of the innovation and their attitude towards risk. A computerized experiment is designed whereby managers from multiple firms are asked to make an adoption decision given that they are facing a given competitive environment.

MEDICAL FORECASTING TRACK

Chair: Jay Christensen-Szalanski
Department of Management Sciences, University of Iowa, Iowa City, IA 52242

"CONFIDENCE PROFILES: A BAYESIAN METHOD FOR SYNTHESIZING RESEARCH RESULTS WITH APPLICATIONS TO HEALTH TECHNOLOGY ASSESSMENT"

David M. Eddy
J. Alexander McMahon Professor of Health Policy and Management, Director, Center for Health Policy Research and Education, Duke University, Durham, NC 27706

One of the most difficult tasks in assessing the effect of a new program such as a health technology is to interpret and integrate the existing research. The available information typically comes from different sources, involving studies with different designs, with each individual study being subject to biases that confuse their interpretation. Examples of biases are errors in measuring the outcome, patient selection biases, differences in the programs being evaluated or the circumstances in which the program is being applied, and different lengths of follow-up. Somehow, decision makers must integrate this information to predict the expected effect of the program on important outcomes. Confidence Profiles is a methodology based on Bayesian statistics for integrating individual pieces of evidence, adjusting individual pieces of evidence for a variety of biases such as those just listed, and combining the evidence to derive a probability density function for the effect of the intervention on important outcomes. The first part of this workshop will describe the problem and introduce the concepts and mathematics of the Confidence Profile Method. The second part will demonstrate a computer program that implements the Method. The third part will illustrate the use of the Method to assess the long-term effects of a particular health technology used to treat acute heart attacks.

Session WD7
BEACON A

Wednesday
4:00-5:30

WHAT SOFTWARE DEVELOPERS SHOULD KNOW ABOUT BUSINESS FORECASTING

Chair: Thomas R. Willemain
School of Management, Rensselaer Polytechnic Institute, Troy, NY 12180-3590

Panelists:

John Black
Wendy's International

Linda Calvert
American Management Systems

Edward Greco
Southern Pacific Pipelines

Mukit Hossain
GTE of the South

Walter Schaefer
New Jersey Bell

EACH PANELIST WILL BE ASKED TO RESPOND TO THESE QUESTIONS:

(1) What are the most difficult methodological problems facing practitioners of business forecasting?

(2) What are the most difficult organizational problems?

(3) What should software developers do next to help the practicing business forecaster?

(4) Can you offer an anecdote that typifies the type of problem faced by forecasting practitioners?

Session WD8
BEACON B

Wednesday
4:00-5:30

MULTICRITERIA DECISION MODELS AS A FRAMEWORK FOR FORECASTING

Chair: Nick Bahmani
School of Business Administration, Montclair State College, Upper Montclair, NJ 07043

"ANALYTICAL HIERARCHY PROCESS AS A SALES FORECASTING METHOD"

Michael S. Zawadzki
Levolor Lorentzen, Inc., One Upper Pond Road, Parsippany, NJ 07054

This paper documents the use of the Analytical Hierarchy Process (AHP) as a Sales Forecasting Method in a medium size manufacturing company (approximate Sales volume is $300 million). Using a three-level hierarchy, the process is used to guide Sales and Marketing Executives to predict percentage changes in product sales. Three criteria that are encompassed into the model are: Price, Competing Products, General Economy, Consumer Spending/ Discretionary Income Levels, Stage of Product in Life Cycle and Past Performance. Results are compared to similar forecasts using a Judgemental model, a Naive model, and the actual sales levels experienced.

"MODELS RANKING AND FORECASTS COMBINATION: A HIERARCHICAL APPROACH"

Q.P. Duong
Bell Canada and the University of Western Ontario, London, Ontario, CANADA

The current debate on the relative merits of Model Selection versus Synthesis in forecasting is reviewed within a Bayesian framework. By modelling the forecasting process as a hierarchical procedure in strategic planning and decision-making, it is argued that the "real" question in practice is not whether one or the other of the two approaches is adopted, but whether some degree of consistency has been achieved. The Analytic Hierarchy Process (AHP) method is then suggested as a practical way of implementing the forecasting process in a business environment. Examples are discussed to illustrate the method in forecasting Telecommunication demands.

Session WD9
BEACON C

Wednesday
4:00-5:30

ECONOMIC FORECASTING

Chair: John E. Triantis
A T & T Communications, 412 Mt. Kemble Ave., Morristown, NJ 07960

"FORECASTING WITH A WEEKLY MODEL OF THE U.S. ECONOMY"

Evangelos O. Simos
University of New Hampshire, Durham, NH 03824
John E. Triantis, Demirhan Yenigun
AT&T Communications, 412 Mt. Kemble Ave., Morristown, NJ 07960

In this paper we use weekly macro variable statistics to construct a weekly vector autoregressive (VAR) model of the U.S. economy. Variance decomposition is performed to measure the forecast variance of each variable due to effects caused by every other variable in the model and ex post forecasts are generated to measure the accuracy of the model's predictions. Furthermore, the impulse response functions, which trace out the responses of the model variables to a particular set of one-time shocks, are plotted to show the response of each variable to a shock in each of the other variables.

"A SIMPLE MONETARY DISEQUILIBRIUM MODEL FOR FORECASTING REAL G.N.P. GROWTH"

Dwayne Wrightsman
Whittemore School of Business and Economics, University of New Hampshire, Durham, NH 03824

This paper builds and tests a simple monetary disequilibrium model for forecasting real GNP growth. The model is derived from Irving Fisher's theory that changes in the money supply cause changes in real output during transition periods between equilibrium positions. It is also based on Milton's Friedman's proposition that the effects of monetary change on the real GNP operate with a lag of about a year. This lag renders the model useful for forecasting purposes. Tests of the model are encouraging. The standard errors of the regressions and the out-of-sample errors of the forecasts are remarkably low given the simplicity of the model.

"UNIVARIATE ARIMA FORECASTS OF DEFINED VARIABLES: THE CASE OF REAL INTEREST RATES FOR THE U.S., 1959-1986"

Johnathan D. Jones
Department of Economics and Business, Catholic University of America, Washington, DC 20064

This paper provides additional evidence on whether indirect or direct ARIMA forecasts of defined variables are better. Six monthly real interest rates on U.S. securities of varying maturity over the period 1959 to 1986 are used in the analysis. Univariate ARIMA models are identified and estimated for three-month and six-month Treasury bill rates and the rates on one-year, five-year, ten-year, and twenty-year government bonds for the period January 1959 to December 1982. Out-of-sample updated one-step-ahead forecasts are then made from January 1983 to December 1986 in order to compare the accuracy of the indirect and direct forecasts using mean absolute error and mean squared error criteria.

EXCHANGE RATE FORECASTING

Chair: Stephen Parker
Congressional Budget Office, U.S. Congress, Washington, D.C. 20515

"MULTIVARIATE GARCH PROCESSES AND MODELS OF THE VARYING RISK PREMIA IN FOREIGN EXCHANGE MARKETS"

Richard Baillie
Michigan State Univ., East Lansing, MI
Tim Bollerslev
Northwestern Univ., Evanston, IL

This paper considers the time series properties of various daily spot exchange rates versus the U.S. dollar for the period January 1980 to December 1985. While all the series are difference stationary with a strong unit root component, there is evidence of heteroskedasticity in their innovations. The application of univariate GARCH (generalized autoregressive conditional heteroskedasticity) models reveals some interesting regularities between the series. In particular, higher variances occur following holidays, there is a near unit root in the estimated GARCH models and there is some evidence of a positive relationship between variances and absolute interest rate differentials.

"USING DIFFERENT MEASURES OF THE EFFECTIVE EXCHANGE RATE TO FORECAST THE U.S. TRADE BALANCE: DOES IT MATTER?"

Stephen Parker
Congressional Budget Office, U.S. Congress, Washington, D.C. 20515
Helena Tang
Stanford University, Stanford, CA 94305

A number of new U.S. dollar effective exchange rates (EERs) have been developed to account for the dramatic disparity in the movement of the dollar relative to different foreign currencies over the last several years. The magnitude of the recent U.S. dollar depreciation varies, depending on which EER is used, from over 30 percent to almost zero. But, forecasts of the U.S. trade balance using a wide range of EERs generate remarkably similar results, suggesting that, at least over these time periods, trade forecasts do not appear to be sensitive to different measures of the EER.

"A MODEL TO FORECAST INFLATION TREND BASED ON CAPACITY UTILIZATION AND THE VALUE OF THE U.S. DOLLAR"

Hanuman D. Agrawal
Fairfield University, Fairfield, CT 06430

The model of inflation presented in this paper incorporates the impact of changes in the value of the U.S. dollar on the trend of inflation in the United States. This is based on the hypothesis that, in the current flexible exchange rate environment, changes in exchange rates are likely to affect domestic producers' pricing policies more directly than assumed by earlier studies. The statistical properties of the estimated equation are quite satisfactory, and the model accurately explains the historical trend of inflation. The paper will present inflation forecasts generated by the model for 1987-1988, and relate the results with current events.

Session WD12 Wednesday
BEACON H 4:00-5:30

EXPONENTIAL SMOOTHING

Chair: Steven P. Schnaars
Baruch College, 17 Lexington Ave., New York, NY 10010

"EXPONENTIAL SMOOTHING MODEL SELECTION: A STUDY OF RESPONSES TO A STEP FUNCTION"

Don M. Miller, I. Jeffrey Turshen
School of Business, Virginia Commonwealth University, Richmond, VA 23284

The performances of exponential smoothing models have often been studied via simulation, with apparently conflicting results. This simulation study identifies and resolves the major conflicts. The performances of twenty-four exponential smoothing models are compared over a wide range of conditions for a step function (the traditional test pattern). Adaptive-parameter models, especially the Whybark model, performed relatively well in comparisons to fixed-parameter models. The 24 models were also compared empirically, using the 1001 time series of the Makridakis, et.al. study. Points of agreement and discrepancies with the simulation results are discussed.

"A COMPARISON OF STARTING VALUES FOR SIMPLE EXPONENTIAL SMOOTHING"

Sylvia D. Clark
The College of Staten Island, 715 Ocean Ter., Staten Island, NY 10301
Susan J. Cremins
Iona College, 715 North Ave., New Rochelle, NY 10801
Steven P. Schnaars
Baruch College, 17 Lexington Ave., New York, NY 10010

Forecasting with exponential smoothing requires an initial value to get the process started. This study compares three possible starting values suggested in the literature: (1) a naive forecast -- using the first observation in the series, (2) the mean of the series, and (3) backcasting -- using exponential smoothing to predict the first observation in the series. Comparisons are made over thirty forecasts generated from thirty data series. The results indicate that, in most cases, the selection of a starting value is not an important issue. Although backcasting tended to provide the most accurate forecasts, all three starting values produced forecasts of comparable accuracy.

"STATISTICAL CHARACTERS OF ADAPTIVE EXPONENTIAL SMOOTHING"

Jochen Schwarze, Xianchun Ding
Abteilung Statistik und Operations Research, Technische Unversitat Braunschweig, Postfach 3329, D-3300 Braunschewig, Fed. Rep. of Germany

This paper researches the dynamics of the forecasting errors and its tracking signals in exponential smoothing forecasting method, especially in the situation when the forecasting system has a change. For some important statistical characters of the errors and each of the researched tracking signals some difference equations are developed. These equations show how the smoothing parameters effect the dynamics of them. And with the help of these equations we can not only have good understanding about the tracking signals, confirming some results that have been gotten in practice and through simulation, but also make comparisons among the researched tracking signals.

Session WD13 Wednesday
LIBERTY A 4:00-5:30

FORECASTING FOR MANUFACTURING AND DISTRIBUTION PLANNING

Chair: Timothy A. Davidson
Temple, Barker & Sloane, Inc., 33 Hayden Ave., Lexington, MA, 02173

Companies in the U.S. today have found that computer based planning systems (e.g., MRP, DRP, etc.) routinely require input of sales forecasts at the product code level of detail each week or month. Some companies interested in improving service levels, minimizing finished goods inventories and in instituting JIT networks have overlooked this essential requirement. This session will discuss how two firms have introduced statistical forecasting models into their normal production requirements planning or replenishment order systems. The database structure and the expert forecast modeling procedures will be discussed along with the network and hardware implications, staff selection/training and payback.

Speakers:

R. Christian Johnston
Varian Vacuum Products, 121 Harwell Avenue, Lexington, MA, 02173

Steven M. Rogers
Abbott Laboratories, D-6HD, AP6A 2nd, Abbott Park, IL 60064

MODIFICATIONS TO THE ISF 87 PROGRAM

Page	Correction(s)
16	**Paul A. Samuelson's KEYNOTE SPEECH** is scheduled for 12:45-1:45 p.m.
38	**Session WB12 - SEASONAL MODELS** (enclosed) Xinhong and Qiaoliang's paper has been replaced by Cosgrove's paper.
52	**Session WC11 - EXCHANGE RATE FORECASTING** (enclosed) Cullity, Klein and Moore's paper has been added
96	**Session TC10 - FORECASTING SYSTEMS** This session has been CANCELLED. Maier's paper has been moved to Session TD14 - APPLICATIONS (enclosed). Black's paper has been moved to Session FB14 - LEGAL ASPECTS (enclosed).
101	**Session TC15 - EXPERT SYSTEMS, ARTIFICIAL INTELLIGENCE, AND FORECASTING** John J. Chen should be John J. Cheh.
116	**Session TD14 - APPLICATIONS** (enclosed) Guimaraes' paper has been replaced with Maier's paper. Dr. Lyndon Simkin was a co-author on Maier's paper.
117	**Session TD15 - TELECOMMUNICATIONS FORECASTING** McGowan's paper has been withdrawn.
131	**Session FB14 - LEGAL ASPECTS** (enclosed) The session has been retitled **APPLICATIONS.** Newick's paper has been replaced with Black's paper.
BINDING	We are aware that **Massachusetts** has been misspelled and wish to apologize to all those who may feel offended. We offer our condolences to future ISF Program Chairpersons and recommend that future symposiums be held in Utah or Ohio for sake of simplicity.

Session WB12 Wednesday
BEACON H 10:00-11:30

SEASONAL MODELS

Chair: Stanley R. Schultz
College of Business Administration, Cleveland State University, Cleveland, OH 44115

"THE CHATFIELD - PROTHERO CASE STUDY REVISITED: OBJECTIVE ORDER DETERMINATION CRITERIA AND SEASONAL TIME SERIES"

Nader Nazmi
Department of Economics and Business, Lake Forest College, Lake Forest, IL 60045

The 'Sales of Company X' as studied by Chatfield and Prothero (1973) generated a fair amount of discussion on Box-Jenkins seasonal modelling. In recent years, objective order determination criteria such as AIC, BIC, Hannan-Quinn, Hannan-Rissanen and Hannan-Kavalieris have become increasingly popular in the identification stage of the process of model selection. However, the evidence on their performance for seasonal modelling is, as far as I know, virtually nonexistent. This paper attempts to compare the forecasting performance of various automatic order determination criteria when seasonal time series such as the 'Sales of Company X' of Chatfield-Prothero (1973) or Series G of Box-Jenkins (1976) are involved.

"THE RELATIONSHIP BETWEEN SERIES LENGTH AND FORECAST ACCURACY"

Jerome R. Cosgrove
Baruch College, City University of New York, 17 Lexington Avenue, New York, NY 10010

Nine monthly data series of various retail sales were used to examine the effect of different series lengths on forecast accuracy. The study used seven forecasting techniques and looked at six separate years of data. The length of the data series was systematically varied from 48 months down to six months. Results showed that more data was not more effective than less data in predicting sales. Mape was the standard of measure.

"UNSTABLE SEASONALITY"

Stanley R. Schultz
College of Business Administration, Cleveland State University, Cleveland, Ohio 44115
Robert E. Mazurak
Pickands Mather & Co., 1100 Superior Avenue, Cleveland, Ohio 44114

Seasonality may change suddenly, or it may change gradually. If it changes suddenly, the usual advice is to use only the later data (after the change). But the amount of remaining data may be unsatisfactory for modeling. If seasonality changes gradually throughout the series, the question is whether any well-known method will give adequate results for forecasting purposes. In this paper, problems of such changing seasonality are explored, with reference to the following methods in particular: decomposition; Winters; dummy variables; and univariate Box-Jenkins. Practical implications are suggested.

Session WC11
BEACON G

Wednesday
2:00-3:30

EXCHANGE RATE FORECASTING

Chair: Stephan S. Thurman
International Affairs Unit, Congressional Budget Office, U.S. Congress, Washington, D.C. 20515

"THE OUT-OF-SAMPLE FORECASTING PERFORMANCE OF EXCHANGE RATE MODELS WHEN COEFFICIENTS ARE ALLOWED TO CHANGE"

Gary J. Schinasi, P.A.V.B. Swamy
Board of Governors of the Federal Reserve System, Washington, D.C. 20551

This study examines the out-of-sample forecasting performance of models of exchange rate determination without imposing the restriction that coefficients are fixed over time. Both fixed and variable coefficient versions of conventional structural models are considered, with and without a lagged dependent variable. While our results on fixed coefficient models support most of the Meese and Rogoff conclusions, we find that when coefficients ar allowed to change, an important subset of conventional models of the dollar-pound, the dollar-deutsche mark, and the dollar-yen exchange rates can outperform forecasts of a random walk model.

"MONETARY/ASSET MODELS OF EXCHANGE RATE DETERMINATION IN THE 1980'S - A PERIOD OF GRADUAL CHANGE OR A JUMP PROCESS"

Don Alexander
Citicorp Investment Bank, New York, NY
Richard T. Baillie
Department of Economics, Michigan State University, East Lansing MI
Lee R. Thomas, III
Goldman, Sachs & Co., New York, NY

The purpose of this study is to evaluate the performance of stochastic coefficient models of exchange rate determination during the 1980's. The study is based on methodology developed by Meese and Rogoff (1983, 1985) and Alexander and Thomas (1987). The first part of the study uses a Kalman filter to see if changes in the coefficients can be broken down into a predictible and unpredictible component. A second part of the study looks at changes in the coefficients to see if the change is a gradual process or follows a jump process.

"FORECASTING U.S. TRADE FLOWS WITH EXCHANGE RATES AND LEADING INDICATORS"

John P. Cullity
Department of Economics, Rutgers University, Newark, NJ
Philip A. Klein
Department of Economics, Pennsylvania State University, University Park, PA
Geoffrey H. Moore
Graduate School of Business, Columbia University, New York, NY

APPLICATIONS

Chair: Jukka Lassila
The Research Institute of the Finnish Economy, Lonnrotink 4-B, SF00120 Helsinki, Finland

"SHORT-TERM FORECASTING OF BUILDING CONSTRUCTION"

Pekka Ilmakunnas, Jukka Lassila
The Research Institute of the Finnish Economy, Lonnrotink 4B, SF00120 Helsinki, Finland

The model presented here is used in regular business cycle forecasting at the Research Institute of the Finnish Economy. Buildings are classified by intended use into 10 categories. The model consists of two blocks. In Block I, quarterly forecasts for the amount of started building works are made, using ARIMA- models and investment functions. In Block II the volume of building construction is forecast, using building starts as input. Comparisons are made with ARIMA-forecasts of volume. It is also tested whether the division of building process into these two blocks is justified. The issue of forecast aggregation is also addressed.

"PRIORITIZING STOCK PHASING TO MATCH MARKETING FORECASTS"

Jens Maier, Lyndon Simkin
School of Industrial & Business Studies, University of Warwick, Coventry CV4 7AL, UK

This paper describes the development of a stock planning system for multiple retailers and considers its relationship with marketing strategy. Products are clustered into groups with similar selling and stockholding characteristics. Those groups of most importance to companies' financial success are highlighted, enabling managerial resources to be allocated appropriately. The planning model applies the principle of ordering just in time. Major savings are achieved in stockholding costs by reducing premature and excessive stock intakes, and effectively estimating safety margins.

"FUTURE INVESTMENT PATTERN OF INDIAN HOUSEHOLDS: A MARKET RESEARCH"

Biswa N. Bhattacharyay
National Institute For Training In Industrial Engineering, Bombay, 400 087, INDIA

Of late, the rate of growth of deposits in Indian Commercial banks has not matched the growth rate of domestic savings rate. If this trend continues, banks will find it difficult to meet the credit obligation fully and this in turn may affect the economic development of the country. This paper attempts to project the pattern of households' investment into physical and financial assets along with the reasons behind these investments which would enable banks to formulate marketing strategies for deposit mobilization. The analysis is based on an anticipatory market survey of 40,000 urban households.

"A COMPARISON OF BOX-JENKINS TIME FORECASTS TO PRELIMINARY MILK PRICE ESTIMATES"

Ben Klugh, Jr., John Markham
U.S. Dept. of Agriculture, NASS, 14th and Independence Ave., S.W. Room 4801, Washington, D.C.

Forecasts for 1979 through 1983 from Box-Jenkins time series models outperformed the preliminary milk price estimation procedure in five States and was competitive at the national level. One-month-ahead forecasts for the 60-month period possessed average absolute forecast errors of less than 1 percent. The model forecasts were closer to the final estimate or the same as the preliminary estimate 650 times out of 900 State forecasts. This modeling technique could be used to replace or supplement the current preliminary milk price estimation procedure.

APPLICATIONS

Chair: J.T. Black
213 Dunsten Hall, Auburn University, Auburn, Alabama 36849

"THE IMPENDING DEMISE OF FORECASTING FOR INVENTORY CONTROL"

J.T. Black
213 Dunsten Hall, Auburn University, Auburn, Alabama 36849

The demise of forecasting for inventory control is a natural result of eliminating the existing manufacturing system, the job shop, replacing it with an Integrated Manufacturing Production System. An IMPS is capable of producing large volumes of parts in small lots. Setup times are eliminated and inventory is greatly reduced. Inventory control is integrated directly into the manufacturing system (route sheets and short range forecasts are eliminated) using a pull system of inventory control which allows the people on the plant floor to control the level of the work in progress. IMPSs react quickly to changes in demand which in turn allows for shorter long range forecasts and therefore increases the accuracy of the forecasting.

"DATA LIMITATIONS AND THEIR IMPACT ON FORECASTING THE EFFECTS OF COMPARABLE WORTH"

Pearl I. Steinbuch
St. John's University, Jamaica, NY 11439

This paper analyzes the Johnson and Solon (1986) forecast of the effects of comparable worth in light of the deficiencies of the currently available data sources. Comparable worth, as currently proposed, is not suggested as a remedy for differences in occupational pay between firms, but instead seeks to eradicate wage differentials between comparable occupations within an individual firm. Therefore, the forecasts of the effects of comparable worth are discussed with respect to the policy's aim and intended coverage. Further, guidelines for future data collection are recommended.

