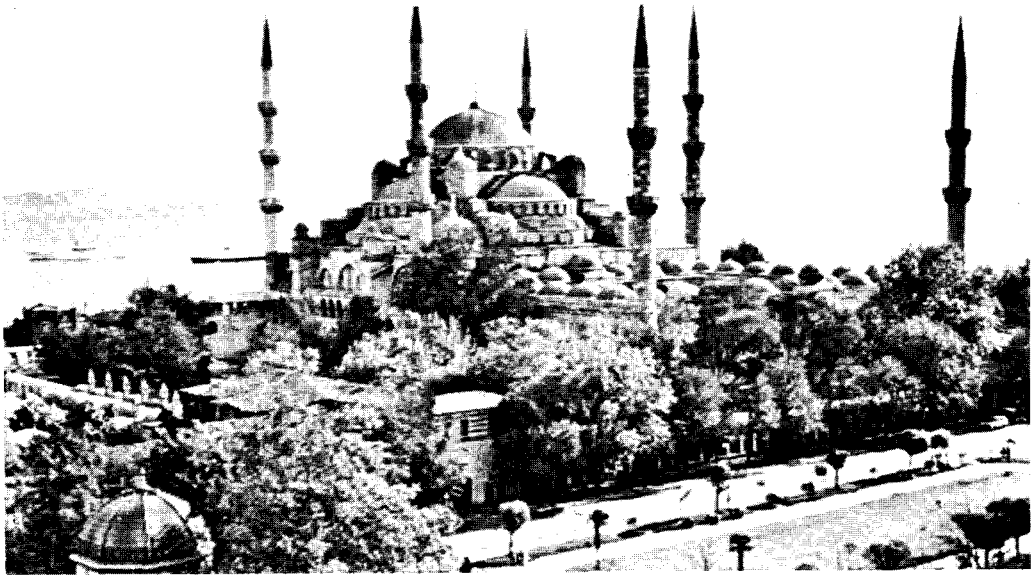
WELCOME TO

THE SECOND INTERNATIONAL SYMPOSIUM ON FORECASTING ISTANBUL

THEME

FORECASTING FOR PLANNING AND DECISION MAKING



Istanbul Sheraton Hotel, July 6-9, 1982

MESSAGE FROM THE PROGRAM CHAIRPERSON

Forecasting is a difficult business. Two years ago, when the first International Symposium on Forecasting was planned, the optimistic forecast was for 40 papers and 80 participants. The pessimists of the group were saying that it would be impossible to get enough people to have a conference on forecasting. Maybe if it were in New York, but who would go to Quebec City!!! Well, all forecasts turned out to be wrong. In the end, there were close to 500 participants from 22 nations - over 175 papers, and 40 different sessions. As one colleague put it, "it was the biggest forecasting conference ever held". With the Quebec City Conference, the field of forecasting was formally launched. The professional forecaster found a forum to express his or her views and interact with others whose main preoccupation was also forecasting.

Istanbul can now claim to be hosting the biggest forecasting conference. There are 197 papers, 49 sessions, and participants from more than 26 countries who have managed to overcome the high transportation costs and budget cuts to come to the Second International Symposium on Forecasting. The professional forecaster is willing to go very far to advance his or her field.

The wide range of topics covered in the program reflect the interests of the participants and the reality of forecasting. The almost equal distribution of academics and practitioners shows the need to further bridge the gap between theory and practice and find effective ways to make forecasting relevant and useful for managers and policy makers.

Finally, the Journal of Forecasting will continue its mission of becoming a communication vehicle unifying the field of forecasting and publishing papers from the conference for those who were not able to attend.

I wish you a good stay in Istanbul and I sincerely hope you enjoy the conference and the city.

Spyros Makridakis

ORGANIZING COMMITTEE

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PROGRAM FEATURES

THURSDAY EARLY MORNING, JULY 8 - 8:30 - 10:00

Keynote addresses by R. McNulty, Product Forecasting in High Technology Industries (See page 16)

and by T. Naylor, Corporate Planning Models: Some Challenges for The Future (See page 17)

THURSDAY MORNING, JULY 8 - 10:15 - 11:45

Panel Discussion on the theme, "Forecasting for Planning and Decision Making", Panel Chairperson, C. Faucheux (See page 18)