Session WD14
LIBERTY B

Wednesday
4:00-5:30

STRATEGIC PLANNING

Chair: Shaimshon Kinory
Department of Business Administration, Jersey City State College, Jersey City, NJ 07305

"THE PLACE, ROLE, AND RELIABILITY OF PROGNOSES IN STRATEGIC PLANNING"

Gidai Erzsèbet
Institute of Social Science, 1096 Budapest, IX Haman K.U. 70, Hungary

The lecture analyzes the relation between the prognoses and plans, the methods of alternative ways and means and their manifestations in the practice of long-term strategic planning. It deals with the possibility of creating and harmonizing and consistent systems with short and long-term objectives, identifying aims and reality, and makes conclusions concerning perspectives and reliability of planning. The author is considering reliability as a complex, dynamic notion which expresses knowledge of the present and of the future (judging it from the point of view of quantity and quality) and indicates how prognoses could be the basis of decisions.

"A STRATEGIC MODEL OF FORECASTING WITH APPLICATIONS IN THE MILITARY"

Toby J. Kash
Gladys A. Kelce School of Business and Economics, Pittsburg State University, Pittsburg, KS 66762

Forecasting military budgets has undergone revolutionary changes from traditional budget preparation to simple program budgeting, to PPBS, to project based forecasts with adjustments for inflation. Strategic management subjects strategy to mission, goals, and objectives. Therefore, environmental scanning and analysis links the company goals and resource requirements by formulating strategies. By demonstrating a strategic model of forecasting, we will examine the process of military budget forecasting to establish that the military makes little use of strategic analysis and bases its forecasts on project budgeting and inflationary trends. We will recommend a conceptual model to link their strategic analysis to budget forecasting.

"DECISION MAKING - PLANNING - FORECASTING"

Lajos Besenyei
Karl Marx University of Economic Sciences, 1093 Budapest, IX, Dimitrov Ter. 8, Hungary

The examination of the connection of decision making with planning and forecasting is an important task from both theoretical and methodological points of view. Let us consider the following steps: (a) situation-analysis, diagnostics (i.e., WHAT IS NOW?), (b) forecasting, prognosis (i.e., WHAT IS TO BE EXPECTED?), (c) objectives of company (i.e., WHAT DO WE LIKE TO DO?), (d) decision, plan (i.e., WHAT DO WE HAVE TO DO?). Expected future conditions of company economic processes involve two important questions: (a) distinction between company economic processes that can be planned or can not be planned, (b) investigation of the identity and difference of the scientific disciplines of planning and forecasting.

Session WD15
LIBERTY E

Wednesday
4:00-5:30

APPLICATIONS

Chair: Rufus Dawe
Economic Advisor, Westpac Banking Corporation, Wellington, New Zealand

"POLITICAL ECONOMICS - FORECASTING THE RANDOM WALK"
Rufus Dawe
Economic Adviser, Westpac Banking Corporation, Wellington, New Zealand

Recent evidence suggests that there is a recognizable world economic philosophy which dictates political action irrespective of the nominal philosophy of national governments. Such action tends to swing slowly between laissez faire and interventionism in response to major economic shocks such as the Great Depression of the 1930s or the Oil Crisis of the 1970s. This suggests that it is possible to forecast the long-term direction of economic policy in Western democracies where governments of apparently contradictory philosophy can alternate in office.

"A GENERAL APPROACH FOR MODELLING SHIFTS IN INTERNATIONAL INTRA-INDUSTRY COMPETITIVENESS"
I. Menzler-Hokkanen
Forskningsinstitutet vid, Svenska Handelshogskolan, Arkadiagatan 22, 00100 Helsinki 10, FINLAND

A residual procedure was used to obtain estimates of shifts in international competitive advantage. Intra-industry trade and comparative advantage indices, which are measures of the degree to which a firm has been able to achieve international competitiveness, are treated as dependent variables. As explanatory variables firm specific factors, as well as domestic and foreign policy variables, on which the market success (or failure) of a particular product actually depends, were included. The model has been preliminarily tested on Finnish data (1964-1984) for metal products and textiles. The introduced methodological frame seems to offer a workable tool for testing for forces which determine international industrial competitive dynamics.

"FORECASTS OF OPTIMAL SOCIAL-ECONOMIC INDICATORS"
Hsih-chia Hsieh
75 Chang-shing St., Chung-Hua Institute for Economic Research, Taipei, Taiwan

A new method provided here is to derive a nonlinear optimal feedback function of the high-order derivatives when the objective function is unknown and assumed to be unsmoothly convex. An example of estimating and forecasting the optimal macroeconomic policy is provided. The control variable will stabilize itself only when it has stabilized the state variable during the forecasting period.

Session TB1
EXETER

Thursday
10:00-11:30

ENERGY APPLICATIONS

Chair: Jay Patel
Kennedy School of Government, Harvard University, 79 Kennedy Street, Cambridge, MA 02138

"IMPACT OF THE TAX REFORM ACT OF 1986 ON FUTURE OIL AND GAS DRILLING ACTIVITY: A MODEL OF RIG COUNT"

James L. Williams
Texas Business Forecasts, P.O. Box 6008, Midland, TX 79711
Patricia Elliott Williams
University of Texas Permian Basin, Odessa, TX 79762

A model of oil and gas exploration activity as measured by the number of rotary rigs running, the most commonly reported measure of exploration activity, is developed using monthly data for the 1973 to 1986 time period. An examination of the historical impact of various tax policies including personal tax rates, investment tax credit and the Windfall Profits Tax is used to estimate the impact of the Tax Reform Act on oil and gas drilling activity, a proxy for investment, under various scenarios for crude oil prices.

"APPLICATION OF LOAD FORECASTING AND COMPUTER FUZZY SIMULATION TO THE EAST CHINA POWER SYSTEM"

Dehang Chen
Department of Management, Wuhan University, China

The stepwise regression is used to forecast the power demand of East China. With the regression analysis of the seven factors influencing the power demand,the forecasting models are established. The fuzzy set theory is used for simulation of the typical daily load pattern of the East China Power System. The composite system is considered as a composition of all load components. The composite system load are treated as the fuzzy set of type II. The load components contribute with various degrees of membership grade set to form the load pattern. The fuzzy membership grades are converted to the corresponding non-fuzzy values by the computer fuzzy simulation method.

"A STATISTICAL MODEL TO FORECAST POLITICAL RISKS IN THE OIL INDUSTRY APPLIED TO INDONESIA"

Randall J. Jones, Jr.
Department of Political Science, Central State University, Edmond, OK 73060

A model is described which demonstrates a statistical technique of political risk forecasting. The purpose of the model, derived from data on 29 countries, is to determine the likelihood that the government of an oil-producing developing country will take action that reduces the profitability of local oil production operations of foreign companies. Using discrimant analysis, adverse government action was found to be a function of economic conditions in the host-country during the preceding year. The model has been successfully applied to Indonesia in ex post forecasts since 1969. Ex ante forecasts for 1987 and 1988 also have been made.

Session TB2
GARDNER

Thursday
10:00-11:30

TUTORIAL: AN INTRODUCTION TO DECISION ANALYSIS FOR FORECASTING

Chair: Robert T. Clemen
College of Business Administration, University of Oregon, Eugene, OR 97403

Speaker: David Bell
Harvard Business School, Cambridge, MA 02163

Forecasting and decision analysis are closely related disciplines. Forecasters use their skill and knowledge to measure and thereby reduce uncertainty. Decision analysts try to prescribe what should be done in the face of the uncertainty that exists. This talk will give an overview of decision analysis, including subjective forecasting, the value of information, risk analysis, scenario analysis and the implications of these for forecasters. (The talk will not cover software for decision analysis.)

Session TB3 Thursda
DALTON 10:00-11:3

THE IMPLEMENTATION OF SALES FORECASTING SYSTEMS

Chair: Richard C. Wiser
Mary Kay Cosmetics, Inc., Dallas TX

It is generally accepted by US corporations that better forecasting is a desired goal. However, systematic and objective forecasts ar often overridden because management does not understand the forecasting techniques or the forecast does not meet management expectations. What can we as forecasters do to ensure the implementation of better forecasts? Our panel will present you with thei experiences in implementing forecasting systems and overcoming common barriers to better forecasts. Communications problems and implementation strategies will be discussed from different perspectives.

Participants:

Robert P. Gray
Paper Mate Division, The Gillette Company, Boston, MA

R. Christian Johnston
Vacuum Products Division, Varian, Lexington, MA

Richard C. Wiser
Mary Kay Cosmetics, Inc., Dallas, TX

Session TB4
CLARENDON

Thursday
10:00-11:30

BEHAVIORAL FORECASTING

Chair: Professor Thomas R. Willemain
School of Management, Renssalaer Polytechnic Institute, Troy, New York 12181

"SHOULD PROBABILITIES BE ATTACHED TO MULTIPLE SCENARIOS?"

Martin T. Topol
Pace University, New York, NY 10038
Steven P. Schnaars
Baruch College, 17 Lexington Ave., New York, NY 10010

This question is the focus of this research. Subjects were provided with an identical set of scenarios that were assigned different probabilities and asked to make forecasts after reading them. Specifically, three conditions were created such that one-third of the subjects were presented with either (1) equal probabilities, (2) unequal probabilities--with a higher probability assigned to the scenario that actually came true, or (3) unequal probabilities--with a higher probability assigned to the scenario that least resembled the actual outcome. The results indicate that the assignment of probabilities bears little upon forecast accuracy.

"ANCHORING BIASES IN CONSUMER JUDGMENTAL FORECASTS OF REBATE RESPONSIVENESS"

Prof. Bernard Goitein
Business Management and Administration, Bradley University, Peoria, IL 61625

An approach to setting the size of product rebates involves the collection of consumer judgmental forecasts in surveys. Respondents must predict their buying behavior at each of several rebate sizes. Psychological research shows that these judgmental forecasts are likely to be affected by the first value specified, which acts as a cognitive anchor from which other rebate values are evaluated. Experimental results are presented from a consumer survey to questions regarding rebate responsiveness, where different initial rebate values were used, and their biasing impacts identified. An alternative methodology to consumer judgmental forecasts of rebate responsiveness is presented.

"GRAPHICAL ADJUSTMENT OF STATISTICAL FORECASTS"

Professor Thomas R. Willemain
School of Management, Renssalaer Polytechnic Institute, Troy, New York 12181

Twelve experimental subjects made judgmental adjustments of 36 forecast graphs. The graphs displayed automatically-generated statistical forecasts. The graphical adjustments were made on-screen using a personal computer. The forecasted data were artificial ARIMA series of six types with known optimal forecasts. On average, graphical adjustment did not change forecast accuracy. Graphical adjustment decreased accuracy when the initial statistical forecasts were accurate, but increased accuracy when there was room for improvement in the statistical forecasts. These findings explain a result of Carbone and Gorr [1985] but contrast with certain findings by Lawrence, Edmundson and O'Connor [1986].

Session TB5 Thursday
BERKELEY 10:00-11:30

METHODOLOGICAL APPROACHES TO EXCHANGE RATE FORECASTING

Chair: Robert F. Bordley
GM Research Labs, Warren, MI 48090

"MULTIVARIATE TIME-SERIES FORECASTS OF MARKET SHARE"
Robert Kleinbaum
GM Corporation, 3044 W. Grand Blvd., Detroit, MI 48202

This paper examines the usefulness of multivariate time-series models for forecasting monthly vehicle shares for the conventional or light-duty pickup trucks. The six-month-ahead forecasts are off only 6-7% for most vehicles in the segment.

"MULTI-MATURITY EFFICIENCY IN INTERNATIONAL FINANCIAL MARKETS"
Robert Lippens
Chrysler Economics Staff

For an exchange rate forecaster, the issue of an 'efficient' market is a paramount concern. This paper is concerned with econometric testing of multi-maturity efficient market hypotheses for Canadian and Japanese foreign exchanges and Eurocurrency deposit rates. A multi-maturity efficient market hypothesis is developed and it is demonstrated that for the null hypothesis of multi-maturity efficiency to hold in the foreign exchange market, rational expectation of the term structure of the matching Eurocurrency deposit rate must hold.

"BAYESIAN FORECAST COMBINATION AND EXCHANGE RATES"
Robert F. Bordley
GM Research Labs, Warren, MI 48090

The standard approach to combining forecasts involves taking a weighted average. A new proposal allows for the possibility of an intercept. This paper shows that formula is consistent with Bayesian principles and discusses some applications to exchange rate forecasting problems.

"BUSINESS APPLICATIONS OF EXCHANGE RATE FORECASTING"
Richard Kass
GM Economic Staff, Warren, MI 48090

This paper provides an overview of exchange rate forecasting in business. A wide variety of business applications are discussed.

Session TB6
HAMPTON

Thursday
10:00-11:30

RISK ANALYSIS

Chair: Robert M. Oliver
College of Engineering, University of California, Berkeley, CA 94720

"PREDICTING NUCLEAR POWER INCIDENTS"
Robert M. Oliver
College of Engineering, University of California, Berkeley, CA 94720

In this paper the author reviews the status of data on serious U.S. and worldwide nuclear power incidents, classifies the data by a measure of severity level and proposes a model for the prediction of time to the next incident and the odds that incident(s) of a given level of severity will occur within a future time period. Numerical estimates of the odds will be provided.

"RISK ANALYSIS: WHEN FORECASTING IS A MATTER OF LIFE AND DEATH"
Michael Epstein
MVMA, 300 New Center Bldg, Detroit, MI 48202

Risk analysis frequently serves as the impetus for regulatory initiatives which are intended to protect human lives. The use of risk analysis has grown significantly in recent years although the field remains in the early stages of development. Common downfalls in Risk Analysis include the use of inadequate data and methods in determining risks. Additionally, risk estimates are rarely presented in the comparative light of other risks, so that regulatory efforts may be prioritized. The purpose of this presentation will be to suggest how an improved risk analysis process can provide a more reliable basis for evaluating regulatory priorities.

"RISKY DECISION-MAKING: A CONCEPTUAL MODEL AND EMPIRICAL TEST"
Myron L. Weber
Faculty of Management, University of Calgary, Calgary, Alberta, CANADA T2N 1N4

A conceptually based risky decision-making model is developed in which empirically derived risk measures are assigned to several decision situation characteristics, decision-makers (risk predisposition metrics), and decision strategies. Decision-makers are expected to adapt the riskiness of their decision strategies to decision situation risk in order to maintain overall decision risk constant at a level specified by risk predisposition. An experimental study supportive of the model relates individual risk-taking to decision situational characteristics, individual risk predisposition, and differential individual payoff functions, the latter successfully modifying individual risk-taking.

Session TB7
BEACON A

Thursday
10:00-11:30

ADVANCES IN FORECASTING SOFTWARE

Chair: Robert F. Nau
Fuqua School of Business, Duke University, Durham, NC 27706

"COMPUTING WITHOUT CONSTRAINTS: BENEFIT OR THREAT?"

John D. Sneed
Sorities Group, Inc., PO Box 2939, Springfield, VA 22152

Econometric and statistical fourth-generation languages are now available for inexpensive virtual memory computer systems. The hardware and software cost of econometric research is dropping rapidly, and the implications for forecasting professionals are profound. Many more researchers now have access to data and computer facilities than ever before, and constraints on the type of problem which can be solved in a timely and cost-effective manner are dropping away. Forecasters will be increasingly challenged by other professionals with equally easy access to analytic resources to attain and maintain a state-of-the-art level of expertise. At the same time, projects that have been impossible from a practical standpoint will become feasible, opening up new areas of opportunity for the imaginative practitioner.

"INTEGRATING THE USER INTO STATISTICAL ANALYSIS AND FORECASTING SOFTWARE"

Neil W. Polhemus
Statistical Graphics Corporation, 5 Independence Way, Princeton, NJ 08540

The usefulness of software systems is as much a function of their structure as of their contents. By making certain operations easy to accomplish, software often steers the user toward specific techniques and options and away from others. In the areas of statistical analysis and forecasting, it is essential that the user retain primary control over the analysis process. The most effective systems are those which allow the user to interact easily with the software, so that the user and the machine work as a team. This paper examines some of the important issues which arise when attempting to integrate the user into an interactive data analysis and forecasting environment. Techniques which have been used to blend user and machine input in several software packages are described.

"A DOUBLE EXPERT SYSTEM FOR BUSINESS FORECASTING"

Charles N. Smart
SmartSoftware Inc., Belmont, MA 02178

An organization's basic assets for developing accurate forecasts are its data base and the professional judgment of its personnel. State of the art PC forecasting software, such as SmartForecasts II^{tm}, exploits these assets by combining an expert system for automatic statistical forecasting with interactive graphics for judgmental refinements. This system combines the technical expertise of a trained forecasting analyst with the substantive expertise of the user. The expert system conducts a tournament among competing time-series forecasting methods, evaluating their performance on hold-out data sets. The interactive graphical forecasting component exploits the graphics capabilities of the personal computer to elicit the user's assessment of information not captured in the organization's data base.

Session TB8
BEACON B

FORECASTING SOFTWARE WITH EXPERT CHARACTERISTICS

Chair: Hans Levenbach
Core-Analytic, Inc., PO Box 742, Route 202, Far Hills, NJ 07931

"EXPERTISE IN ADDATA"
Timothy A. Davidson
Temple, Barker & Sloane, Inc., 33 Hayden Avenue, Lexington, MA 02173

This talk will describe the automatic forecasting aspects of ADDATA, a system for routine sales forecasting for production/distribution planning.

"EXPERTISE IN AUTOBOX"
David Reilly
Automatic Forecasting Systems

This talk will describe the AUTOBOX system which uses expertise to configure a multivariate Box-Jenkins model.

"EXPERTISE IN AUTOCAST"
Hans Levenbach
Core-Analytic, Inc., PO Box 742, Route 202, Far Hills, NJ 07931

This talk will discuss the extent to which AUTOCaST and 4CaST/2 fulfill the characteristics of expert systems.

Session TB9
BEACON C

Thursday
10:00-11:30

INDICATORS AND ECONOMIC FORECASTING

Chair: Geoffrey H. Moore
Columbia University, New York, NY 10027

"THE CONTRIBUTION OF LEADING INDICATORS TO SHORT-TERM ECONOMIC FORECASTING: AN INTERNATIONAL REVIEW"

Ernst A. Boehm
Institute of Applied Economic and Social Research, University of Melbourne, Parkville, Victoria 3052 Australia
Geoffrey H. Moore
Columbia University, New York, NY 10027

This paper explores the use of leading and coincident indexes for nine leading industrial countries to forecast economic activity and changes in it in the months ahead. Particular attention is devoted to testing the "signal system" developed at the Center for International Business Cycle Research (Columbia University, New York) for forecasting when slowdowns are likely to be followed by recession or by faster growth and continued expansion. The leading index is also used to demonstrate how short-term qualitative forecasts may be supplemented by short-term quantitative forecasts of national product, employment, and unemployment.

"INVESTIGATION INTO THE APPROPRIATE SERIES FOR A LEADING INDICATOR INDEX OF ECONOMIC ACTIVITY"

Stephen Silver
Bentley College, Waltham, MA 02254

Using a method divised by Saul Hymans (1973). the author determined which of the series currently comprising the Index of Leading Indicators are appropriate for signalling future turning points in macroeconomic activity. The author found that six of the twelve leading indicator series actually led turning points sufficiently well to be considered leading indicators series, using the Commerce Department methodology, to forecast the eight cycles between 1948 and 1984 and compared the relative forecasting performances of his series and the published series.

"THE METHOD OF SELECTING ECONOMIC DIFFUSTION INDICATORS -- LAG CORRELATION ANALYSIS METHOD"

W. De Hua
Economic Information Centre of Sichuan Provincial, Chenydu, Sichuan, People's Republic of China

The paper introduces a new method for selecting economic diffusion indicators, and compares it with previous methods. The main premise of adopting the Lag Correlation Analysis Method, that it is an indicator reflecting synthesized economic movement, must be confirmed. Adopting the method will raise Diffusion Index forecasting precision.

Session TB10
BEACON F

Thursday
10:00-11:30

PRACTICAL ASPECTS OF FORECASTING FOR INVENTORY CONTROL

Chair: Pierre Lefrancois
Faculté des sciences de l'administration, Université Laval, Ste-Foy, Quebec, CANADA G1K 7P4

"THE EFFECT OF FORECAST ERROR ON FIVE STATISTICAL METHODS OF DETERMINING SAFETY STOCKS"

John D. Christfield
American Software, Inc., 470 East Paces Ferry Road, Atlanta, GA 30305

As an organization implements formal forecasting and inventory management systems and its managers become comfortable with more sophisticated techniques, questions arise about the merits and relative inventory investment required by alternative safety stock methods. Using a sample of product histories from industry, forecasts are generated, and then used to calculate safety stocks with five common statistical methods. The forecast errors are then manipulated in simulation to gauge the sensitivity of the safety stock methods to changes in the error.

"DETERMINING SAFETY STOCKS WHEN THE FORECAST ERRORS ARE ASYMMETRIC"

Pierre Lefrancois
Faculté des sciences de l'administration, Université Laval, Ste-Foy, Quebec, CANADA G1K 7P4

Stationarity in demand patterns and symmetry in forecast errors are convenient assumptions when determining safety stocks within an inventory management system. Those assumptions are however rarely satisfied. The empirical work presented investigates the performance of dynamically adapted safety stocks derived in a context of non-stationarity and asymmetry in forecast errors. Implementation of such adaptive safety stocks in a forecasting and inventory management system is discussed.

"MEDIUM FORECASTS ARE RARELY WELL DONE"

Robert G. Brown
Materials Management Systems, PO Box 239, Thetford Center, Vermont 05075

The forecasts used for production planning, distribution, and inventory control should be considered as a medium of communication between Marketing and Production. Marketing know a lot about demand, but don't always transmit the real news to Production. Production know a great deal about supply, but very seldom transmit the real news to Marketing. There are several areas of research, which may prove to be extremely useful, suggested by looking at forecasts as a medium of two-way communication.

Session TB11
BEACON G

Thursday
10:00-11:30

FINANCIAL FORECASTING

Chair: Lawrence D. Brown
School of Management, SUNY-Buffalo, Buffalo, NY 14260

"THE FORMATION OF CANADIAN ANALYSTS' SHARE PRICE FORECASTS"
Lawrence D. Brown, Charles A. Trzcinka
School of Management, SUNY-Buffalo, Buffalo, NY 14260
Gordon D. Richardson
Faculty of Commerce and Business Administration, University of British Columbia, Vancouver, British Columbia, CANADA

The issues addressed by this research include: Do analysts have differential forecast ability in predicting future share prices, Do these differences persist over time, Do analysts act as if their forecasts conform to the Capital Asset Pricing Model, Do analysts have differential forecast ability in predicting firms' future earnings numbers, Is the skill in forecasting share prices related to the skill in forecasting earnings, and Do analysts' forecasts of future share prices conform to the rational expectations hypothesis? Both individual analyst forecasts and consensus analyst forecasts of Toronto Stock Exchange firms for the time period 1983 to 1985 are investigated.

"A THEORETICAL AND EMPIRICAL ANALYSIS OF THE DETERMINANTS OF CROSS-SECTIONAL AND INTERTEMPORAL DIFFERENCES IN EARNINGS RESPONSE COEFFICIENTS"
Daniel W. Collins
College of Business Administration, University of Iowa, Iowa City, IA 52242
S.P. Kothari
School of Management, University of Rochester, Rochester, NY 14618

Previous research suggests price response to earnings changes exhibits considerable intertemporal and cross-sectional variation. The objective of this study is to provide an economic explanation and document evidence on factors that contribute to differential earnings response coefficients. The earnings response coefficient is demonstrated to vary as a function of the risk-free interest rate, and the growth, persistence and riskiness in the permanent earnings series. Endogenizing interest rates, risk and earnings growth in the valuation model extends previous analytical work and has important implications for the interpretation of the magnitude of the earnings response coefficient.

"PROPERTIES OF MANAGEMENT'S QUALITATIVE AND QUANTITATIVE EARNINGS FORECASTS"
Maureen McNichols
Graduate School of Business, Stanford University, Stanford, CA 94305

This research project focuses on a data set of approximately 2500 qualitative and quantitative earnings forecasts by corporate management. These forecasts were made from July 1979 to December 1983, and thus have occurred subsequent to the Securities Exchange Commission's "Safe Harbor" rules for management forecasts. Features of the data we intend to document include the extent of bias in numeric earnings forecasts, favorableness of qualitative forecasts, and timing of qualitative and quantitative forecasts in relation to their favorableness. We will also document events accounced concurrently with management forecasts, and events occurring over the forecast horizon. The aim of the research is to shed some light on the conditions under which management issues earnings forecasts, and how these conditions affect the forecasts.

"INDIVIDUAL FORECASTING ABILITY"
Patricia C. O'Brien
Sloan School of Management, Massachusetts Institute of Management, Cambridge, MA 02139

Contrary to popular press promotions of certain analysts as superior forecasters, this study finds no statistically superior forecasters of corporate earnings. Superiority is defined as consistently better average accuracy through time than other analysts, controlling for individuals' selections of particular firms and/or years to forecast. Forecasts from approximately 80 individuals for earnings of several hundred firms over the period 1975 through 1981 are examined. The relatively short time frame should bias results in favor of finding a superior forecaster, suggesting results would be robust to extensions of the sample.

Session TB12
BEACON H

Thursday
10:00-11:30

TIME SERIES MODELS

Chair: John A. Lane
University College of Wales, Aberystwyth, Dyfed SY23 3BZ, UK

"SOME PITFALLS OF LINEARIZATION IN FORECASTING NON-LINEAR TIME SERIES"

John A. Lane
University College of Wales, Aberystwyth, Dyfed SY23 3BZ, UK

Exact multi-step forecasting of a non-linear autoregressive process $X_t = G(X_{t-1}) + A_t$ where A_t is Gaussian white noise, requires a sequence of numerical integrations. Three approximate methods are discussed: deterministic extrapolation i.e., "shutting off the white noise"; linearization of the autoregression function G; the "normal forecasting error" (NFE) method. Using Ozaki's EXPAR class for illustration, we note some deficiencies of deterministic extrapolation and explain the unsatisfactory dynamic behavior of the linearized forecast function. In contrast the NFE method performs well in a wide range of situations and displays sensible dynamic behavior.

"IMPROVING SHORT-TERM FORECASTS BY EDITING SPIKES"

K. Kern Kwong
Department of Management, California State University, Los Angeles, CA 90032

To ensure good forecasts, the forecaster has to study the pattern of demand and filter out spikes in a time series. This paper discusses an automatic data editing method which checks a time series and edits random spikes. It improves forecasting accuracy by minimizing the transient effect of spikes disruptive to subsequent forecasts. It can easily be incorporated with any time series technique. This method has been tested by using 108 synthetic time series and 85 real time series selected from the 1001 Time Series. Results indicate that under most circumstances it performs well.

"IMPACT OF NONLINEAR AND TIME-VARIANT PARAMETERS UTILIZED IN FORECASTING MODELS"

George D. O'Clock
School of Physics, Engineering and Technology, Mankato State University, Mankato, MN 56001

We live in world that is nonlinear, time-variant and full of time delays. Economic, social and physical systems become highly unpredictable and unstable under the influence of parameters that have these properties. Even when dealing with economic parameters involving human factors, rational and consistent behavior is often assumed. However, actual human behavior is not always rational or consistent. Forecasting inaccuracies have often have been blamed on poor models. However, in many cases, the real problem with forecasting accuracy involves the failure to adequately treat the nonlinear and time-variant properties of the parameters being used in the forecasting model.

Session TB13 Thursday
LIBERTY A 10:00-11:30

MARKETING FORECASTING

Chair: Michael L. Bagshaw
Federal Reserve Bank, P.O. Box 6387, Cleveland, OH 44101

"COMPARISON OF UNIVARIATE ARIMA, MULTIVARIATE ARIMA, AND VECTOR AUTOREGRESSION FORECASTING OF SALES AND ADVERTISING"

Michael L. Bagshaw
Federal Reserve Bank, PO Box 6387, Cleveland, OH 44101

This study: 1) compares the forecasting performance of: univariate ARIMA, multivariate ARIMA, and vector autoregression (both unconstrained -- VAR -- and Bayesian -- BVAR) models, and 2) examines the problem of whether series should be differenced for use in forecasting. When applied to the Lydia Pinkham annual data on sales and advertising, in general, the ARIMA and MARIMA models provided better forecasts that the VAR or BVAR models when differenced data was used for the MARIMA models, and for both differenced and level data for ARIMA models. Also, VAR models in the differenced data provided better forecasts than BVAR models in either levels or differences.

"COMBINING ECONOMETRICS WITH TIME SERIES ANALYSES: THE ADTRAF MODEL"

P.A. Wigodsky, G.J. Hooley, N. Wilson
Research Surveys of Great Britain, Ltd., Research Centre, West Gate, London W5 1EL, UK

There has been growing interest in recent years in the use of continuous (panel) data to estimate advertising effects. Models to date, however, have generally adopted an econometric modelling approach (using Koyck type transformations) to data which often exhibits a high level of autocorrelation, thus violating the statistical assumptions of the approach. The authors report the development of the ADTRAF model which uses an ARIMA approach to pre-whitening the dependent variable prior to the use of econometric (causal) modelling thus overcoming the problem of autocorrelation.

"FORECASTING METHODS OF THE COMMERCIAL AIRPLANE MARKET: OVERVIEW AND PROSPECTS"

Hamoudia Mohsen
University of Paris, Center of Industrial Studies, 17, rue des Galons, 92190 Meudon, FRANCE

The objective of this paper is to present the methods and techniques available to forecast the commercial airplane market (for airplane over 20 seats). The techniques are different regarding level of detail, time horizon and accuracy. The forecasting methods used in aircraft industry are various and can be divided into 3 groups: qualitative and judgmental techniques, quantitative techniques, and decision analysis. The paper contains an overview of forecast methodology used in the major aircraft industrial companies, and an analysis of the future prospects of forecasting in the aircraft industry, particularly with high international competition.

Session TB14
LIBERTY B

Thursday
10:00-11:30

BUSINESS FORECASTING

Chair: Ronald H. Eaton
Fogelman College of Business and Economics, Memphis State University, Memphis, TN 38152

"BUSINESS FORECASTING AND THE ORGANIZATIONAL-ENVIRONMENTAL INTERFACE"

Pamela H. Church, J. David Spiceland
School of Accountancy, Memphis State University, Memphis, TN 38152

Advances in quantitative planning techniques may not always lead to enhanced organizational performance. The quality of the information used in forecasting environmental conditions is as crucial as the analytical tools used to process that information. To enhance the timeliness and accuracy of this information, boundary spanners involved in organizational - environmental interaction should be included as vital elements of the environmental forecasting process. This article employs a rational model to demonstrate the crucial role of boundary spanners within a total forecasting cycle.

"ASSESSING MANAGERS' PRIOR KNOWLEDGE OF FORECASTING METHODS"

Samuel M.K. Anyomi
Newport University, Newport Beach, CA 92660-2662

Managers' familiarity with forecasting methods was tested. Ten univariate forecasting methods were listed for managers of both small businesses and Fortune 500 companies. The managers were asked to identify and rank each method. The responses showed lack of prior knowledge for the majority of the respondents. This low percentage of familiarity could be linked to some of the reasons for the high degree of business failures. This finding is important to the researcher and the practitioner because they are now aware that they must devote some of their forecasting efforts or time on the small business area as well.

"THE USE OF DATA BASES IN PREPARING FORECASTS"

Ronald H. Eaton
Fogelman College of Business and Economics, Memphis State University, Memphis, TN 38152

A recent publication listed some two thousand data bases with the contents ranging from listings of the telephone yellow pages to full-text financial reports. The Securities and Exchange Commission is developing a data base (EDGAR) which will contain the financial reports of all public companies. Technological advances in hardware and software allow the contents of many data bases to be downloaded into machine readable files that can be entered into other computer programs and expert systems for detailed analysis. This paper will present information concerning financial data base availability, content search techniques, and potential applications to financial forecasters.

Session TB15
LIBERTY E

Thursday
10:00-11:30

APPLICATIONS

Chair: George J. Schick
School of Business Administration, University of Southern California, Los Angeles, CA 90089, and The Aerospace Corporation

"MODELLING BATTERY LIFE OF SATELLITES"
George J. Schick
School of Business Administration, University of Southern California, Los Angeles, CA 90089, and The Aerospace Corporation

Both the U.S. Air Force and the U.S. Navy use the Fleet Satellite Communication System (FLTSATCOM) extensively as part of a large communication network. There are four of these satellites in a geosynchronous orbit which supply almost complete worldwide coverage. Batteries provide power for the satellites during eclipse. Three approaches are used in this paper in order to predict battery life: a) regression analysis, b) decision theory, and c) flaw size growth is modelled using differential equations. Since one satellite costs about three million dollars, it is easy to see why battery life is an important parameter to predict and monitor.

"FORECASTING USER REQUIREMENTS FOR COHERENT COMPUTER SYSTEMS"
Richard S. Segall
Department of Mathematical Sciences, University of Lowell, Lowell, MA 01854

This presentation describes a written questionaire and its responses from the time sharing users community at a large government installation where there are currently several types of operating systems available. One of the main purposes of the survey was to forecast additional user requirements for the other operating systems upon a projected elimination of an existing time sharing system. Conclusions of user requirements and future directions of the research are presented.

"LIFE CYCLE FORECASTING OF MOTORCYCLES IN GERMANY"
Karl-Werner Hansmann
Fachbereich Wirtschafts und Organisationswissenschaften, Universitat der Bunderswehr Hamburg, Postfach 70 08 22, D2000 Hamburg 70, W. Germany

The development of the demand for motorcycles over the past forty years is so complicated that no simple life cycle function can be fitted for the real values. Several trends superimpose each other with changing impact on the time series at different times. My forecasting model - implemented on an IBM XT - combines elements of the generalized logistic function with a new life cycle function to consider the double peak structure of the time series. A non-linear estimation method is used to estimate the parameters of the forecasting function. The results are compared with solutions I obtained by non-linear multiple regression.

Session TC1
EXETER

PUBLIC SECTOR FORECASTING

Chairs: Stuart Bretschneider
Department of Public Administration, The Maxwell School, Syracuse University, Syracuse, NY 13244
Wilpen Gorr
The School of Urban and Public Affairs, Carnegie Mellon University, Pittsburgh, PA 15213

"POLITICAL AND ORGANIZATIONAL EFFECTS ON FORECAST PERFORMANCE: FORECASTING REVENUE FROM STA SALES TAXES"

Stuart Bretschneider
Department of Public Administration, The Maxwell School, Syracuse University, Syracuse, NY 13244
Wilpen Gorr
The School of Urban and Public Affairs, Carnegie Mellon University, Pittsburgh, PA 15213
Gloria Grizzle, Earle Klay
Department of Public Administration, Florida State University, Tallahassee, FL 32306

Recent empirical research on forecasting has focused heavily on the impact of alternative forecast methods on forecast accuracy. In co this paper includes political environment, organizational design, and other factors in the study of forecast performance. Five years of da the forecast performance of state governments at forecasting sales tax revenues are used to test a series of hypotheses on these factors. preliminary result is that those states with executive and legislative branch forecasting agencies tend to be more accurate than those hav only an executive branch agency.

"FORECAST ACCURACY AND POLITICAL EXIGENCIES: THE POLITICS OF DEFINING STATE AND LOCAL BUDGET PROBLEMS"

Patrick D. Larkey, Richard A. Smith
Department of Social and Decision Sciences, Carnegie-Mellon University, Pittsburgh, PA 15213

Most of the literature on state and local government budget forecasts is concerned with the technical problems of producing accurate (some measure) forecasts. Evidence is accumulating, however, that the forecasts are systematically biased. These biases, optimistic and pessimistic, reflect political exigencies and bureaucratic incentives in uncertain, conflict laden organizational contexts. This paper cons government revenue and expenditure forecasting as an organizational decision process in which accuracy is a secondary criterion for w constitutes a "good forecast." Two cases, Texas in 1986 and North Carolina from 1926 to 1954, are examined in detail.

"PRESENTING FORECAST EVALUATION RESULTS: THE EFFECT OF PRESENTATION MODE ON DECISION CONFIDEN AND PRECISION"

Stuart Bretschneider, Jeff Straussman
Department of Public Administration, The Maxwell School, Syracuse University, Syracuse, NY 13244

Using a small group experimental setting, this research investigates the effect that different presentation modes (graphical, tabular, mix have on the way past forecast performance information influences interpretaion of the current forecast. The experimental decision pr setting is that of a local government using forecasts of revenues to establish next year's budget. Of particular interest is how presentati mode influences confidence in and precision of budget estimates from current revenue forecasts.

"REVENUE FORECASTING IN LOCAL GOVERNMENT: INCORPORATION OF SPECIAL EVENT DATA FOR DATA CLEA

Wilpen Gorr
The School of Urban and Public Affairs, Carnegie Mellon University, Pittsburgh, PA 15213
Dennis W. Hostetler
Department of Public Administration and Policy Analysis, Southern Illinois University, Edwardsville, IL 62025

We hypothesize that an important factor for improving accuracy in local government revenue forecasting is "data cleaning" - identifyin accounting for pattern interruptions in time series data; e.g., due to tax rate and base changes, construction of large commercial buildi This hypothesis will be tested by applying the concept of special event data and the post-sample experimental design to the case studies three municipal governments in Illinois. We plan to decompose special events into state and local government components, and to incl three major factors in the design: local governments' forecasts; objective forecasts without special event adjustments; and objective fo with state and local special event adjustments.

Session TC2
GARDNER

Thursday
2:00-3:30

DECISION ANALYSIS APPROACHES TO THE COMBINATION OF FORECASTS

Chair: Peter C. Wilton
School of Business Administration, 350 Barrows Hall, University of California, Berkeley, CA 94720

"ANALYTICAL APPROACHES TO COMBINING EXPERT JUDGMENTS"

Peter A. Morris
Applied Decision Analysis, Inc., 3000 Sand Hill Rd, Menlo Park, CA 94025

There are many diverse analytical approaches to combining expert probability distributions. This paper presents a view of the state of the art from the Bayesian perspective. Approaches to modelling an expert as a forecasting process are outlined. A hierarchy of expert models for decision analysis practice is presented.

"THE STRATEGY OF DEVELOPING FORECASTS TO BE COMBINED"

Rex V. Brown, Jacob W. Ulvila
Decision Science Consortium, Inc., 7700 Leesburg Pike, Suite 421, Falls Church, VA 22043

A good deal of work has been done recently by Winkler, Makridakis, Bunn and others on combining multiple forecasts after they already exist. This paper proposes a strategy for proactively developing multiple forecasts and allocating efforts among them. Judgments on the credibility of the candidate approaches and their independence play a crucial role.

"COMBINATION OF FORECASTS USING THE CAUCHY DISTRIBUTION"

Robert Bordley
Societal Analysis Department, General Motors Research Labs, Warren, MI 48090

Most forecasting combination techniques used today presuppose that expert forecasts are asymptotically normally distributed. This paper supposes that expert forecast errors have a Cauchy distribution; i.e., that outliers are much more probable than the normal distribution predicts. We deduce a Cauchy formula for aggregating forecasts which discounts outliers much more heavily than traditional formulas.

"SUBJECTIVE ESTIMATION OF AGGREGATION MODEL PARAMETERS: A COMPARATIVE TEST"

Sunil Gupta
Graduate School of Business, 518 Uris Hall, Columbia University, New York, NY 10027
Peter C. Wilton
School of Business Administration, 350 Barrows Hall, University of California, Berkeley, CA 94720

While deriving optimal weights for combining forecasts is theoretically possible, the practical appeal of procedures to do so remains largely untested. The nature of the required subjective parameter estimates of alternative combination models and the data availability condition [bias levels, expert (in)dependence, non-stationarity, sample size, etc.] can influence the accuracy of the combined estimate. We report a controlled experiment which manipulates both the combination model and data availability conditions to assess the impact on error of the combined estimate. The set of models tested includes the odds-matrix approach, a new approach that facilitates the encoding of a manger's subjective judgment while remaining robust across a wide variety of data conditions.

Session TC3
DALTON

THURSDAY
2:00-3:30

WEATHER FORECASTING

Chair: Allan H. Murphy
Department of Atmospheric Sciences, Oregon State University, Corvallis, OR 97331

"FORMULATION AND VERIFICATION OF WEATHER FORECASTS"

Harry R. Glahn
Techniques Development Laboratory, National Weather Service, Silver Spring, MD 20910

Weather and climate have a profound effect on the lives of the people of the world. Skillful forecasts of that weather and climate have great benefits to the world's economies. Weather forecasts are made for phenomena of sizes ranging from tornadoes of a few tens of meters in diameter to winter storms covering several thousand kilometers. These forecasts extend over time scales of a few minutes to several days. This paper will review the scientific basis for meteorological prediction, the practice of weather forecasting in the United States, the general accuracy and skill of weather forecasts, and the trends in skill and accuracy over the past 20 years.

"EVALUATING THE SKILL OF DAILY WEATHER FORECASTING: AN 18-YEAR EXPERIMENT"

Frederick Sanders
Marblehead, MA 01945

Between 1966 and 1984, students and staff at Massachusetts Institute of Technology prepared forecasts of temperature and precipitation at Boston for 1-4 days ahead, on about 180 days each year. Skill of these forecasts, the fractional distance of their accuracy from that of a simple statement of the long-term mean to perfection, was about 50% for the first day, with 50% of the remaining skill lost each additional day. The growth of skill was about 0.5% per year despite massive increases in technological support and guidance. A consensus forecast was nearly always more skillful than the most skilled individual.

Session TC4 Thursday
CLARENDON 2:00-3:30

BEHAVIORAL FORECASTING

Chair: Paul B. Andreassen
Department of Psychology, Harvard University, Cambridge, Massachusetts 02138

"WHEN WHAT WENT UP WON'T COME DOWN: ON THE REGRESSIVENESS OF INTUITIVE PREDICTIONS"

Paul B. Andreassen, Stephen Kraus
Department of Psychology, Harvard University, Cambridge, Massachusetts 02138

Predictions about a series are hypothesised to become less regressive as changes in past values of the series become more salient. The hypothesis was supported in two market simulations. In the first study the magnitude of the average price change of a stock was manipulated. Subjects were least likely to sell as the price rose (or to buy as the price fell) in series with large changes, regardless of whether the average change was up or down. In the second study, the length of the series was manipulated. The longer a trend persisted, the less regressive subjects' behavior became.

"ARE ECONOMETRIC FORECASTS COMPATIBLE WITH SUBJECTIVE EXPECTATION? A LENS MODEL FRAMEWORK"

Harinder Singh
Department of Economics, San Diego State University, San Diego, California 92182

In spite of the crucial importance of the precise nature of expectation formation in economics, econometric forecasts are generally employed as proxies for subjective expectations, without adequately ascertaining their validity. In this paper, Brunswik's lens model is suggested as a potentially meaningful framework for analyzing expectations from both the environmental and subjective environment. It is shown how achievement (the expost compatibility of actual realizations with subjective expectations) can be analytically broken down into multiplicative components (representing knowledge, cognitive control, task uncertainty, etc.) to provide significant insight into the nature of expectation formation.

"DECISION MAKERS' FORECASTING ABILITY ANALYZED IN A COVARIANCE STRUCTURAL MODEL"

Waymond Rodgers
Graduate School of Management, University of California, Irvine, California 92717

The purpose of this paper is to determine how decision makers' schemas of categorization (perception) and analyses (judgment) are influenced by certain types of information before they make a prediction. The model used in this paper to depict decision makers' cognitive processes is called a covariance structural model. This model consists of a factor analytic model and a structural equation model measured simultaneously. The subjects used in this prediction model were 22 commercial loan officers. The results indicated that loan officers' categorization of information influences the way they select certain types of information for forecasting purposes. Finally, this model represents yet another way to depict information and decision makers' processes into a single model to enhance forecasting reliability.

Session TC5
BERKELEY

Thursday
2:00-3:30

FORECASTING NEW PRODUCT DEMAND WITH CHOICE MODELS

Chair: Brian T. Ratchford
School of Management, State University of New York at Buffalo, Buffalo, NY 14260

"FORECASTING WITH LOGIT: THINGS AREN'T AS GOOD AS THEY LOOK"

George H. Haines, Jr.
Carleton University
Michael Berkowitz
Faculty of Management Studies, University of Toronto, Ontario, CANADA

Multinomial logit estimates for the Canadian home heating market are presented. These estimates are then used to forecast actual choices in the Canadian home heating market several years later. The forecasts are supremely bad, even though the results from the estimation sample indicate that the forecasts ought to be good. The data to support these assertions are presented along with the results. Reasons why logit might fit well but forecast poorly are presented and discussed.

"PREDICTING CHOICE SHARES FOR NEW PRODUCTS FROM CONJOINT EXPERIMENTS"

Wagner A. Kamakura
Owen School of Management, Vanderbilt University, Nashville, TN 37203

Most applications of conjoint analysis focus either on the preferences of each individual consumer, or on the "typical" consumer. This study discusses an approach which falls within these two extremes: rather than considering the idiosyncratic preferences of each individual, or pooling all individuals into a single "representative" consumer, the proposed approach attempts to estimate the distribution of preferences within the group, thus reducing the number of parameters while accounting for some heterogeneity across consumers. Given the estimated distributions of utilities assigned by consumers to each attribute level, and the choice process assumed by the model, it is then possible to predict the choice share of a new product.

"USING AGGREGATE DATA TO PREDICT NEW PRODUCT CHOICE: THE ABSTRACT PRODUCT APPROACH REVISITED"

Brian T. Ratchford
School of Management, State University of New York at Buffalo, Buffalo, NY 14260

Forecasts of brand choice for new products are typically developed from survey data on individual choices or from conjoint analysis. But, if brands can be viewed as bundles of attributes, it is also possible to develop new product forecasts from aggregate data. Using pooled time-series/cross section data one would establish a relationship between relative brand shares, relative amounts of brand attributes, and relative prices. Given this relationship, one would forecast the demand for a bundle of attributes not already on the market. This approach is applied to a model of the U.S. automobile market, using data on brand sales, prices and attributes spanning 1960-84.

Session TC6
HAMPTON

Thursday
2:00-3:30

PREDICTION AND COMMUNICATION IN CLINICAL AND HEALTH POLICY DECISIONS

Chair: Peter E. Politser
School of Public Health, Harvard University, Boston, MA 02115

"TOWARD CODIFYING THE VALUES OF EXPRESSIONS OF PROBABILITY"

Frederick Mosteller
School of Public Health, Harvard University, Boston, MA 02115

Qualitative expressions of probability, such as "likely," have different numerical meanings to different people, which can lead to misunderstanding among physicians and between physicians and patients. In a study conducted through a nationwide interactive computer network based at Massachusetts General Hospital, we gathered information on the meaning of common expressions of probability. The degree of agreement among professionals and between studies is encouraging for the future prospects of codifying the meaning of such expressions. The variation among five studies in the mean values assigned to 37 expressions in the medical literature and the variation among individual opinions show that such codification is necessary. In the meantime, the average numerical values presented here for various qualitative expressions of probability could well be used to enhance communication among medical professionals.

"SIGNAL RECEPTION AND CLINICAL PREDICTION"

Donald M. Berwick
Harvard Medical School, Boston, MA

The quality of clinical work depends, in part, on the accuracy of prediction. Based on incomplete information, the physician must often estimate, for example, the information content of a laboratory test, the prior probability of disease, the natural history (or prognosis) for a patient with a disease, and the marginal value or toxicity of a test or treatment. One approach to these tasks is to build prescriptive decision-making models to assist prediction. Another is to assess the predictive skill of the clinician directly, without regard to the underlying decision rules being used by the clinician. This paper illustrates the latter approach: assessing the ability of physicians to predict the outcome of a test using receiver operating characteristic (ROC) analysis.

"TOWARD PREDICTING THE VALUE OF MEDICAL DECISION ANALYSIS"

Peter E. Politser, Harvey V. Fineberg
School of Public Health, Harvard University, Boston, MA 02115

Analyses of medical decisions are often costly, time-consuming, and equivocal. We sought to identify features of a clinical problem predicting whether its analysis would reveal a clear advantage of one strategy over others (here termed the "size of effect" from analysis). We found that in medical decision analyses published between 1970 and 1986, complex ones (those with more than 30 terminal branches in the decision tree) had six times the effect of simpler ones. A preliminary sketch identifying complex decision trees may therefore help predict whether a more complete analysis (estimating probabilities and utilities) is likely to produce a convincing effect.

Session TC7
BEACON A

Thursday
2:00-3:30

UTILITY OF AUTOMATIC FORECASTING SOFTWARE

Chairs: Leonard J. Tashman
School of Business Administration, University of Vermont, Burlington, VT 05405
John R. Snyder
Colorado State University, Fort Collins, CO

Panelists:

Everette S. Gardner
University of Houston (AUTOCAST)

Robert L. Goodrich
Business Forecasting Systems (FORECAST PRO)

David P. Reilly
Automatic Forecasting Systems (AUTOBJ)

Charles N. Smart
SmartSoftware (SMARTFORECASTS II)

David R. Vogt
Wisard Software Company (WISARD)

"Expert systems" have been making deep inroads into forecasting software. By providing a capability for "automatic" model selection, the new software is making accessible procedures once thought to be too complex to be worthwhile. At the same time, traditional concerns about "black-box" forecasting are accentuated. The panelists are all pioneers in the development of automatic forecasting programs. In a "Meet the Press" format, they will be asked to describe the goals and objectives of automatic forecasting packages, to evaluate the role of automatic forecasting in model development, to anticipate probable areas of misapplication and what should be done to reduce the associated risks, and to examine the value of these products as instruments of decision support -- namely how well the manager's judgment, experience, and feedback from past errors can be incorporated into the forecasting process.

Session TC8 Thursday
BEACON B 2:00-3:30

THE REVISION OF MACROECONOMIC FORECASTS

Chair: Francis Taurand
Departement d'Economique, Université Laval, Ste-Foy, Quebec, CANADA G1K 7P4

"REVISING A FORECAST, OR WHAT TO DO WHEN THE FUTURE IS NO LONGER WHAT IT USED TO BE"

Christopher N. Caton
D.R.I., 24 Hartwell Avenue, Lexington, MA 02173

Forecasters and economic analysts make two (related) errors. They tend to overreact to each new piece of high frequency data, and to misidentify short-term cyclical phenomena as longer-term trends. This paper analyses such mistakes and describes how to avoid them in practice. There are times, however, when revisions of forecasts become necessary. Recent changes in long-run views about relative energy prices, inflation, the size of the federal deficit have sent all macroeconomic forecasters back to the drawing boards; so did the rebasing of the National Income and Product Accounts and the industrial production indexes in 1985. The paper examines the effects of these developments on Data Resources' forecasts.

"REVISION TO MACROECONOMIC FORECASTS IN THE CANADIAN DEPARTMENT OF FINANCE"

Ernie Stokes
Economic Analysis and Forecasting Division, Department of Finance, Ottawa, Ontario CANADA K1A 0G5

This paper analyses how the Canadian Department of Finance revises its macroeconomic forecasts. Awareness of purpose and setting of forecast helps pinpoint actual constraints in the revision process. Two main types of revisions are identified: a) changes in the econometric model, when new information requires respecification of no longer reliable equations, and b) non-structural changes, due to new data on exogenous variables, especially information on the "current" quarter suggesting targets for variables that differ from forecasted values.

"ANALYZING FORECAST REVISIONS IN A MULTIVARIATE TIME-SERIES MODEL OF A REGIONAL ECONOMY"

Richard Todd
Research Department, Federal Reserve Bank of Minneapolis, 250 Marquette Avenue, Minneapolis, MN 55480

Each quarter forecasters at the Federal Reserve Bank of Minneapolis publish 2-year forecasts from a set of Bayesian vector autoregressive models of the US economy and six Upper Midwest regions. An explicit accounting scheme has been set up to decompose regional forecast revisions into specific components. Components include a) unpredictble shocks to the endogenous (i.e., regional) variables, b) revision in the forecasts or historical data for the exogenous (i.e., U.S.) variables, c) revisions in the historical data for the endogenous variables, and d) revisions in the regional model coefficients.

Session TC10
BEACON F

Thursday
2:00-3:30

FORECASTING SYSTEMS

Chair: Asghar Sabbaghi
Division of Business and Economics, Indiana University at South Bend, South Bend, IN 46634

"A DECISION SUPPORT SYSTEM FOR CAPITAL BUDGETING WITH LEARNING CURVE"

Asghar Sabbaghi
Division of Business and Economics, Indiana University at South Bend, South Bend, IN 46634

The purpose of this study is to develop a programming model to analyze the issue of the keep-replace decision and to propose a system to support capital budgeting decisions for a multiple product firm. It is assumed that increased labor efficiency may happen gradually over-time as workers learn how to best utilize the new acquisition. A nonlinear programming model is developed. Piece-wise linear approximation and multistage mixed-integer programming techniques are used to solve the model for the optimum product mix and to analyze the impact of the learning curve on the keep-replace decision. The model provides a more integrated approach to the keep-replace decision.

'PRIORITIZING STOCK PHASING TO MATCH MARKETING FORECASTS"

Jens Maier
School of Industrial & Business Studies, University of Warwick, Coventry CV4 7AL, UK

This paper describes the development of a stock planning system for multiple retailers and considers its relationship with marketing strategy. Products are clustered into groups with similar selling and stockholding characteristics. Those groups of most importance to companies' financial success are highlighted, enabling managerial resources to be allocated appropriately. The planning model applies the principle of ordering just in time. Major savings are achieved in stockholding costs by reducing premature and excessive stock intakes, and effectively estimating safety margins.

"THE IMPENDING DEMISE OF FORECASTING FOR INVENTORY CONTROL"

J.T. Black
213 Dunsten Hall, Auburn University, Auburn, Alabama 36849

The demise of forecasting for inventory control is a natural result of eliminating the existing manufacturing system, the job shop, replacing it with an Integrated Manufacturing Production System. An IMPS is capable of producing large volumes of parts in small lots. Setup times are eliminated and inventory is greatly reduced. Inventory control is integrated directly into the manufacturing system (route sheets and short range forecasts are eliminated) using a pull system of inventory control which allows the people on the plant floor to control the level of the work in progress. IMPSs react quickly to changes in demand which in turn allows for shorter long range forecasts and therefore increases the accuracy of the forecasting.

Session TC12 Thursday
BEACON H 2:00-3:30

TIME SERIES MODELS

Chair: Ken Hung
College of Business and Management, University of Maryland, College Park, Maryland 20742

"THE EFFECT OF POOLING UNCORRELATED TIME SERIES ON FORECASTING"

Lap-Ming Wun
Systems Development Division, U.S. Postal Service, 475 L'Enfant Plaza, S.W., Washington, D.C. 20260
Ken Hung
College of Business and Management, University of Maryland, College Park, Maryland 20742

Analyzing related time series jointly can detect possible feedback relationships among the series and improve accuracy of forecasts. However, if the series pooled together are essentially unrelated then we are adding irrelevant variables to the model of each individual series. In this study, we investigate whether the resulting problem of having additional variables in each series due to pooling of unrelated time series into a vector model leads to the same consequence as those of linear model and univariate time series models. The result can also be used as a guideline for choosing between vector model and univariate model when observed data do not reveal enough information for the decision.

"RECURSIVE LIMITING UPDATING VECTORS FOR CANONICAL LINEAR DYNAMIC SYSTEM MODELS"

M. Akram
University of Bahrain, East Riffa, Bahrain, Arabian Gulf

For the analysis and forecasting of discrete time series driven by ARMA (p,q) type coloured noise process, Harrison-Akram and Akram introduce a wide class of linear dynamic system models, called GEWR (n,p,q) models. For the observable canonical form of these models, a general recursive limiting result for gain or updating vectors is given. This result provides a useful framework for computing the limiting results for similar linear dynamic system models in other forms, such as, diagonal and triangular forms. The validity of the result extends to a class of linear dynamic system models adopting moving origin representation through constant transition matrices and enjoying exponential smoothing with constant discount factors.

"DYNAMIC FACTOR ANALYSIS OF NONSTATIONARY MULTIVARIATE TIME SERIES"

Jan G. de Gooijer
Department of Economic Statistics, University of Amsterdam, Jodenbreestraat 23, 1011 NH Amsterdam, Netherlands

This paper develops a dynamic factor model for the analysis of multivariate nonstationary time series in the time domain. The nonstationarity in the series is represented by a linear time dependent mean function. Two simulations examples are presented to demonstrate that the proposed factor analysis is capable of correctly recovering the presence of nonstationary factor series underlying observed multiple time series of relatively short length. The usefulness of the model and the analysis are further demonstrated on U.S. hog time series data.

Session TC13
LIBERTY A

Thursday
2:00-3:30

FORECASTING INFLATION

Chair: David J. Stockton
Federal Reserve System, Washington, D.C. 20551

"FORECASTING INFLATION WITH ASSET PRICING THEORY"

Joe D. Kelley
California State University, Sacramento, CA 95819

Inflation rates are forecast as functions of lagged values of the variances and covariances of those inflation rates. The inflation rate covariance matrix fluctuates over time in response to business cycles. Asset pricing theory says that more risky assets should have higher returns. Viewing a more general class of products as assets, then a higher (co)variance in a product's inflation rate should cause a higher level in the inflation rate for that product. The hypothesis is tested by a vector autoregression and is found to be strongly supported by the data. The vector autoregression can easily be used in forecasting since all variables are functions of past data.

"TESTS OF THE SPECIFICATION AND PREDICTIVE ACCURACY OF NONNESTED MODELS OF INFLATION"

David J. Stockton, Charles S. Struckmeyer
Federal Reserve System, Washington, D.C. 20551

The recent volatility of inflation has provided considerable data to distinguish between competing theories of inflation. The key competing models are the expectations-augmented Phillips curve, a monetarist equation, and the rational expectations model. This paper will attempt to replicate the results of earlier studies and tests their relative performance using nonnested hypothesis tests. In addition, the forecast accuracy of each of the alternative specifications will be evaluated using the methodology developed by Fair (1984). This method seeks to identify forecast uncertainty arising from the model's error term, coefficient estimates, exogenous variable forecasts, and possible misspecification.

"WAGE INFLATION AND REAL WAGES"

S.B. Henry
National Institute of Economic & Social Research, London, England

The rapid growth of real wages, and the sluggishness with which wage inflation has declined since 1980 in the UK, has caused considerable concern to government and business. Explanations of the real wage phenomenon are investigated using co-integration techniques popularised by Clive Granger. These models provide good statistical explanation of the lack of response of real wages to the changing conditions of the labor market since 1980. Models of the real wage and models of wage inflation are shown to be closely linked, so that the recent behaviour of wages - both real and nominal - can be explained. This explanation uses parsimonious econometric models, which are shown to clearly rule out some of the favoured explanations of real wage rigidity currently being advanced by some economists and other commentators in the UK.

Session TC14
LIBERTY B

Thursday
2:00-3:30

INDUSTRY EVOLUTION

Chair: A.J. Murfin
London School of Economics, London, England

"ENTRY AND INDUSTRY EVOLUTION: THE U.K. CAR INDUSTRY 1958-1983"

P.A. Geroski
University of Southampton, Southampton, England
A.J. Murfin
London School of Economics, London, England

Expected post-entry profits are shown to be the principle determinants of entry behavior in a multi-equation model of the U.K. car market over the past 25 years (for 17 firms in three sub-markets). A Tobit entry model is augmented by the endogenous determinant of advertising and profitability, which provide the "rational expectations" for potential entrants. The goals are: (1) are naive entry models better served by admitting rational expectation forecasts? (2) to show how entry will affect the short-run dynamics of industry performance and its long run level (3) to evaluate the model's predictions of entry paths and firm behavior.

"FORECASTING INDUSTRY FAILURE RATES"

Harlan D. Platt
College of Business Administration, Northeastern University, Boston, MA 02115

An extensive literature exists on the prediction of corporate bankruptcy. This study pioneers the analysis and prediction of industry failure rates. Unlike corporate studies which utilize data that is not time specific, this study incorporates economic determinants of industry failure and the transmission of failure between industries. Sixteen industries are analyzed over a 31-year period. Model parameters are estimated using a full information technique, three-stage least squares. Failures in every industry are related to economic events, and to failures in certain other industries. Not every industry is responsible for failures in other industries.

"CAN SURVIVING COMBINATIONS OF INDUSTRIES BE USED TO PREDICT SUCCESS IN DIVERSIFIED FIRMS?"

M. Gary Davis
University of New Brunswick, Saint John, New Brunswick, Canada E2L 4L5

One of the core issues for top managers facing diversification decisions is the choice of industries to diversify into. This paper discusses the validity of using historically successful combinations of industries in diversified firms as predictors of future success. Using empirical data, it shows how the data can be organized to indicate industries that have an affinity for each other, and suggestions are made for the use of this approach in a corporate setting.

Session TC15
LIBERTY E

EXPERT SYSTEMS, ARTIFICIAL INTELLIGENCE, AND FORECASTINC

Chair: Noel Greis
School of Business, University of North Carolina, Chapel Hill, NC 27514

"A MICROCOMPUTER-BASED DIALOGIC FORECASTING EXPERT SYSTEM"

K. Kern Kwong
Department of Management, California State University, Los Angeles, CA 90032
Donald Cheng
Department of Management Information Systems, Georgia State University, Atlanta, GA 30303

This paper describes a microcomputer-based forecasting expert system. It allows an inexperienced user quickly and accurately to select an appropriate forecasting technique for his/her specific requirement. The system suggests a forecasting technique(s) based on a dialogue which includes a series of multiple choices and yes-no questions with an user. The system can provide an explanation for the suggested technique(s) when requested. The knowledge base of the system is compiled from the published forecasting articles and textbooks, and can easily be updated to reflect the latest research result. The system, developed by using Turbo Prolog, can easily be implemented on any microcomputer.

"EXPERT SYSTEMS' IMPACTS ON THE FORECASTING TECHNIQUES"

Michael Broida, David C. Yen
School of Business Administration, Miami University, Oxford, Ohio 45056

Since the 1970s, the development of expert systems (ES) has accelerated and applications have developed in a variety of areas, such as management and production. Currently, ES are evolving at a tremendously fast speed in almost every computer-related discipline, especially in the forecasting and marketing analysis areas. The main purpose of this paper is twofold: 1) study and examination of four different attributes of ES such as ES techniques, languages, concepts, and applications; and 2) discuss what kind of impacts that ES will create on currently used forecasting techniques in terms of the four ES disciplines discussed in part one.

"AI AND FORECASTING"

John J. Chen, Paul Sheldon Foote
New York University, New York, NY 10003

Can artificial intelligence (AI) enhance automatic forecasting software? Traditionally, forecasting models have required extensive expertise to be used effectively. The first step is to build an inference machine into an expert system for novice users of a forecasting model to reduce their errors from the lack of the knowledge in the forecasting models. The second step is an expert system so that it helps the experienced users improve their data analysis which otherwise would not be possible. The third step is to build an AI system so that this system automates the forecasting process for the system users.

Session TC16 Thursday
LIBERTY F 2:00-3:30

APPLICATIONS

Chair: Jan Widberg
National Defence Research Institute, PO Box 27322, S-102 54 Stockholm, Sweden

"OPERATIONAL THREAT ASSESSMENT FOR CIVIL DEFENCE PLANNING"
Jan Widberg
National Defence Research Institute, PO Box 27322, S-102 54 Stockholm, Sweden

Planning for the relevant measures in the event of crisis or war is to a large extent a matter of handling uncertainty. Operational threat assessments can be formulated to support analyses of necessary measures. General security policy judgments are decomposed into plausible scenarios, characterized by different sets of typical events. Their possible consequences under actual conditions are studies evaluated. The approach demands and results in interaction between analytical and practical competences. Thus, different chains of events can flexibly be generated and tested.

"A SYSTEM FOR FORECASTING DROUGHT PROGRESSION IN SOUTH FLORIDA"
George Shih
South Florida Water Management District, PO Box 24580, West Palm Beach, FL 33416

South Florida is susceptible to water shortage. For drought management, it helps to know how the drought might progress months ahead. An AR(1) model was calibrated to transform monthly rainfall into soil moisture indices. Return-years of moisture indices were analyzed and mapped to depict a drought status. To forecast the drought progress, an ARIMA model was built for each data series. Drought maps are made with the forecasted values. The system is able to forecast the drought scenarios to assist management decisions.

"AN APPLICATION OF LINEAR REGRESSION TO MUNICIPAL LIBRARY COLLECTION DEVELOPMENT"
Louis R. Gaydosh
The William Paterson College of New Jersey

In order to plan for the future development of the Florham Park, New Jersey Public Library collection, two linear regression equations were computed: one for the association between the population of a municipality and the size of its library collection, and a time series for the growth of the borough's population. By solving the second equation for the years 1990 and 2000 and then plugging the results into the first equation, it is possible to predict how large the library's collection should be for the given years. This plan is now the official policy of the Florham Park library.

Session TD1
EXETER

Thursday
4:00-5:30

EMPLOYING ENVIRONMENTAL SCENARIOS FOR STRATEGIC DECISION MAKING

Chairs: Robert E. Linneman, Harold E. Klein
Temple University, Philadelphia, PA 19122

The formal use of scenarios for providing environmental assessments/forecasts for strategic planning purposes is still quite new, although most large corporations have experimented with the approach. Few companies to date have actually incorporated scenario-generating techniques into their planning processes. Scenarios do appear to be most useful when the organization is confronted by turbulent environmental conditions. This session will provide two in-depth company case examples of individual experiences applying different scenario generating methodologies: the application of SPIRE at the Douglas Aircraft Company and the use of BASICS at Bellsouth Corporation.

Presenters:

Stephen M. Millett (for BASICS)
Forecasting & Strategic Planning Studies, Batelle Memorial Institute, Columbus, Ohio

Holly Iyer
Corporate Strategic Planning, Bellsouth Corporation, Atlanta, Georgia

Harold E. Klein (for SPIRE)
Department of Management, Temple University, Philadelphia, PA 19122

Adam Pilarski
Douglas Aircraft Company, Long Beach, CA

Discussant:

Richard De Roeck
International Macroeconomics Staff, General Motors Corporation, New York, NY

Session TD2
GARDNER

Thursday
4:00-5:30

PROBABILISTIC FORECASTING TECHNIQUES AND APPLICATIONS

Chair: Jacob W. Ulvila
Decision Science Consortium, Inc., 7700 Leesburg Pike, Suite 421, Falls Church, VA 22043

"PEARSON-TUKEY THREE-POINT APPROXIMATIONS VS. MONTE CARLO SIMULATION"

Samuel E. Bodily, Sherwood C. Frey, Phillip E. Pfeifer
Darden Graduate Business School, University of Virginia, Box 6550, Charlottesville, VA 22906

Accuracy of the Pearson-Tukey three-point approximation is measured in units of standard deviation and compared to that from Monte Carlo simulation. Using the beta and normal distributions, comparisons are made for the mean of a random variable and for common functions of the random variable. Comparisons are also made for NPV in a Hertz-type capital investment model.

"TESTING THE EFFECTIVENESS OF DEBIASING"

Theresa M. Mullin
Decision Science Consortium, Inc., 7700 Leesburg Pike, Suite 421, Falls Church, VA 22043

Numerous experimental studies involving expert subjective judgments have shown widespread and systematic biases toward overconfidence. Many decision analysts, however, consider that this potential shortcoming in human judgment can be ameliorated through the use of various debiasing strategies, although evidence of their effectiveness is largely anecdotal. A study involving probabilistic estimation of almanac quantities was conducted to test three suggested debiasing strategies that entailed telling the assessor (1) to give contradictory reasons: (2) to describe alternative scenarios; or (3) about the problems with anchoring and adjustment. Group calibration remained poor despite any form of debiasing, and only warnings about anchoring and adjustment reduced overconfidence significantly.

"CASES IN DECISION TREES FOR PROBABILISTIC FORECASTING: POSTAL AUTOMATION AND CORPORATE DIVISION PLANNING"

Jacob W. Ulvila
Decision Science Consortium, Inc., 7700 Leesburg Pike, Suite 421, Falls Church, VA 22043

Two actual applications of decision trees for probabilistic forecasting will be presented. One is an analysis of a decision by the US Postal service to invest $350 million in automation equipment to be used in conjunction with a nine-digit ZIP code for business mailers. The other is the use of decision trees to forecast sales, earnings, returns on investment, and other financial variables for a major division of a large corporation.

Session TD3 THURSDAY
DALTON 4:00-5:30

WEATHER FORECASTING

Chair: Allan H. Murphy
Department of Atmospheric Sciences, Oregon State University, Corvallis, OR 97331

"SEVERE WEATHER FORECASTING"

Frederick P. Ostby
National Severe Storms Forecast Center, National Weather Service, Kansas City, MO 64106

The National Severe Storms Forecast Center is responsible for the issuance of severe weather watches for the continental U.S. Because severe weather occurs on space and time scales too small to be resolved by operational numerical weather prediction models, it is necessary to employ empirical and statistical techniques and rely primarily on the skill of experienced severe weather forecasters. Hourly surface weather observations and twice-daily upper-air data provide the main data sources for diagnosing the potential for severe weather. These sources are augmented by satellite and radar data. Recently, an interactive processing system known as the Centralized Storm Information System was developed to assimilate the various data sources in a timely fashion and display them for the forecaster to manipulate. A significant improvement in verification scores has resulted from this new technology.

"LONG-RANGE WEATHER PREDICTION: LIMITS OF PREDICTABILITY AND BEYOND"

Edward S. Epstein
Climate Analysis Center, National Weather Service, Camp Springs, MD 20233

The details of the weather are not predictable beyond one to two weeks. At longer ranges, averages of the weather over space and time can be usefully predicted only to the extent that the variations of the averages exceed the "noise" produced by the omnipresent but unpredictable transient weather. This margin of potential predictability is not large, but parts of it are being exploited in routinely issued monthly and seasonal forecasts. The format and utilization of these forecasts, the methods by which they are routinely produced, and prospects for improvements will be discussed.

Session TD4 Thursday
CLARENDON 4:00-5:30

JUDGMENTAL FORECASTING

Chair: George Wright
Department of Business Studies, Bristol Polytechnic, Bristol, England B516 1QY

"JUDGMENT IN FORECASTING"
George Wright
Department of Business Studies, Bristol Polytechnic, Bristol,England B516 1QY
Peter Ayton
City of London Polytechnic, London, England

This paper provides a wide-ranging review of the role of judgment in forecasting. Our focus will be on the relative validity and applicability of judgmental forecasting across forecasting domains. We pay special attention to the situational effects of time horizon, time duration and imminence and to the subjective desirability and perceived controllability of the events to be forecast. We also evaluate evidence for the existence of consistent individual differences in forecasting ability and discuss the use of a general purpose computer aid to judgmental forecasting.

"ADAPTING TO UNPREDICTABILITY"
Amitai Etzioni,
George Washington University, Washington, D.C. 20052

In many areas of human behavior it is impossible to forecast with sufficient degree of precision to be of value other than for heuristic purposes. Forecasting in these areas may virtually cause damage because it provides false sense of knowing the future. Once the inability to forecast in these areas is truly accepted, highly productive lessons for behavior toward the future arise. E.g., hedging one's bets; factioning decisions. Nine such rules will explicated.

"OBJECTIVE AND SUBJECTIVE ASSESSMENTS OF UNCERTAINTY IN ORGANIZATIONAL ENVIRONMENTS"
Pamela H. Church
Fogelman College of Business and Economics, Memphis State University, Memphis, TN 38152

For at least two decades researchers have attempted to measure the uncertainty inherent in the market, financial, technological, and socio-political environments of firms. Essentially, two types of assessment tools have been employed in this task: (1) subjective measures determined form executives' perceptions as reported in questionnaires and (2) objective indexes of environmental volatility calculated from financial statement data. This paper evaluates the two types of uncertainty measures. Evidence from a research project utilizing both types of assessment tools provides the basis for this comparative analysis.

Session TD5
BERKELEY

Thursday
4:00-5:30

FORECASTING MODELS IN MARKETING: STATE-OF-THE-ART EXAMPLES

Chair: Glen Urban
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139

"THE EFFECTIVENESS OF MANUFACTURERS' COUPONS"

John D.C. Little
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139

The effect of manufacturers' cents-off coupons as delivered by free standing inserts contained in daily and Sunday newspapers can be measured by forecasting household purchases in the absence of receiving coupons. The difference between actual and predicted sales after a coupon drop provides an estimate of the effect. Customer purchases prior to the drop are modeled as multinomial logit and calibrated on historical panel data for individual households.

"PRELAUNCH FORECASTING OF NONDURABLE CONSUMER PRODUCTS: A FIFTEEN YEAR SUCCESS STORY AND SOME NEW DEVELOPMENTS"

Steve Gaskin, Ann Lee
Information Resources, Inc.

Since the early 1970's, the marketing research industry has developed services to forecast the sales and market share of new consumer non-durables. These services identify failures at an early stage - thus saving millions of dollars in potential losses. They also provide diagnostics to improve the new products and maximize their chances for success. We will provide an overview of the leading methodologies used, an assessment of their accuracy and their value to clients. We will also outline some of the latest research and development as an indication of future directions for the forecasting industry.

"PRELAUNCH FORECASTING OF NEW AUTOMOBILES"

Glen Urban, John Hauser
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139
John Roberts
Australian Graduate School of Business, Sydney, New South Wales, Australia

A prelaunch forecasting model and measurement system for marketing planning is proposed and applied in the automobile market. Especially challenging factors included in the model are: active search by consumers, dealer visits, word of mouth communication, magazine reviews, and production constraints. We describe a topline forecasting model and the measurement system to support it. Evolution to a more detailed consumer flow model is outlined and we demonstrate how the models were used by managers. Comparisons of model predictions and actual results are made.

Session TD6
HAMPTON

Thursday
4:00-5:30

DIAGNOSTIC JUDGMENT: SOME INCONSISTENCIES WITH NORMATIVE FORECASTING MODELS

Chair: Jay Christensen-Szalanski
Department of Management Sciences, University of Iowa, Iowa City, IA 52242

"CLINICAL INTUITION AND DECISION ANALYSIS IN MEDICAL DIAGNOSIS"

Arthur S. Elstein
Medical Decision Making Program, Center for Educational Development, University of Illinois at Chicago, Chicago, IL 60680

Physicians' intuitive decisions concerning estrogen replacement therapy for menopausal women were compared with those decisions reached through formal decision analysis and subjective expected utility models. Physicians' intuitive decisions displayed strong preferences either for or against treatment with little indecision. However, the decision analytic and subjective expected utility models prescribed a large numbers of treatment "toss-ups". The lack of physicians' indecision appeared to be caused by their use of a common heuristic: decision by the most important attribute -- risk of cancer.

"PRIMACY EFFECTS IN DIAGNOSTIC JUDGMENT AND SUBJECTIVE FORECASTING"

J. Frank Yates
Department of Psychology, University of Michigan, Ann Arbor, MI 48104

Consensus among professional diagnosticians' judgments is surprisingly low. This is due at least partly to differences in the reliance upon various diagnostic cues. The present research suggests that these phenomena are manifestations of primacy effects in the formation of judgment policies. Several experiments showed that both contingency judgments and diagnoses of hypothetical diseases exhibited strong primacy results. Most often the contingency judgment effects were found to result from attention decrement, whereby attention to relevant information is diminished after the first few cases are observed. Interestingly, primacy effects on diagnoses persisted even after they were eliminated from contingency judgments.

"USING PATIENTS' PREFERENCES TO MAKE MEDICAL DECISIONS: SOME PROBLEMS, SOME SOLUTIONS, AND SOME MORE PROBLEMS"

Jay Christensen-Szalanski
Department of Management Sciences, University of Iowa, Iowa City, IA 52242

Several quantitative methods such as decision analysis, cost-benefit analysis, and risk-benefit analysis are being advocated to prescribe the "optimal decision" for a patient or policy maker in medical contexts. The accuracy of these prescriptions greatly depends upon the accuracy of the patients' preferences and subjective description of their health status. This paper first summarizes research on patients' preferences and subjective descriptions of their health problem and concludes that such measures can often be highly unreliable. While citing the usefulness of these quantitative techniques, the paper shows how cost-benefit or decision-analytic approaches can be inconsistent with how individuals actually make decisions and incompatible with how individuals ethically believe decisions should be made.

Session TD7
BEACON A

Thursday
4:00-5:30

MARKET SHARE FORECASTING

Chair: Rod Brodie
Department of Business Administration, University of Canterbury, Christchurch 1, New Zealand

"ALTERNATIVE METHODS OF FORECASTING MARKET SHARE"

Michael D. Geurts
Brigham Young University, Provo, Utah 84602

In marketing, the measure often used to evaluate a product's success or the success of a marketing programme is the share of the maket obtained. Many times marketing managers prefer a forecast of market share rather than actual sales. Prior publishcd forecasting research has focused exclusively on forecasting actual values rather than market share values. This paper critically examines the various methods of forecasting market share. It explores some new models which use consumer preference data to forecast market share for both new products and currently existing products. The forecasting accuracy of the various models is examined using holdback samples.

"MARKET SHARE FORECASTING USING SEGMENTATION"

Rod Brodie, Charles Lamb
Department of Business Administration, University of Canterbury, Christchurch 1, New Zealand

While it may be expected that a market segmentation approach leads to more accurate aggregate market share forecasts there is little empirical evidence to support this expectation. This paper develops a conceptual framework for incorporating market segmentation methods and examines alternative research approaches. Some preliminary reults are reported from a study which compares segmentation and aggregate methods to forecast audience share for commercial radio.

"A MATHEMATICAL PROGRAMMING MODEL FOR MARKET SHARE PREDICTION"

Muhittin Oral, Ossama Kettani
Faculté des sciences de l'administration, Université Laval, Ste-Foy, Quebec, CANADA G1K 7P4

The primary objective of multiattribute models in marketing is to discover the way consumers make their choice among available alternative products. The multiattribute models proposed for this purpose can be grouped into two classes: (i) models based on mathematical programming techniques, and (ii) models based on statistical techniques. In this study we will concentrate only on the mathematical programming methods of estimation in general and on a new market share prediction model in particular. The main feature of the proposed model is that it recognizes the dependence of attribute weights on attribute scores through a step function. The predictive ability of model is discussed via a hypothetical numerical example.

Session TD8
BEACON B

Thursday
4:00-5:30

EXPERT SYSTEMS APPLICATIONS

Chair: Timothy A. Davidson
Temple, Barker & Sloane, Inc., 33 Hayden Avenue, Lexington, MA 02173

"FROM QUANTITATIVE TECHNIQUES TO THE EXPERT SYSTEM IN SALES FORECASTING"

Federico Garriga, Jaime Ribera, Joaquin Villa
ETSEIT, Universitat Politecnica de Catalunya, Spain

Applications of ARIMA modeling are well documented. Transfer function modeling surfaced at the same time as ARIMA modeling did, yet applications of this more powerful method are not as prevalent. This paper discusses an expert system approach to modeling transfer functions. We introduce the algorithm and apply it to several of the now classical transfer function examples.

"SIBYL/RUNNER, THE EARLIEST EXPERT FORECASTING SYSTEM"

Timothy A. Davidson
Temple, Barker & Sloane, Inc., 33 Hayden Avenue, Lexington, MA 02173

Although today SIBYL/RUNNERs forecasting techniques appear to be dated, Makridakis and Wheelwright produced in 1973, a suite of BASIC language routines that have, in many respects, characteristics of today's expert forecasting systems. Like an expert advisor SIBYL questions the user about the nature of the given data. More examples of expert system characteristics include the extensive use of prose versus computer talk, and the helpful way SIBYL/RUNNER suggests to the user the appropriate sequence of steps in time-series analysis. The speaker will conclude with an outline of the "son of SIBYL" designed for forecasting practitioners in the 1990s which embodies the expertise of this decade's research.

Session TD9
BEACON C

Thursday
4:00-5:30

MACROECONOMIC FORECASTS

Chair: Willem Voorhoeve
Econometrics Institute, Groningen University, PO Box 800, 9700 AV Groningen, The Netherlands

"A COMPARATIVE ASSESSMENT OF U.K. MACROECONOMIC FORECASTS"

J.D. Whitley
ESRC Macroeconomic Modelling Bureau, University of Warwick, Coventry, England

This paper considers the comparative performance of the major UK macroeconomic forecasts made in 1983 and 1984. A distinctive feature of this study is the breakdown of forecast error into its various components: exogenous variable error, judgmental error and model error. Data revision problems are discussed and the performance of model-based forecasts against mechanical forecasts is also assessed. Consideration is given as to the extent to which it is possible to combine the forecast errors on the main macroeconomic variables for each of the models to give an overall measure of forecast performance.

"THE ACCURACY OF MACROECONOMIC FORECASTS USING AN ECONOMETRIC MODEL"

Willem Voorhoeve
Econometrics Institute, Groningen University, PO Box 800, 9700 AV Groningen, The Netherlands

In order to get an idea of the prediction ability of an econometric model one can investigate how this model has or would have predicted in the past. Another approach is to generate prediction intervals instead of point predictions, using the estimated standard deviations of the predictions. In this paper the results are presented of application of both approaches mentioned, using the GRECON model, a forecasting model for the main Dutch macroeconomic quantities. Before the results are presented, an outline is given of possible causes of prediction errors, when using an econom(etr)ic model.

"USING A RATIONAL EXPECTATION MODEL IN FORECASTING"

S.G.B. Henry
National Institute of Economic and Social Research, London, England

The National Institute has derived a fully specific macro econometric model with heavy emphasis on forward-looking expectations formation in wages, employment, stockbuilding, investment and the exchange rate. There are important issues in using such a model for regular forecasting including solution technique, the nature of end point conditions, and policy assumptions. This paper reviews how the National Institute has attempted to deal with these problems in a practical forecasting situation

Session TD10
BEACON F

Thursday
4:00-5:30

FORECASTING AND PRODUCTION

Chair: Lois D. Etherington
Faculty of Business Administration, Simon Fraser University, Burnaby, British Columbia, CANADA V5A 1S6

"FORECASTING OF PRODUCTION PROCESSES IN AN ACTIVE LEARNING FRAMEWORK"

Arye Sadeh, David A. Bessler, Wade L. Griffin, Hovav Talpaz,
College of Agriculture, Texas A&M University, College Station, TX 77843

Production levels defined as a vector of state variables with nonlinear transfer functions are estimated and forecasted for an entire planning horizon. While some components are observed with errors, other are unobserved, except at the end point of the production process. The effort needed at each point of time for estimation and the forecasting is determined as a control variable. Updating of forecasts is performed at each decision point in an active learning framework of optimizing the economic unit's performance subject to partial information. When more than one production process exists, the information from all processes is aggregated. The case study for this work is a management model of a shrimp pond farm.

"SYSTEM TRANSFORMING INNOVATIONS: ATTRIBUTES PREDICTING SUCCESS"

Lois D. Etherington
Faculty of Business Administration, Simon Fraser University, Burnaby, British Columbia, CANADA V5A 1S6

This study examines the prediction of success of implementing innovations in organizations, using as examples the adoption and utilization of two innovations in an automobile plant - Quality of Work Life and Statistical Process Control. The study extends previous work by distinguishing a meta attribute of innovation; those that are "system maintaining" and those that are "system transforming". The study found that the five innovation attributes of the classical diffusion model, which have been widely predictive of adoption of innovations, did not predict adoption of system transforming innovations. The paper concludes with five propositions for improving forecasting success for system transforming innovations.

"MEASUREMENT AND INTERPRETATION OF TOTAL FACTOR PRODUCTIVITY"

Neal C. Stolleman
GTE Service Corporation, One Stamford Forum, Stamford, CT 06904

It is well known that changes in observed total factor productivity (TFP) may reflect the indexing method used to construct input and output aggregates. This paper investigates additional sources of variation in observed TFP measures: 1) the degree to which input price changes are unanticipated, and 2) the divergence between ex-post and ex-ante production frontiers. These sources of variation are examined and sorted out analytically in order to show how they can bias the interpretation of TFP.

Session TD11
BEACON G

Thursday
4:00-5:30

FORECASTING COSTS

Chair: Frederick P. Biery
The Analytical Sciences Corporation, 1700 N. Moore St., Suite 1220, Arlington, VA 22209

"FORECASTING MATERIAL COSTS FOR MAJOR AEROSPACE AND DEFENSE CONTRACTORS"

James M. Caltrider
University of San Diego, San Diego, CA 92110

Award of a major contract brings with it enormous management control and reporting requirements. Effective, accurate budgeting and control depend upon the ability to accurately forecast the timing and the magnitude of labor and material expenditures. At first glance, the process of developing ongoing forecasts of the magnitude and timing of material cost incidence for contracts that the firm has already been awarded, would seem to be a simple matter. However, the author's experience in working with major aerospace and defense contractors over several years indicates that this problem is far more complex than it sounds.

"UNCERTAINTY IN ADVANCE TECHNOLOGY SYSTEM COST ESTIMATING"

Frederick P. Biery
The Analytic Sciences Corporation, 1700 N. Moore St., Suite 1220, Arlington, VA 22209

This paper examines the magnitude and sources of error in advance technology, mainly military, cost estimates. It also examines the methods used to forecast the costs of advance technology products and the analytic approaches used to assess the cost and schedule risks of large complex projects.

"IMPROVING YOUR ROUND OF GOLF STOCHASTICALLY -- WITH IMPLICATIONS FOR COST ACCOUNTING AND OPERATIONS MANAGEMENT"

A. Wayne Corcoran
Baruch College, City University of New York, New York, NY 10010

This paper focuses on performance stimulation, and the sport of golf is used as vehicle for the modelling. The theory that is developed is meaningful for POM and cost accounting as well as sports. The modelling relies on stochastic methods including convolutions, Markov chains, and Bayesian sampling. Initially emphasis is on the individual; later, through the use of convolutions, the modelling is extended to groups. The notion that a person's progress always follows a smooth curve is discarded; instead variability of performance is posited with the notion that humans are not always at their best. It is suggested that strategy should be modified to suit current capabilities rather than assuming ideal performance.

Session TD12
BEACON H

Thursday
4:00-5:30

TIME SERIES MODELS

Chair: Gregory B. Hudak
Scientific Computing Associates, Lincoln Center, Suite 106, 4513 Lincoln Ave., Lisle, IL 60532

"INFERENCE IN DYNAMIC MODELS CONTAINING 'SURPRISE' VARIABLES"

Richard T. Baillie
Department of Economics, Michigan State University, East Lansing, MI 48824

Some new results on calculating moving average representation (MAR) coefficients and their limiting distribution from estimated vector ARMA processes are presented. The technique is applied to the problem of estimating the coefficients of unanticipated or 'surprise' variables in a single equation for a multi period expectations horizon. The method naturally, conditions the expectations on all past values of the process and avoids the necessity of using two step regression procedures and adjusting the resulting standard errors. A numerical example is presented with a VAR(2) model being estimated on the spot exchange rate, the 90 day forward rate and Eurobond interest rate differential for the U.S./West German weekly data.

"FORECASTING DISJOINT STRUCTURES WITH STOCHASTIC COEFFICIENT MODELS"

J. Thomas Yokum
DePaul University, Chicago, IL 60604
Albert R. Wildt
University of Missouri, Columbia, MO

Disjoint data structures are patterns where shocks in the external environment lead to permanent or temporary changes in the data structure. If the shock occurs during the forecasting horizon, the forecasts may widely vary from realized values. Even though it is difficult to know the timing of market shocks, a forecasting system is needed that can discount possible shocks and still maintain adequate accuracy. A suggested methodology is stochastic coefficients. A common market response model (partial adjustment) is used with varying coefficients (AR1 and random) and applied to frequently purchased brands where the structure has changed after the forecast is made.

"MODELING CONSIDERATIONS IN THE PRESENCE OF CALENDAR VARIATION"

Gregory B. Hudak
Scientific Computing Associates, Lincoln Center, Suite 106, 4513 Lincoln Avenue, Lisle, IL 60532

This paper discusses how forecasts can be improved when calendar variation is presented in a time series. Monthly time series are often subject to variation due to trading day and holiday effects. This paper presents some simple schemes that can be employed in modeling such series and demonstrates the techniques on real data using the SCA Statistical System.

Session TD13
LIBERTY A

Thursday
4:00-5:30

FORECASTING METHODS

Chair: F.A. van Vught
Department of Public Administration, Rijksuniversiteit te Leiden, 2311 GJ Leiden, The Netherlands

"THE RATIONAL FOUNDATIONS OF FORECASTING METHODOLOGIES"

F.A. van Vught, P.M. van der Staal
Department of Public Administration, Rijksuniversiteit te Leiden, 2311 GJ Leiden, The Netherlands

In a critical rationalist view of scientific progress, newly discovered or constructed theories and hypotheses should, in order to be considered as scientific products, in principle be testable empirically. Whereas products of scientific forecasting cannot be tested a priori, only the procedures and inferences leading to the forecasts can be subject to a meaningful test. This paper aims at a critical analysis of the set of rationally reconstructable forecasting techniques in order to evaluate the rational foundations of these techniques.

"FORECASTING WITH MINI MAX CURVE FITTING"

William C. Conley
School of Business, University of Wisconsin-Green Bay, Green Bay, WI 54302

Mathematical forecasting has been dominated by the least squares theory ever since its development. Other curve fitting techniques such as least absolute deviation (which minimizes the sum of the absolute values of the error terms) and mini-max are intuitively appealing. Mini-max fits the curve from a family of functions in which the maximum absolute error is a minimum. Mini max curve fitting is something of a compromise between least absolute deviation and least squares. A new computer mathematics algorithm called multi stage Monte Carlo optimization will be used to fit mini-max curves. Comparisons of the three techniques will be made.

"A COMPARISON OF TRACKING SIGNALS"

Xianchun Ding and Jochen Schwarze
Abteilung Statistik und Operations Research, Technische Universitat Braunschweig, Postfach 3329, D-3300 Braunschewig, Federal Republic of Germany

This paper gives a comparison of several tracking signals. To measure the sensibility and noise-identifying-ability of a tracking signal some criteria are proposed. For each of the researched tracking signals some expressions concerned with these criteria are then developed. They show the effection of system parameters to the above properties. Some qualities of tracking signals, which may help us to understand how a tracking signal reacts when system changes, are also derived. And with these expressions a comparison among the researched tracking signals is made. With the help of this comparison several suggestions are given, which are necessary when one will judge or select one from a group of tracking signals.

APPLICATIONS

Chair: Jukka Lassila
The Research Institute of the Finnish Economy, Lonnrotink 4-B, SF00120 Helsinki, Finland

"SHORT-TERM FORECASTING OF BUILDING CONSTRUCTION"

Pekka Ilmakunnas, Jukka Lassila
The Research Institute of the Finnish Economy, Lonnrotink 4B, SF00120 Helsinki, Finland

The model presented here is used in regular business cycle forecasting at the Research Institute of the Finnish Economy. Buildings are classified by intended use into 10 categories. The model consists of two blocks. In Block I, quarterly forecasts for the amount of started building works are made, using ARIMA- models and investment functions. In Block II the volume of building construction is forecast, using building starts as input. Comparisons are made with ARIMA-forecasts of volume. It is also tested whether the division of building process into these two blocks is justified. The issue of forecast aggregation is also addressed.

"MONTHLY FORECASTS FOR JAPANESE STEEL PRODUCTION"

Sidnei Guimaraes
Companhia Vale do Rio Doce, Av. Graca Aranha 26, 20005 Rio de Janeiro - RJ, Brazil

The purpose of this work is to present the obtained results with the Brown Adaptive Method applied to forecast the Japanese monthly steel production from 1984 to 1986. This methodology was developed in 1980 at the Catholic University of Rio de Janeiro. The process consists of filtering and forecasting a time series by multiple exponential smoothing where the nonseasonal parameters and seasonal factors are sequentially updated in time. At the moment the Japanese Steel Series have more than ninety observation and mean absolute error of the forecasts produced by the method is consistently less than 5%.

"FUTURE INVESTMENT PATTERN OF INDIAN HOUSEHOLDS: A MARKET RESEARCH"

Biswa N. Bhattacharyay
National Institute For Training In Industrial Engineering, Bombay, 400 087, INDIA

Of late, the rate of growth of deposits in Indian Commercial banks has not matched the growth rate of domestic savings rate. If this trend continues, banks will find it difficult to meet the credit obligation fully and this in turn may affect the economic development of the country. This paper attempts to project the pattern of households' investment into physical and financial assets along with the reasons behind these investments which would enable banks to formulate marketing strategies for deposit mobilization. The analysis is based on an anticipatory market survey of 40,000 urban households.

"A COMPARISON OF BOX-JENKINS TIME FORECASTS TO PRELIMINARY MILK PRICE ESTIMATES"

Ben Klugh, Jr., John Markham
U.S. Dept. of Agriculture, NASS, 14th and Independence Ave., S.W. Room 4801, Washington, D.C.

Forecasts for 1979 through 1983 from Box-Jenkins time series models outperformed the preliminary milk price estimation procedure in five States and was competitive at the national level. One-month-ahead forecasts for the 60-month period possessed average absolute forecast errors of less than 1 percent. The model forecasts were closer to the final estimate or the same as the preliminary estimate 650 times out of 900 State forecasts. This modeling technique could be used to replace or supplement the current preliminary milk price estimation procedure.

TELECOMMUNICATIONS FORECASTING

Chair: Janice Wojnar
Bellcore, 290 W. Mt. Pleasant Ave., Livingston, NJ 07039

"FOCUS ON FORECASTING TOOLS"

Steven H. Capes
Indiana Bell Telephone Co., 220 N. Meridien St., Room 1422, Indianapolis, IN 46204

When developing forecasts or budgets, a large portion of one's time must be spent in developing the baseline data and manually inputting it into a forecast model - or does it? Time is wasted and the data must be edited for input errors. All of this is expensive. The Advanced Language Functional Accounting (ALFA) system has been developed to complement the systems which build the actual database and which generate forecasts/budgets through locally designed models. Through use of 4GLs, flexibility has been provided without jeopardizing security.

"EXPERT SYSTEMS - ITS APPLICATION TO TELECOMMUNICATIONS FORECASTING"

Andrew J. Pryde
British Telecommunications plc, C613, BT Centre, 81 Newgate St., London EC1A 7AJ, England

The devolution of some forecasting activity has led to a significant increase in the number of personnel who are now required to use econometric and other quantitative techniques to produce operational forecasts of a wide range of business variables, such as demand for connections, traffic and products. Whilst significant specialist support remains at corporate level, there has been a requirement to substantially raise the awareness and technical competence of District personnel in a relatively short time. This paper highlights the benefits which expert systems technology can bring as well as pointing to some of its limitations. By way of illustration, reference is made throughout to an econometric modelling expert system intended to promote awareness among British companies of the potential uses of fifth generation computer technology.

"FORECASTING SUBSTITUTIONS FOR TELEPHONE SWITCHING SYSTEMS"

Elaine M. Keramidas, Jack C. Lee, Keh-Wen Lu
Bell Communications Research, Inc., 435 South Steet, Room 2Q374, Morristown, NJ 07960

In Lee and Lu (1987), improvements in forecasting substitutions by using a family of data-based transformed (DBT) models were shown via several data sets. However, this family of models and those compared against (Fisher and Pry, 1971; Gompertz, 1825; Sharif and Islam, 1980; and Stapleton 1976) are not adequate when the number of time points is small. In this paper the efficacy of the DBT models in forecasting substitutions for telephone switching systems is established. The paper then focuses on the problem of forecasting substitution when there only a few time points available. A multivariate model that utilizes repeated measurements is presented. The improvement in forecasting power by using this model is demonstrated with two sets of telephone switching data.

"THE USE OF SPLINE FUNCTIONS IN PRODUCTIVITY ANALYSIS AND FORECASTING"

Francis S. McGowan
Alberta Government Telephones, 1-9c, 10020-100 St., Edmonton, Alberta T5J ON5, CANADA

Spline functions can be useful in connection with the decomposition formulas of total factor productivity analysis. This paper shows how spline functions can be used to produce smoother, more consistent productivity decompositions with smaller discretization error. The standard properties of spline functions are reviewed. It is then shown that the use of these functions in computing the decomposition gives results with smaller discretization error. These results are illustrated by recomputing the productivity gain decomposition for Alberta Government Telephones.

SYSTEM DYNAMICS - ADVANCES AND APPLICATIONS

Chair: R.J. Rahn
Sciences de l'administration, Université Laval, Ste-Foy, Québec, CANADA G1K 7P4

"FORECASTING FOR SYSTEMS CONTAINING STATE VARIABLES THAT ARE CONTINUOUS MARKOV PROCESSES"

Foster Morrison
Turtle Hollow Associates, Inc., PO Box 3639, Gaithersburg, MD 20878-0639

One or more state variables in most "real world" systems behave like continuous Markov processes. Such variables are predictable for awhile and often tend to look deceptively like cycles. Attempts to use state variables methods to model actual systems will fail, because they cannot be linearized and so it is not possible to perform multiple regressions to adjust parameters or initial conditions. Successful forecasting requires that Markovian state variables be replaced with statistical variables, so that the mathmatical model becomes "deterministic." Often a change of variables is needed to optimize the separation of "deterministic" and Markovian state variables.

"A POLICY TO IMPROVE DEFENSE BUDGET PLANNING"

Rolf Clark
Department of Engineering and Applied Science, George Washington University, Washington, DC 20052

Historical data has highlighted relationships important to defense budgeting: Ownership funds (which depend on force levels) are stable while acquisition varies with budget changes. Unit costs growth depends on austerity of budgets . . . and on whether the growth is in planned budget estimates or in contracted costs. Such relationships, incorporated in a system dynamics model relating ownership and acquisition appropriations under fairly predictable fiscal constraints, can improve the budget process if augmented by external overview of aggregated categories in the Five Year Defense Plans – and review of major system cost estimates. Suggested congressional and administration actions, plus the methodology, are presented.

"FORECASTING LONG RUN DEMAND FOR TOURISM SITE DEVELOPMENT"

Richard G. Fritz
Department of Economics, University of Central Florida PO Box 25000, Orlando, FL 32816

Historically, tourism development studies have focused on economic impacts, neglecting non-economic effects. In previous work, a system dynamics model of the commodity production cycle of a tourism site was developed. This work reports on extensions of this model to incorporate a more complete treatment of the demand side of the system.

PROBABILITY ASSESSMENT AND MODELING

Chair: Robert T. Clemen
College of Business Administration, University of Oregon, Eugene, OR 97403

"THE RELIABILITY OF SUBJECTIVE PROBABILITIES OBTAINED THROUGH DECOMPOSITION"
H.V. Ravinder
R.O. Anderson School of Management, University of New Mexico, Albuquerque, NM 87131
Don N. Kleinmuntz
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139
James S. Dyer
Department of Management, University of Texas at Austin, Austin, TX 78712

The use of decomposition as a procedure for improving the consistency of subjective probability encoding is discussed. Using a psychometric measurement model, an expression is developed that describes the random error associated with decomposition estimates as a function of characteristics of the component assessments. Decomposition is compared to direct assessment in terms of the percent change in measurement error that can be attributed to the use of decomposition. The results are derived for the case of independent elicitation errors and for the more general case of dependent errors. Potential benefits of decomposition are specified and recommendations made on how to utilize decomposition as an approach for error control.

"ON THE INCREMENTAL INFORMATION CONTAINED IN ECONOMETRIC FORECASTS OF US GNP"
John Guerard
College of Business and Economics, Lehigh University, Bethlehem, PA 18105
Robert T. Clemen
College of Business Administration, University of Oregon, Eugene, OR 97403

The GNP forecasts used by Clemen and Winkler (1986) are combined with a naive time series model to examine the incremental information within individual and composite econometric forecasts. Latent root regression is used to examine the forecast multicollinearity problems. Stepwise regression is studied as a method for selecting among forecasters.

"THE USE AND VALUE OF WEATHER FORECASTS"
Barbara Brown, Richard W. Katz
National Center for Atmospheric Research, Environment & Societal Impacts Group, PO Box 3000, Boulder, CO 80307
Allan H. Murphy
Department of Atmospheric Sciences, Oregon State University, Corvallis, OR 97331

Weather forecasts are formulated and issued on an operational basis, and they are used to make many different types of decisions. In addition, verifying observations are consistently available so that the quality of weather forecasts can be easily evaluated. Hence, weather forecasts are ideally suited for studies of the use and value of forecasts. In order to investigate weather forecast use and value in a decision-analytic framework, one must first model and describe the forecasts, actions, and outcomes of interest. A case study of the so-called fallowing/planting problem is presented in which these components are described, and the relationship between forecast quality and forecast value is investigated.

"THE VALUE OF FREQUENCY CALIBRATION"
Robert T. Clemen
College of Business Administration, University of Oregon, Eugene, OR 97403
Allan H. Murphy
Department of Atmospheric Sciences, Oregon State University, Corvallis, OR 97331

A Bayesian model is developed to calculate the value of calibrating a forecaster on the basis of his historical performance. This model is applied to weather forecasters and their probability forecasts of precipitation. The model also leads naturally to a discussion of the process through which probability forecasters learn to be better forecasters.

COMBINING FORECASTS

Chair: G. Anandalingam
Department of Systems Engineering, University of Virginia, Charlottesville, VA 2290

"COMBINING FORECASTS USING MULTI-ATTRIBUTE VALUE THEORY"

G. Anandalingam
Department of Systems Engineering, University of Virginia, Charlottesville, VA 22901

The vast majority of the literature on combining forecasts is based on minimizing a single criterion: error variance of the combined forecasts, or minimum absolute percentage error. A decision maker may have different preferences for positive versus negative errors, depending on his utility (loss) function. We provide a method based on multi-attribute value theory for combining forecasts with respective to multiple error types. We analyze cases where there is imprecise information on the preferences for the error types, and give results for different functional forms of the decision maker loss functions.

"FORECAST COMBINATION UNDER ECONOMIC CONSTRAINTS AS A FORECASTING TECHNIQUE"

André Keller
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Quarterly economic forecasts may be obtained by means of a combination of forecasts upon related economic indicators. However, the results must satisfy the usual economic constraints, within a national accounts framework. A simplified national accounts framework is taken. The indicators are projected by Box-Jenkins techniques and will give several forecasts for each macroeconomic variable. Thereafter, a solution is found to two main difficult issues: firstly, the combination of forecasts for each macroeconomic variable; secondly, the implication of the usual accountancy relations and identifies.

"COMBINING FORECASTS IN ROAD TRANSPORTATION INDUSTRY"

Jean Couillard
Faculty of Administration, University of Ottawa, 275 Nicholas, Ottawa, Ontario K1N 6N5, CANADA
Gilles R. d'Avignon
Sciences de l'administration, Université Laval, Ste-Foy, Quebec, PQ G1K 7P4, CANADA

Accurate demand forecasting is essential in vehicle fleet capacity planning since demand often varies significantly from day to day, from week to week, month to month, and even from year to year. This paper proposes a methodology for aggregating subjective and objective forecasts, assumed to be lognormally distributed, in order to obtain a final forecast with lower variance. The distribution of the final forecast is studies through a FORTRAN code and the observations thus obtained are discussed.

OBTAINING JUDGMENTS FROM GROUPS

Chair: J. Scott Armstrong
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

"RELATIONSHIP BETWEEN DELPHI ACCURACY, SELF-RATINGS AND VARIABILITY"

Frederick Parente, Janet Anderson-Parente
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This study correlated Delphi panelists' perceived expertise with the accuracy of their predictions. The variability of opinion among 50 groups of 10 subjects each, was also correlated with two measures of accuracy for short-term (two month) "world events" occurences. Instructing half of the groups only to predict scenarios about which they felt confident significantly reduced accuracy contrary to previous findings. Response variability, our measure of consensus, was unrelated to either measure of accuracy regardless of group membership.

"THE APPROPRIATE USE OF THE DELPHI TECHNIQUE AS A FORECASTING TOOL"

Floyd G. Willoughby
School of Business Administration, Oakland University, Rochester, MI 48063
Diane Kasunic
Corporate Planning and Development, Ameritech Publishing Inc.

The Delphi technique is a sequential questionnaire-feedback, opinion survey technique for systematically obtaining the judgments of a group of experts (Huber, 1980). There has been renewed interest in the Delphi technique as turbulent international and domestic environments are fostering increasingly more rapid and unpredictable changes within most industries. Historical data are becoming less useful for predicting future events. Thus accurately predicting changes within industries is rapidly becoming the key task in developing competitive strategies. Using two actual studies as examples, recommendations are made as to the most appropriate use of the technique and realistic expectations for the method. Panel selection, comparisons of panels, and operational problems to be avoided are discussed.

"ROLE PLAYING VERSUS UNAIDED OPINIONS IN THE PREDICTION OF THE OUTCOME OF CONFLICT SITUATIONS"

J. Scott Armstrong, Philip Hutcherson
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

Role playing and unaided opinions were used to forecast the outcome of two conflict situations. One situation involved the attempt by the Dutch government to end a support program for artists; the other situation involved the contract negotiation between the editors of the Journal of Forecasting and their publisher, John Wiley. Predictions were made by 92 subjects who worked in pairs and were randomly assigned to use role playing or unaided opinions. Role playing yielded more accurate predictions; Ten of the 32 role playing pairs (31%) correctly predicted the actual outcome, while only three of the 35 opinion pairs (9%) were correct. This difference in predictive ability is statistically significant ($p < .01$).

FORECASTING DEMAND FOR NEW PRODUCTS

Chair: Ronald S. Rubin
College of Business Administration, University of Central Florida, Box 25000, Orlando, FL 32816

"MARKET FORECASTING FOR A SMALL TECHNOLOGY-BASED FIRM: A CASE STUDY OF AN INTELLIGENCE GATHERING METHODOLOGY"

Ronald S. Rubin
College of Business Administration, University of Central Florida, Box 25000, Orlando, FL 32816

One of the first steps in the development of a marketing strategy for a new product is to estimate its market potential for defined markets. This paper discusses one such approach, intelligence-gathering forecasting, using a case study of a high-tech firm for determining the market potential for a new communications device for selected market segments. The methodology presented provides for an estimate of market potential for high-tech products, in general, using intelligence-gathering methods when information from usual sources are not available or are not adequate for the given situation at hand.

"CURRENT STATUS AND FUTURE OF STRUCTURAL PANELS IN THE WOOD PRODUCTS INDUSTRY"

Henry Montrey
Forest Products Laboratory, USDA Forest Service, 1 Gifford Pinchot Drive, Madison, WI 53705-2398
James M. Utterback
Massachusetts Institute of Technology, 292 Main Street, Cambridge, MA 02139

The technical, manufacturing, economic and policy considerations which are shaping innovation in structural wood panels will be briefly examined. A model of the substitution of newer panel forms for plywood, done in 1980 when market penetration was about 3 percent, will be presented. More recent data will be used to reexamine the model and validity of the Fisher-Pry technique in this instance.

FORECASTING DEMAND FOR A NEW SERVICE/TECHNOLOGY"

Diana Davis
Seattle, Washington

Demand forecasts for cellular radiotelephone were required in the applications placed before the Federal Communications Commission during licensing competition. With the exception of a few small test markets, the service was not yet in use, and had received limited publicity. Since cellular telephone was quite different from existing technology, our demand model could depend on conventional approaches to demand modeling only in part, and had to satisfy the client and F.C.C. reviewers. Our multidisciplinary team combined original market research, statistical modeling, and demographic and business data from federal sources with a market penetration curve based on recent research in the broader field. The demand model and the resulting projections satisfied our clients, their technical staff, and F.C.C. reviewers.

FORECASTING: MODELING AND EVALUATION

Chair: Victor E. McGee
Amos Tuck School of Business Administration, Dartmouth College, Hanover, NH 03755

"THE OWL AND THE M COMPETITION: PART I - ANNUAL SERIES"

Victor E. McGee
Amos Tuck School of Business Administration, Dartmouth College, Hanover, NH 03755

In the M Competition, the decision to automate the analyses of 1,001 time series was justified on the basis of the size of the task, but the long-term influence of the resulting conclusions warrants more careful study. Inappropriate averaging over inappropriate groupings of time series vitiates many results of the M Competition and a careful re-assessment of the results is in order. This paper deals with a reclassification (clustering) of the 184 annual series into homogeneous groupings (based on a number of criteria), and makes use of the OWL (a computerized model of argumentation) to audit the assertions that are identified with the M Competition.

"MODELLING AND FORECASTING RELIABILITY"

David A. Belsley
Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139

Four (counter) examples are used to establish the proposition that good forecasting requires a good and proper model, particularly when forecasting into situations that differ greatly from those that characterize the data upon which the model estimates are based. It is also argued that, contrary to much current opinion, it is latter activity that is the real art of forecasting. The central notion of a "good and proper" model is defined, and the process leading to its construction is examined.

"IMPLEMENTING STATISTICAL QUALITY CONTROL IN ECONOMETRIC FORECASTING EVALUATION"

Elliott H. Levy
Office of Industry Statistics, International Trade Administration, U.S. Department of Commerce, Washington, D.C.

Statistical Quality Control, SQC, a tool used to satisfy production standards, has a viable application in forecasting. Upper and lower control limits can be established for forecast error tolerances. These errors are plotted on a control chart to show variation from a line of perfect forecasts (no error). Errors within tolerances show forecast process in control and those outside indicate a lack of control. The author demonstrates how to apply the SQC method to evaluate an annual series of forecasts of commercial building construction activity.

Session FB7
BEACON A

Friday
10:00-11:30

FORECASTING USING STATE SPACE METHODS AND FORECASTMASTER

Chair: Raman K. Mehra
Scientific Systems Inc., One Alewife Place, Cambridge, MA 02140

"OVERVIEW OF FORECASTMASTER AND STATE SPACE METHODS"
Raman K. Mehra
Scientific Systems Inc., One Alewife Place, Cambridge, MA 02140

This paper will present the philosophy and structure of ForecastMaster, a software package for advanced statistical forecasting of both univariate and multivariate time series data. The State Space Forecasting Technique which is unique to the ForecastMaster package will be discussed in simple terms. A few test applications of the forecasting techniques will also be presented to illustrate the use of ForecastMaster and State Space forecasting.

"GTE OF THE SOUTH: A CASE STUDY OF END USER FORECASTING"
Murkit Hossain
GTE of the South, 4020 Roxboro Rd., Durham, NC 27702

"ELECTRIC LOAD FORECASTING IN AGCC STATES"
D.M.K. Alquobasi, Pradhu N.P. Singh
PO Box 219, Directorate of Power and Desalinization Plant, Water and Electric Dept., Adu Dhabi, UAE

As a consequence of phenomenal rise in oil price in seventies, economy of the Arab Gulf Co-operation Council states experienced unprecedented growth and electricity demand grew accordingly. The demand is mainly due to domestic load (air conditioning, etc.), and exhibits a high growth rate and also pronounced seasonal pattern with growing amplitude. In brief, the process describing the demand is non stationary and attempts to model it have proved difficult. This paper presents the results of an attempt by the authors to identify an accurate model of the process using various available recursive and non-recursive estimation techniques and findings are presented here.

"EX-ANTE FORECASTING PERFORMANCE USING A KALMAN FILTER TECHNIQUE AND A MACROECONOMETRIC MODEL OF THE U.S. ECONOMY"
Lawrence Taylor
Guidance and Control Division, NASA Langley, Hampton VA 23665
Rudeen Smith-Taylor
Investment Analysis Company, 114 Edward Wakefield, Williamsburg, VA 23185

In this paper, the Kalman filter forecast technique and model are descibed and its forecast performance is compared with that of the Wharton, Data Resources, U.C.L.A. and Chase macroeconometric models. Forecasts of inflation are seen to be most accurate for the low-order model using Kalman filter techniques. This leaves little doubt as to the advantage of using Kalman filter techniques for forecasting. Improvements to the macroeconometric model, however, are possible. Specific improvements are discussed which may lead to further improvements in the accuracy of economic forecasts.

Session FB8
BEACON B

Friday
10:00-11:30

EXPERT SYSTEMS IN ARIMA MODELLING I

Chair: Anne B. Koehler
Decision Sciences, Miami University, Oxford, Ohio 45056

Presenters:

Robert L. Goodrich
Business Forecast Systems, 170 Walden Street, Concord, MA 01742

David J. Pack
Decision Sciences, Miami University, Oxford, OH 45056

David P. Reilly
Automatic Forecasting Systems, Inc., PO Box 563, Hatboro, PA 19040

Approaches to using computer software to replace the expert's role in ARIMA modelling will be presented. The decisions that an expert makes and the problems encountered in computerizing these decisions will be discussed. In order to illustrate the concepts, the analysis and forecasting of two univariate time series (one nonseasonal and one seasonal) will be demonstrated by a human expert, and by the application of two distinct forecasting software packages which are designed to make the decisions for the user.

Session FB9
BEACON C

Friday
10:00-11:30

ECONOMIC FORECASTING

Chair: Richard K. Curtis
Department of Communication and Theater, Indiana University, Indianapolis, IN 46202

"COMPLEXITY AND PREDICTABILITY: THE APPLICATION OF CHAOS THEORY TO ECONOMICS"

Richard K. Curtis
Department of Communication and Theater, Indiana University, Indianapolis, IN 46202

Modern chaos theory, as developed by Kadanoff, et al., would classify economics as essentially chaotic. In conditions that are orderly, errors in information concerning present conditions are magnified additively in projections. But those same errors, applied to chaotic conditions, are magnified exponentially in projections. Furthermore, the further out one projects, the greater the magnification. Perhaps one of the most suspect of economic measures, presumably describing current conditions, is the Gross National Product. There are a number of reasons why this descriptor provides erroneous information concerning the economic well being of a nation. Until a more accurate measure is developed, however, projections should be relatively short and should be largely limited to "ball park" figures, involving a wide range under varying probabilities.

"SOME ASPECTS OF ECONOMIC FORECASTS IN SOFT-ORIENTED SOCIETY"

Hajime Myoken
Faculty of Economics, Nagoya City University, Yamanohata, Mizuhoku, Nagoya 467, Japan

The main purpose of this paper is to draw attention to various problems of economic forecasts arising from soft-oriented society. In this context, we discuss advantages and disadvantages of economic forecasts used in econometric and time series models, business survey and business index (DI, CI). Some empirical results are illustrated, and some aspects for use of forecasting methods are also developed.

"FORECASTING AND OPTIMIZATION: A CASE OF ENERGY PRICE AND ECONOMIC GROWTH"

Hsieh Li-Pi-I
9, Alley 24, Lane 52, Shih-wey Rd., Shih-chian College, Taipei, Taiwan, ROC

Using an energy-economic model for illustration, this study provides a new algorithm to forecast and optimize with nonlinear simultaneous equations. In the first two stages, it applies the Gauss-Seidel method to the auxiliary linear equations for the growth rates of the same variables as shown in the structural model and then to the structural model. In the third and fourth stages, it uses the predictor-corrector method to generate the next initial values. Thus it overcomes the difficulty of different initial values leading to different results.

SHORT TERM FORECASTING

Chair: Benito E. Flores
College of Business Administration, Texas A & M University, College Station, TX 77843

"OPTIMIZING THE LENGTH OF FORECASTING REGRESSIONS"

Douglas Dalrymple
Graduate School of Business, Indiana University, Bloomington, IN 47405

This study focuses on the question of whether optimizing the length of trend regressions reduces forecasting errors. Several methods for finding optimum length regressions are evaluated and the stability of these parameters is measured over time. The study also compares the accuracy of optimized regression forecasts with those prepared using naive and single and double exponential smoothing procedures. The results raise questions about whether trend regression should continue to be used in sales forecasting.

"IMPROVING THE ACCURACY OF SHORT TERM FORECASTING"

Essam Mahmoud
School of Management, University of Michigan, Flint, MI 48502-2186

Forecasters and decision makers face the question of selecting a reliable model to ensure better forecasts. Effective sales forecasting has become a prerequisite for the successful management of a company, and the necessity for accurate predictions of both unit and dollar values is increasing. A discussion of how forecasters can improve their forecasting accuracy includes consideration of issues such as monitoring the reliability of the data bases used, selecting the best parameters, anticipating environmental change, monitoring forecasting accuracy, and revising forecasts.

"AN EMPIRICAL INVESTIGATION OF A HIERARCHICAL FORECASTING SYSTEM"

C.S. Reddy, A. Dale Flowers
Department of Operations Research, Case Western Reserve University, Cleveland Ohio 44106

Managers of different levels of the organization have different forecasting needs, related to the level of aggregation of data. This need gives rise to the concept of hierarchical forecasting systems. The objective of this study was to test a methodology called "forcing", which ensures consistency among forecasts made at each level, and to investigate whether the aggregate forecast can be used to improve the forecasts at the lower levels. The methodology requires 1) obtaining independent forecasts at each level, and 2) "forcing" the lower level forecasts to total the aggregate. A large industry database was used to test the methodology.

"EXPANDING THE STRATEGIES OF FOCUS FORECASTING"

Benito E. Flores
College of Business Administration, Texas A & M University, College Station, TX 77843
D. Clay Whybark
Graduate School of Business, Indiana University, Bloomington, IN 47405 and, IMEDE, Lausanne, Switzerland

Focus Forecasting has come out of industry as a simple but effective short term forecasting technique. The methodology is based on observations on how people actually forecast sales and tries to capture their ideas. In this study, some of the basic strategies are expanded to include some additional analytical methods such as exponential smoothing (Brown, Holt and Winters). In addition, other strategies such as weighted and unweighted combinations of forecast strategies are also utilized. The Makridakis Competition data is used to test the methodology.

Session FB11
BEACON G

FINANCIAL FORECASTS IN THE STRATEGIC DECISION MAKING PROCESS

Chair: Alan Singer
Department of Business Administration, University of Canterbury, Christchurch 1, New Zealand

"EVALUATION AND SELECTION OF INVESTMENT PROJECTS FOR COMPETITIVE ADVANTAGE"

Muhittin Oral
Sciences de l'administration, Université Laval, Quebec, CANADA G1K 7P4

The essence of investment planning is to create and maintain a competitive potential in the firm. For this however the relative competitive potential of the firm is to be measured in terms of investment planning variables. This paper discusses a model-based approach to the evaluation and selection of investment projects in a competitive environment. Also discussed are the forecasting needs that are inputs for the evaluation and selection process.

"CAPITAL BUDGETING, FORECASTING AND EVALUATION OF MANAGERIAL PERFORMANCE: AN AGENCY PERSPECTIVE

Lawrence A. Gordon, Martin Loeb, Andrew W. Stark
College of Business and Management, University of Maryland, College Park, Maryland 20742

Decision-support systems designed to forecast cash-flows might lead to misallocations of a firm's resources if (i) there is a divergence of preference between the sponsor of a capital project and the senior corporate decision makers, and (ii) the sponsor is better informed (i.e., assymetric information). It is often noted in practice that project sponsors exaggerate the attractiveness of projects, when lobbying for projec funding. This paper makes use of the rapidly growing literature on Agency Theory to argue that over-zealous cash-flow forecasts may be deal with by using a hurdle-rate greater than the firm's cost of capital.

"FINANCIAL FORECASTS AS A FACTOR IN CORPORATE DIVESTMENT DECISIONS"

Irene M. Duhaime
Department of Business Administration, University of Illinois, Champaign, Illinois 61820

This paper considers both current usage and potential usefulness of financial forecasts in divestment decision-making. Drawing on interviews with corporate executives the author describes how financial forecasting is currently used for divestment decision-making. Possible reasons for the limited use of forecasts in this context are explored, and suggestions for their fuller use are given.

Session FB12
BEACON H

Friday
10:00-11:30

GROWTH MODELS

Chair: Hans Levenbach
CORE Analytic Inc., Bridgewater, NJ 08807

"DEVELOPING A GROWTH MODEL FOR SHORT TERM PLANNING -- GRAPHICAL DATA ANALYSIS AND A COMPOUND POISSON BIRTH PROCESS"

Lilian Shiao-Yen Wu
IBM Thomas J. Watson Research Center, Yorktown Heights, NY
Hans Levenbach
CORE Analytic Inc., Bridgewater, NJ 08807

In business planning we often have the following situation: we have a group of contracts, where a contract is made on date xx for y units to be taken anytime within the next z months. In order to use these data for short term planning, we need to develop a representative growth model of acceptance under contract. This talk is a case study of the development of such a growth model. Our model has two aspects: 1) the use of graphical data analysis to develop a growth model of the aggregate data, 2) the identification of a stochastic process for individual contracts which in the aggregate is consistent with the behavior of our model. Our approach contrasts with more traditional curve-fitting approach of least squares, or attempts to fit increasingly more complex curves by adding more terms and more complex forms. We rely heavily on graphical analysis of residuals to assess and develop our growth models. We have identified the compound Poisson linear birth process as an appropriate model for individual contracts.

"FORECASTING WITH GROWTH CURVES – THE EFFECT OF ERROR STRUCTURE"

Nigel Meade
Department of Management Science, Imperial College, London SW7 2BX, UK

There are various problems in using growth curves for forecasting. Firstly, the identification of the appropriate growth curve, secondly the non-linear estimation of its parameters. Some writers have used convenient data transformations and then used least squares, others have used non-linear least squares or maximum likelihood methods. In the latter cases, either discounted least squares are used, or an assumption of constant error variance is made. This paper examines the effect of assuming various types of plausible non-constant error variance on the forecasting performance of growth curves.

"FOOD AVAILABILITY AND RATE OF INDUSTRIAL GROWTH IN INDIA: A TRANSFER FUNCTION ANALYSIS"

Subhash C. Ray
Department of Economics, University of Connecticut, Storrs, CT 06268

This study uses annual data on the growth rate of manufactured goods production and availability of foodgrains per capita per day in India during the period 1950-51 through 1981-82 to fit a bivariate transfer function using Box-Jenkins methods. The input series (availability of food in natural logs) had no structure other than the mean. The sample cross-correlation function suggested a second order transfer function without any delay in impact. The fitted bivariate model was quite adequate and no remaining structure was found in the residuals. The steady state gain indicated that 1% increase in food supply would cause a 0.275% increase in the growth rate of manufacturing in the long run.

Session FB13
LIBERTY A

Friday
10:00-11:30

FINANCIAL FORECASTING

Chair: Swaminathan Sankaran
Faculty of Administration, University of Regina, Regina, Saskatchewan, CANADA S4S 0A2

"ALTERNATIVE FORECASTING MODELS FOR SECURITY VALUATION"

Swaminathan Sankaran
Faculty of Administration, University of Regina, Regina, Saskatchewan, CANADA S4S 0A2

In this paper two forecasting models for security valuation are compared. The two models used are the lognormal model of security wealth relatives and the normal model of price changes. These are compared and validated using a Canadian data base for the Toronto Stock Exchange monthly statistics. Confidence intervals for 185 common stocks are created based on each of the above models for seventeen years and validated over the next two years.

"ELLIOTT WAVES FOR STOCK AVERAGES AS FRACTALS"

David H. Nash
Autofacts, Inc., 222 West Lancaster Ave., Paoli, PA 19301

Fifty years ago R.N. Elliott developed a theory of behavior over time of certain aggregates of stock prices, such as the Dow Jones Industrial Average. This note shows that an idealized "wave" curve proposed by Elliott can be modeled as a fractal, a fundamental geometric concept advanced by Benoit Mandelbrot. The fractal described is in a well-defined sense "directionless" (non-differentiable) at any point, and its fundamental "shape" is independent of the time scale used.

"Z-SCORES VERSUS SHARE PRICES AS INDICATORS OF FUTURE COMPANY FINANCIAL PERFORMANCE"

J. Betts
Schools of Industrial Technology, University of Bradford, Bradford, West Yorkshire BD7 1DP, ENGLAND

There is a long history of research into how share prices reflect new company information. Price changes have been shown to be consistent with an "efficient" market. That is the market adjusts rapidly to new information. In parallel with this, research has been carried out on Z-score models designed mainly to identify companies in danger of financial failure. This paper compares company Z-score and share prices histories, and concludes that often there is a considerable lag in the market's response to publicly available accountancy data and that the market usually over-reacts to both good and bad news.

LEGAL ASPECTS

Chair: Catharine S. Newick
Business Decision Services, PO Box 1046, Concord, NH 03301

"ECONOMIC & FORECASTING TECHNIQUES IN LEGAL CASES INVOLVING WRONGFUL DEATH"

Catharine S. Newick
Business Decision Services, PO Box 1046, Concord, NH 03301

Most state and federal laws provide for the recovery of lost earning capacity in wrongful death cases. The laws provide for the recovery of damages that reflect the individual's capacity to earn money during his probable working life. Inherent in each estimate of lost earning are forecasts for several key variables. These include worklife expectancy, inflation, productivity and interest rates. The present article examines data sources, methodologies and forecasting techniques of these key variables in light of economic changes, as well as, recent court decisions.

"DATA LIMITATIONS AND THEIR IMPACT ON FORECASTING THE EFFECTS OF COMPARABLE WORTH"

Pearl I. Steinbuch
St. John's University, Jamaica, NY 11439

This paper analyzes the Johnson and Solon (1986) forecast of the effects of comparable worth in light of the deficiencies of the currently available data sources. Comparable worth, as currently proposed, is not suggested as a remedy for differences in occupational pay between firms, but instead seeks to eradicate wage differentials between comparable occupations within an individual firm. Therefore, the forecasts of the effects of comparable worth are discussed with respect to the policy's aim and intended coverage. Further, guidelines for future data collection are recommended.

FORECASTING ENERGY CONSUMPTION

Chair: James E. McMahon
Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720

"LONG TERM FRENCH ENERGY CONSUMPTION FORECASTS: A NEW MULTI-ENERGY MODEL IN INDUSTRY"

Robert Grassi
Electricité de France, 2 rue Louis Murat, 75008 Paris, FRANCE

Production investment planning needs to evaluate as accurately as possible the electricity consumption in the future. Long term forecast models used at Electricité de France are based upon analytical methods; this approach by markets and by uses allows to study the load curve evolution. This is main information for the choice of investments and tariff structures. Up to now, industry sector was studied rather simply. In the last few years, energy situation has greatly evolved; competition between different forms of energy has become sharper. In order to take better into acount consumption determining factors, it was necessary to develop a new

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'FUTURE ENERGY CONSUMPTION BY RESIDENTIAL APPLIANCES

James E. McMahon
Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720

Households consume about 25% of total (primary) energy in the United States, and 35% of the electricity. Energy consumption is a function of demographics, economics (energy prices, income), engineering (equipment designs), and governmental policy (e.g., mandatory efficiency standards). The LBL Residential Energy Model projects future annual energy consumption in households by end use (e.g., heating, lighting). Recent research has focused on forecasting the efficiency of equipment, emphasizing interactions between engineering possibilities and historical market behavior in selecting among alternative designs. Such forecasts are needed to estimate the impacts of policies (e.g., proposed national appliance energy conservation legislation) on consumers and utility companies.

"UPDATED COMMERCIAL MODELING FOR THE 1986 GRI BASELINE PROJECTION"

Paul D. Holtberg
Gas Research Institute, 1331 Pennsylvania Avenue, Suite 730 North, Washington, DC 20004

The Gas Research Institute (GRI) develops an analytical framework that establishes a likely projection of future energy supply and demand through 2010 for use in appraising the GRI R&D program. This baseline projection provides a relatively aggregate sector specific projection. However, an aggregate projection of future energy consumption is not adequate for developing a technology specific R&D program for the commercial sector given the heterogeneous nature of commercial activities. GRI undertook analytical work in 1986 which was intended to develop an improved methodology for projecting commercial energy and natural gas consumption by commercial activity. This paper will discuss the results of this effort.

Session FC1 Friday
EXETER 12:00-1:30

EVALUATION OF FORECASTING METHODS

Chair: D. Alan Jones
University College of Wales, Aberystwyth, Wales, UK

"ERROR VARIANCES FOR PREDICTIONS FROM ESTIMATED MODELS"

D. Alan Jones, John A. Lane
University College of Wales, Aberystwyth, Wales, UK

Results for the error variances associated with minimum mean square prediction from finite parameter models are well known. Formulae derived using these results inevitably involve the values of the parameters in the model used. The actual values of these parameters are however rarely known exactly; the usual step is to substitute estimates of these unknown parameters and to carry on regardless. Such action necessarily induces further uncertainty into the estimation/prediction process and this will manifestly increase the variances of prediction errors. This paper illustrates the effects on predictions for some actual series. Some general results for the necessary adjustments to error variance formulae are given, and the results of some simulation trials presented.

"A COMPARISON OF PERFORMANCE CRITERIA FOR FORECASTING MODELS"

Ronald L. Coccari
Cleveland State University, 2121 Euclid Ave., Cleveland, Ohio 44115
Charlene Gallucci
SCM Corporation, 925 Euclid Avenue, Cleveland, Ohio 44115

This paper compares the accuracy of a number of alternative forecasting models applied to U.S. wine imports from 1964 to 1973. The models are ranked on an ex ante and ex post basis. The study reveals that for this particular series, the rankings of the models shift, i.e., the best ex ante fit does not always give the best predictions. In addition, a new measure of forecast accuracy is presented which proves to be more comprehensive than the conventional mean squared error method. This measure is called the correlation error index. It incorporates both relative MSE and the correlation between the predicted and observed values in order to consider magnitude of error along with direction and strength of change.

"PERCEIVED USER-PREPARER DIFFERENCES IN TECHNIQUE EVALUATION CRITERIA"

James E. Cox, Jr.
Department of Marketing, Illinois State University, Normal, IL 61761

An empirical study of ten midwestern companies was done to determine differences between those persons who use the forecast (users) and those persons who prepare the forecast (preparers) with regard to the criteria they judge to be most important in evaluating forecasting methods. Twelve criteria were used including: accuracy, turning point identification, cost considerations, data collection difficulty, how automatic, ease of understanding, and amount of supplementary information provided by the technique. The results indicate that there is much agreement in the criteria used by users and preparers to evaluate forecasting methods but also there is some disagreement.

"EVALUATION OF TIME SERIES MODELS: SOME MONTE CARLO RESULTS"

Emmanuel I. Osagie
Department of Economics, Southern University, Baton Rouge, LA 70813

The increasing cost and complexity of multi-equation structural models has contributed to the popularity of time series models in forecasting literature. Among the noteworthy characteristics of time series models are their relative simplicity and ability to forecast the movement of a variable based on past movements in that variable or past movement in other variables, without causal implications. The choice of a particular model for a set of data often becomes a challenge to the forecaster due to the lack of unequivocal research findings on the relative accuracy of the different techniques. This paper addresses primarily the forecast performance of the exponential smoothing, autoregressive integrated moving average and vector autoregressive models based on selected economic series and monte carlo experiment data.

Session FC2
GARDNER

Friday
12:00-1:30

PANEL DISCUSSION: RISK ASSESSMENT AND INSURABILITY ISSUES

Chair: Howard Kunreuther
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

The market for pollution insurance has recently dried up. Most insurers are not offering coverage; reinsurers have withdrawn from the market. The problems of environmental pollution insurance are similar to other types of coverage such as medical malpractice and product liability. The panel will discuss the causes of the insurability crisis and potential remedies as a way of successfully underwriting specific types of coverage. Implications for risk management when there are uncertainties in forecasts of both probability and losses will be explored.

Panelists:

Elizabeth Anderson
Clement Associates, 1850 K St, NW, Washington, DC 20006

Michael Baram
Bracken and Baram, 33 Mount Vernon St., Boston, MA 02108

Dennis Connolly
Johnson and Higgins, 95 Wall Street, New York, NY 10005

Howard Kunreuther
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104

Session FC3
DALTON

Friday
12:00-1:30

COMBINING FORECASTS

Chair: David Bessler
Department of Agricultural Economics, Texas A & M University, College Station, TX 77843

"COMPOSITE FORECASTING OF PRICES OF AN AGRICULTURAL COMMODITY WITH DIRICHLET PRIORS"

David Bessler, Peter J. Chamberlain
Department of Agricultural Economics, Texas A & M University, College Station, TX 77843

This paper considers alternative values of the parameters of a Dirichlet prior distribution in combining three sets of forecasts of U.S. hog prices using Bayesian parameter updating. Results show increasing prior tightness does improve forecast performance when these three credible forecasts are combined. However, when we substitute a less credible forecast for one of the original three, increased tightness does not improve performance. Next, we elicit subjective prior probabilities as a multinominal distribution on outperformance from four forecast users (three substantive experts and one normative expert). Generally, the substantive users provided distributions which improved forecast performance, relative to any of the individual methods and the symmetric, but loose prior. Performance was not better than the symmetric-tight prior.

"PREDICTIVE ABILITY AND ASYMPTOTIC BEHAVIOR OF N-STEP-COMBINATION FORECASTS"

Celal Aksu, Mine H. Aksu
School of Management, Syracuse University, Syracuse, NY 13244-2130
Sevket I. Gunter
College of Busines & Economics, West Virgina University, PO Box 6025, Morgantown, WV 26506-6025

A multivariate state space forecasting (SSF) procedure is used to combine the one-step-ahead forecasts provided by different techniques. Relative prediction errors resulting from SSF and some other commonly used aggregation procedures are analyzed. Furthermore, the concept of N-Step-Combinations of forecasts is introduced. This procedure involves combining the aggregate forecasts obtained by different combination procedures used at a lower level. The marginal contribution of a higher level of aggregation to predictive ability and the asymptotic behavior of the prediction errors of aggregate forecasts provided by N-Step-Combinations as N gets large are empirically analyzed.

Session FC4
CLARENDON

Friday
12:00-1:30

FINANCIAL FORECASTING

Chair: James B. McDonald
Department of Managerial Economics, Brigham Young University, Provo, Utah 84602

"ADAPTIVE BETA ESTIMATION FOR THE MARKET MODEL"

James B. McDonald, Ray D. Nelson
Department of Managerial Economics, Brigham Young University, Provo, Utah 84602

The market model uses a simple linear equation to relate the expected return on an individual security or portfolio to the composite return in the securities market. The estimation of the beta parameter is important in assessing the performance of a financial instrument relative to the market. Nonnormality makes the robustness of beta estimates to the probability densities of security market returns an important issue. Adaptive estimation techniques are applied to seven years of monthly returns for 1100 companies from the New York Stock Exchange. The results are seen to be sensitive to the underlying distribution of returns.

"FORECASTING THE PRICE OF RISK WITHIN THE CONTEXT OF THE CAPITAL ASSET PRICING MODEL WITH MARKET INDEX IMPLIED STANDARD DEVIATIONS"

Ed Saunders
College of Business Administration, Northeastern University, Boston, MA 02115

This paper advances a methodology for estimating ex ante return/risk relationships within the context of the Capital Asset Pricing Model without reliance upon the use of historical data within a static equilibrium framework. These forecasts are made possible by the existence of a three year history of active markets index option, a wealth of recent research concerning the estimation of Implied Standard Deviations using variants of the Black/Scholes Option Pricing Model, and the possibility that, within a market setting, ex ante return/risk relationships, while stochastic, are stable in functional form.

"THE INCREMENTAL CONTRIBUTION OF FINANCIAL ANALYSTS' EARNINGS FORECAST DISPERSION FOR PREDICTING THE FUTURE VARIABILITY (RISKINESS) OF COMMON STOCK RETURNS"

Bipin B. Ajinkya
College of Business Administration, University of Florida, Gainesville, FL 32611
Michael J. Gift
Graduate School of Business, Indiana University, Bloomington, IN 47405

The cross-sectional dispersion in financial analysts' forecasts of earnings has been found to be a superior measure of risk for pricing capital assets. This study evaluates the information value of such dispersion (DISP) in the context of the other basic model in finance – the Black-Scholes option pricing model. The criterion predicted is the actual future time series variability of stock returns (FSD). The objective is to determine whether DISP contains riskiness information, orthogonal to both historical and option model implied variabilities (HSD and ISD, respectively), that can be exploited to predict FSD. The results indicate the ISD apparently does not reflect all of the currently available information for predicting FSD. Specifically, DISP is a potent risk measure that contains useful predictive information incremental to that embedded in HSD and ISD.

MARKETING FORECASTING

Chair: Annele Eerola
Swedish School of Economics and Business Administration, Arkadiankatu 22, 00100 Helsinki 10, Finland

"MARKET FORECASTS AS STRATEGIC INFORMATION"

Annele Eerola
Swedish School of Economics and Business Administration, Arkadiankatu 22, 00100 Helsinki 10, Finland

The paper examines the process of converting data, knowledge and expertise into strategic information concerning companies' future markets. Particular emphasis is given to the role of various types of consulting service in forecasting the global markets of specific products. The paper examines the processes of preparing and using forecasts, and analyses the information flows between forecasters and users of forecasts. Reasons for using market forecasts prepared by consultants in companies' strategic planning and decision-making are discussed. Some general guidelines for planning, organizing and controlling these services are suggested.

"META-MARKETING FORECASTING MODEL"

David J. Morris, Jr.
University of New Haven, 300 Orange Avenue, West Haven, CT 06516

Marketing forecasting has evolved based on a paradigm of organizational structure that views marketing as a segmented activity rather than unifying the whole. Marketing's continuation of internal battles for organizational territory is counterproductive. Meta-marketing provides a new approach to forecasting by shifting the fundamental role of marketing to means that accomplish organizational goals and objectives. Meta-marketing is a unified approach that identifies knowledge, skills and attitudes on individual, group and company-wide bases. These combine the language, structure and instruments across all disciplines. This common focus results in greater accuracy in marketing forecasting.

"FORECASTS OF RETAIL TRADE"

Shaw K. Chen
Department of Management Science, University of Rhode Island, Kingston, RI 02881-0802

This study investigates the forecasts of retail stores trade by using different seasonal adjustment techniques. One year ahead forecasts will be made from seasonal adjusted series. Comparison of different techniques, BAYSEA, XII, XIIARIMA, and FDSM will be explored. Seasonal adjusted and seasonal unadjusted series forecasts will also be studied.

FORECASTING METHODS AND EVALUATION

Chair: Shalom Apeloig
Ifo-Institut fur Wirtschaftsforschung, Postfach 86 04 60, 8000 Munchen 86, FR-Germany

"AN EVALUATION OF PREDICTION FOR U.S. PRESIDENTIAL ELECTIONS"

Stephen S. T. Kao
Center for Rating the Presidents, 30 Illinois Street, Racine, WI 53405

The voters are voting for achievements, and are not voting for political game-playing any more. The prejudicial opinion polling of historians or political scientists is considered a nonscientific political argument, without too much value any more. A misstatement in presidential debate, a new innovative campaign promise, a missstatement in answering newspeople's questions, or trouble in picking up a suitable running mate usually upsets all the statistical predictions. Examples are given for statistical prediction for U.S. presidential elections in 1984 and other years. When will a presidential candidate from a minority group be ready to take care of this country? This question and others will be discussed.

"GRAPHOSCOPY: RECENT RESEARCH FINDINGS OF AN INNOVATIVE SURVEYING METHOD"

Shalom Apeloig
Ifo-Institut fur Wirtschaftsforschung, Postfach 86 04 60, 8000 Munchen 86, FR-Germany

Graphoscopy is an innovative, purely graphical surveying method recording expectations about future course of cyclical phenomena including their morphology over time. It involves plots of the past and current business cycles of an industry. Specifics include electronic scanning, automatic consistent link of qualitative (timing, duration, intensity, turning points) with quantitative (rate of change) aspects of expectations, and homogenization of input information at the highest level. The performance is good but systematically biased, excellent with bias-correction and dynamic weighting according to individual past performance. Graphoscopy offers high superiority over conventional-numerical methods. It is presently being applied to forecasting of industrial production (FR-Germany) and inflation (Italy).

"STRUCTURAL PERSISTENCE PRINCIPLE IN PREDICTION"

Adi Raveh
Baruch College, 17 Lexington Ave., New York, NY 10010

The paper presents a data analysis method called Structural Persistence used for prediction purposes. The basic underlying assumption is that the structure of a time series does not change in the forecasting range. The predicted value is estimated such that it will fit the structure of the series already estimated. Explicit prediction formulas for various assumptions of the trend (e.g., linearity, exponential, monotonicity) will be presented. The procedure is applied to some previously published time-series data and the prediction results are compared to those obtained by the Box-Jenkins approach.

Session FC7 Friday
BEACON A 12:00-1:30

CURRENT AND FUTURE DEVELOPMENTS IN FORECASTING SOFTWARE: THE PROSPECTS FOR EXPERT SYSTEMS

Chair: Essam Mahmoud
School of Management, University of Michigan-Flint, Flint, MI 48502-2186

Panelists:

Timothy Davidson
Temple Barker & Sloane, Inc., 33 Hayden Ave., Lexington, MA 02173

Harry Harris
Artificial Intelligence Corporation, 100 Fifth Ave., Waltham, MA 02254

Hans Levenbach
Core Analytic Inc., PO Box 742, Route 202, Far Hills, NJ 07931

David R. Vogt
Wisard Software Company, PO Box 19730, Green Bay, WI 54307-9730

The field of artificial intelligence has led to the discovery of practical techniques for building software that enable computers to understand natural language and to solve problems by reasoning. This software provides the basis for expert systems. Although artificial intelligence (AI) has scarely touched today's decision makers, it will begin to have dramatic and widespread impacts on their different areas of management; planning, forecasting, marketing, finance, inventory, etc. This panel will focus on the incorporation of expert systems software in forecasting. This involves a comparison of current forecasting systems: automatic or expert system and non-automatic. The advantages and disadvatages of these different types of systems will be addressed. The panelists will offer suggestions for choosing the optimal forecasting software.

Session FC8
BEACON B

Friday
12:00-1:30

EXPERT SYSTEMS IN ARIMA MODELLING II

Chair: Anne B. Koehler
Decision Sciences, Miami University, Oxford, Ohio 45056

Presenters:

Robert L. Goodrich
Business Forecast Systems, 170 Walden Street, Concord, MA 01742

David J. Pack
Decision Sciences, Miami University, Oxford, OH 45056

David P. Reilly
Automatic Forecasting Systems, Inc., PO Box 563, Hatboro, PA 19040

The discussion in the session Expert Systems in ARIMA Modelling I will be extended to the multivariate setting. The additional decisions that an expert forecaster must make and ways to computerize them for multivariate data will be presented. As in the first session, the concepts will be illustrated by having an example (bivariate) analyzed by a human expert, and by applying two forecasting software packages which are designed to make the decisions for the user.

REGIONAL ECONOMIC FORECASTING

Chair: Ernest H. Manuel, Jr.
Mathtech, Inc., 210 Carnegie Center, Suite 200, Princeton, NJ 08540

"REGIONAL FORECASTING WHEN THE NATIONAL FORECASTS ARE KNOWN"

Ernest H. Manuel, Jr.
Mathtech, Inc., 210 Carnegie Center, Suite 200, Princeton, NJ 08540
Earl E. Bomberger
Gellman Research Associates, 115 West Avenue, Suite 201, Jenkintown, PA 19046

A common forecasting problem is to design a model that generates regional forecasts that sum to national forecasts generated by a separate model. With econometric models, a common approach is to design a model that generates regional forecasts and then to adjust the forecasts to sum to the forecasted national totals. This paper presents an alternative approach in which the regional model is estimated over the historical regional data subject to the constraint that the regional forecasts equal the national forecasts. This method has the advantage that the regional forecasts require no ex post adjustment for consistency with the national forecasts.

"FORECASTING THE PRESENT IN REGIONAL ECONOMIES"

Paul Coomes, Dennis Glennon
School of Business, University of Louisville, Louisville, KY 40292

Preliminary estimates of regional economic variables, though timely and useful, are prone to substantial revision. The final estimate of a variable may not be available for one to two years after the preliminary estimate is reported. Nevertheless, many analysts use the early estimates as indicators of current business conditions. Using a Kalman filter, we show how a forecast of the current value of the variable produced by an econometric model may be combined with the official preliminary estimate to produce a "best" estimate of the true value. The technique is demonstrated using revision-prone regional data on industry employment.

"NATIONAL INDICATOR SERIES AS LONG LEAD QUANTITATIVE PREDICTORS OF REGIONAL EMPLOYMENT LEVELS"

Barry R. Weller
Behrend School of Business, Pennsylvania State University, Erie, PA 16563

The purpose of this paper is to examine the usefulness of three readily available national series as long leaders in forecasting small region employment levels. The study compares the forecasting performance of several time series models including a univariate model, and three single input transfer function models using as drivers the ratio of coincident to lagging indicators (RCL), the index of industrial production (IIP), and the index of leading indicators (ILI). Forecast accuracy is evaluated over horizons ranging from one to twelve months ahead. The accuracy criteria are mean absolute error, root mean squared error, and root mean squared percentage error.

Session FC10
BEACON F

Friday
12:00-1:30

THE FORECASTING PROCESS

Chair: Dennis W. McLeavey
College of Business Administration, University of Rhode Island, Kingston, RI 02881

"PRACTICAL FORECASTING CONSIDERATIONS"

Howard W. Coleman
MCA Associates, 66 Derbyshire, Derby, CT 06418

This presentation will describe many of the considerations necessary to begin and carry on an effective forecasting process in a manufacturing/distribution type business as well as offer some practical solutions. The topics to be discussed include management's role, organization of the forecast function, forecast hierarchies and improvements in level of accuracy, integration of other systems, forecast model selection and frequency of forecasting, practical error measurement, forecast horizons, capture of demand vs sales, demand filtering and adjustments to history, "Band Wagon" planning and the costs involved in successful implementation.

"ORGANIZATIONAL AND PROCEDURAL ASPECTS OF FORECASTING"

Michael Durkin
Ethicon Inc., Somerville, NJ 08876-0151

Some things stay constant in the forecasting process of a large corporation. Forecasts will always be needed to drive a variety of functional areas, each with their own time horizons, consequences for inaccuracy, and political agendas. The historical data used to represent past demand will be tainted with the effects of price increases, product changes, sales promotions, and competitors' actions. At Ethicon, we have implemented a system that incorporates the judgemental knowledge of our marketing people, the graphics and data handling capabilities of the personal computer, and the use of time series techniques. The insights we gained from this experience can be of value to forecasters in other large corporations.

"EXPONENTIAL SMOOTHING WITH REPETITIVE MODEL SELECTION"

Roy Ageloff, Dennis W. McLeavey
College of Business Administration, University of Rhode Island, Kingston, RI 02881

When there is a need to provide many individual forecasts, perhaps for inventory control purposes with thousands of times, a company may be forced to use the same exponential smoothing model for every time series. Of necessity, computer time cannot be devoted to both model choice and unconstrained parameter selection during the model fitting stage. This paper proposes and tests a model choice system with constrained parameters. Model choice and fitting are carried out anew each period in a unique form of adaptive response. Forecast accuracy measures and computation times are presented for the Makridakis' 111 series.

FINANCIAL FORECASTS IN THE STRATEGIC DECISION-MAKING PROCESS

Chair: Alan Singer
Department of Business Administration, University of Canterbury, Christchurch 1, New Zealand

"FINANCIAL FORECASTS AND STRATEGIC RISK-TAKING"

Howard Thomas
Department of Business Administration, University of Illinois, Champaign, IL 61820

This paper reviews the relationship between the Hertz and Thomas risk analysis approach and strategic risk-taking, in the context of applications in strategic planning and policy. Specific examples of applications are given and the role of risk analysis in developing policy dialogue about strategic options is thoroughly examined.

"FINANCIAL FORECASTING AND ANALYSIS FOR ACQUISITION DECISIONS"

Michael Popiel
The Alcar Group Inc., 575 Madison Ave., Suite 1006, New York, NY 10022-2511

What does a financial forecast tell the reviewer? Operating cost flows can be derived from standard pro-forma income statements and balance sheets. Operating cashflows plus residual cashflows, discounted by a firm's cost of capital equal the value of the organisation. The sensitivity of important components of the financial forecast can be measured. This is important for developing confidence ranges and for testing scenarios of how changes (e.g., due to merger) can impact on value.

"FORECAST VERSUS NON-FORECAST FACTORS MEDIATING THE DIVESTMENT DECISIONS OF MULTINATIONALS: SOME NORMATIVE CONSIDERATIONS"

Alan E. Singer
Department of Business Administration, University of Canterbury, Christchurch 1, New Zealand

The rational-agent frame of reference for the analysis of organizational decisions may be extended to a "moral agent" perspective in which strategic decisions are considered to be the result of processing a comprehensive set of normatively important factors. Some of these factors require forecasting, whilst others involve current-state analysis or retrospection, so that forecasts are not needed. Another class of non-forecast factors applies where the decision-making agent appeals to non-consequentialist forms of moral reasoning about strategy. Divestment decisions by MNCs may be analysed using this framework.

FORECASTING DEMAND

Chair: Siva K. Balasubramanian
College of Business Administration, University of Iowa, Iowa City, IA 52242

'A METHOD FOR PREDICTING TURNING POINTS ON PRODUCT LIFE CYCLES"

Frenck Waage
Forecasting Techniques and Modeling Department, A T & T, Gateway Two (13th Floor), Newark, NJ 07102

Two of the most difficult forecasting problems are: 1) when will the life cycle turning point of any given product, in a collection of competing products, occur?, and, 2) how will a new, entering product effect the life cycles of the products which are already in the market? This paper presents a method which is capable of answering these, and several related, questions. These questions prove difficult to answer because they involve predicting how a market will make its comparisons, and choices, between simultaneously available complex alternatives.

"A COMPARISON OF ECONOMETRIC AND TIME-SERIES APPROACHES TO FORECAST DEMAND FOR CONSUMER DURABLES"

Siva K. Balasubramanian
College of Business Administration, University of Iowa, Iowa City, IA 52242

To forecast the aggregate demand for consumer durables, researchers have traditionally relied on product diffusion models developed from epidemiological principles. While this approach only yields good short-term forecasts, recent extensions of this class of (econometric) models have improved long-term forecasting efficiency as well. Motivated by the growing interest in the forecast literature for empirical comparisons between econometric (causal) models and time-series methods, this paper compares the performance of the econometric diffusion model with several time-series techniques in the context of predicting demand for consumer durables.

"MARKET FORECASTING: REDUCING OVERESTIMATION IN A NEW PRODUCT DEMAND SURVEY"

Diana Davis
19715 58th Avenue, NE, Seattle, Washington 98155

A fundamental problem in market research is that the demand predicted is, more often than not, greater than actual demand demonstrated when the product or service is made available. To reduce overestimation due to survey method, as opposed to failures of respondent judgment and/or the effects of other factors, respondents were filtered to reveal those most interested and likely to adopt the new service. The filters progressed towards specificity and concreteness. First, only respondents in a position to commit their firm to purchase of the service were approached. Next, respondents had (1) to demonstrate that they clearly understood the nature of the new service, (2) to identify a specific category of employee who would use the service, (3) to indicate a non-zero liklihood of subscription, and (4) to estimate the approximate amount of service usage.

Session FC13
LIBERTY A

Friday
12:00-1:30

TELECOMMUNICATIONS FORECASTING

Chair: Neal C. Stolleman
GTE Service Corporation, One Stamford Forum, Stamford, CT 06904

"ECONOMICALLY EFFICIENT PRICING FOR TELECOMMUNICATIONS NETWORK FUNCTIONALITY"

Neal C. Stolleman
GTE Service Corporation, One Stamford Forum, Stamford, CT 06904

In order to produce final telecommunications output for end user consumption, different functions are performed within the telecommunications network, such as providing subscriber access, switching and transport of traffic. The prices charged for network functionality are determined by a set of cost allocation rules that instituionalize Federal and State regulatory policy. This paper applies Ramsey pricing theory to the derived demand for factors of production, and specifically derives conditions under which current FCC policy would result in economically efficient prices. These conditions are found to place unrealistic requirements on the production technology and the final good demand elasticities.

"SPREADSHEET FORECASTING TECHNIQUES: A CASE STUDY IN TELECOMMUNICATIONS"

A. J. Nijdam, J. Harvey
Overseas Telecommunications Commission, 32-36 Martin Place, Sydney 2000, Australia

Accurate monthly forecasts are essential for short-term planning purposes. Monthly data however may not only be made up of the classic trend, seasonality and irregular influences, but may also be dependent on the number of working days in a particular month and the location of public holidays. Utilising a spreadsheet, a forecasting methodology has been developed that takes this into account. This paper will describe the methodology and give an example of its application.

"FORECASTING DEMAND FOR NEW INTERNATIONAL TELECOMMUNICATION SERVICES"

Richard J. Skolnik
A T & T Communications, 412 Mt. Kemble Avenue, Morristown, NJ 07960

Custom services are expected to lead the growth of international telecommunications in the next decade. Forecasting the demand for these services in diverse markets requires an integration of market analysis techniques. This paper describes two methods, market research and application analysis, that are used in conjunction to forecast country-specific, custom service demand. Market research based forecasting uses traditional market research techniques specifically adapted for telecommunication demand. Application analysis correlates country characteristics with existing demand in similar markets.

APPLICATIONS

Chair: W.A. Hafkamp
Institute for Environmental Studies, Free University Amsterdam, PO Box 7161, 1007 MC Amsterdam, The Netherlands

"PROTECTING THE IMPACT OF OFFSHORE OIL AND GAS ACTIVITY ON A PRODUCER STATE"

James A. Richardson
Public Administration Institute, Lousiana State University, Baton Rouge, LA 70803

Offshore oil and gas activity occurs mainly outside the political jurisdiction of states, yet the activity has an obvious and potentially large economic impact. An overwhelming majority of the Gulf Coast offshore activity occurs off the coast of Louisiana. Measurement of the impact of offshore oil and gas activity is accomplished by compilation of business transactions of offshore producers and regional input-output modeling. Projection of the overall impact is derived from statistical analysis among leading indicators of offshore activity. The impact-projection model provides a quantitative method for measuring the significance of, in this case, the offshore oil and gas industry on Louisiana and the variation of this impact over time. The technique is suitable to other industries and other states.

"TOWARDS A MODELING AND INFORMATION SYSTEM FOR LONG TERM FORECASTING ON THE RENEWABLE NATURAL RESOURCES OF EUROPE"

W.A. Hafkamp, A. Gilbert
Institute for Environmental Studies, Free University Amsterdam, PO Box 7161, 1007 MC Amsterdam, The Netherlands

The paper reports on an international study, that was carried out for the European Community, under the research program Fast II (Forecast and Assessment in Science and Technology). The study aimed at an in-depth survey of existing models and expertise on long term trends in the availability and quality of renewable natural resources in Europe, and at the subsequent design of a 'total systems analyzing structure'. The latter resulted in Irene, a modeling and information system for the integrated analysis of renewable natural resources in Europe. The system is going to be used by the European Commission of the E.C. and by national governments for the analysis of policy decisions.

"PROJECTIONS OF PUBLIC SCHOOL ENROLLMENTS: AN ANALYSIS OF ERRORS"

Debra E. Gerald
U.S. Department of Education, Center for Education Statistics, 555 New Jersey Avenue, NW, Washington, D.C. 20208-1302

The United States Department of Education has published projections of education statistics since 1964. This paper analyzes the accuracy of the annual projections of enrollment in public elementary and secondary schools from 1964 to 1982. It examines accuracy and consistency measures in terms of the mean absolute percentage error (MAPE), mean square error (MSE), and percentage consistency (PC). The analysis shows that MAPE's for projections of enrollments in grades kindergarten through 12 in public elementary and secondary schools have been less than 1.0 percent for 1 to 5 years into the future and have increased to 7.0 percent for 6 to 10 years into the future. Decomposing the mean square error by expressing the sources of error as their coefficients reveals that for 1 to 5 years into the future, projection errors are due to variability in the data. For longer lead times, the source of error is due to model misspecification.

ENERGY PRICE FORECASTING

Chair: G.A. Hankinson
Kingston Business School, Kingston Polytechnic, Kingston Hill, Kingston-Upon-Thames, Surrey, England

"SHORT-TERM AND LONG-TERM FORECASTS REGARDING OIL PRICE RESPONSES IN AN ENERGY SENSITIVE REGIONAL ECONOMY: AN IMPACT ASSESSMENT"

M. Ray Perryman
Hankamer School of Business, Baylor University, Waco, TX 76798

This paper presents an extensive set of results from the short-term and long-term versions of the Texas Econometric Model regarding the performance of the state economy under a variety of alternative oil price scenarios. The model contains an extensive set of channels of potential oil price effects. The analysis contained within the paper includes simulations on a quarterly basis through 1988 from the cyclical model and on an annual basis through 2005 from the extended model. The projections are, in each instance, predicated on "basic", "high", and "low" oil price postulates. They serve to illustrate the degree of sensitivity of the Texas economy to world petroleum markets and to isolate individual industrial effects.

"MONITORING AND FORECASTING U.K. OIL PRODUCT PRICES"

G.A. Hankinson
Kingston Business School, Kingston Polytechnic, Kingston Hill, Kingston-upon-Thames, Surrey, England

This paper will discuss the practical application of panel data to forecasting the short term fluctuations in the price of oil products to industrial consumers in the U.K. Oil product prices vary considerably both from week to week and from customer to customer. For these reasons, particular attention has to be paid to the method of data collection before effective forecasting models can be developed. Data collection problems will be discussed together with a review of the models developed thus far. The performance of the models in the light of recent trends in world oil prices will also be reviewed.

"UNCERTAINTY ASSESSMENT AND EVALUATION OF PROJECT ECONOMICS IN SITUATIONS WHERE SUBSTANTIAL UNCERTAINTY SURROUNDS PRICE FORECASTS: A COAL ACQUISITION CASE STUDY"

James M. Caltrider
School of Business Administration, University of San Diego, San Diego, CA 92110

Although considerable amounts of time and effort have been devoted to forecasting mineral prices (coal, gold, etc.) substantial uncertainty remains regarding price level. Mining companies have therefore had to devise strategies for evaluating, acquiring and developing properties without reliable price forecasts for input into traditional economic models. Primary emphasis in this presentation will be placed on evaluating project economics. A case study based on an actual coal property acquisition case study will be presented. Although most of the material that will be presented has been developed for use by mining companies, the concepts underlying these techniques would be useful for anyone making decisions in environments in which substantial uncertainty exists regarding price forecasts.

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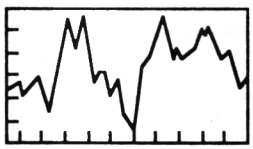

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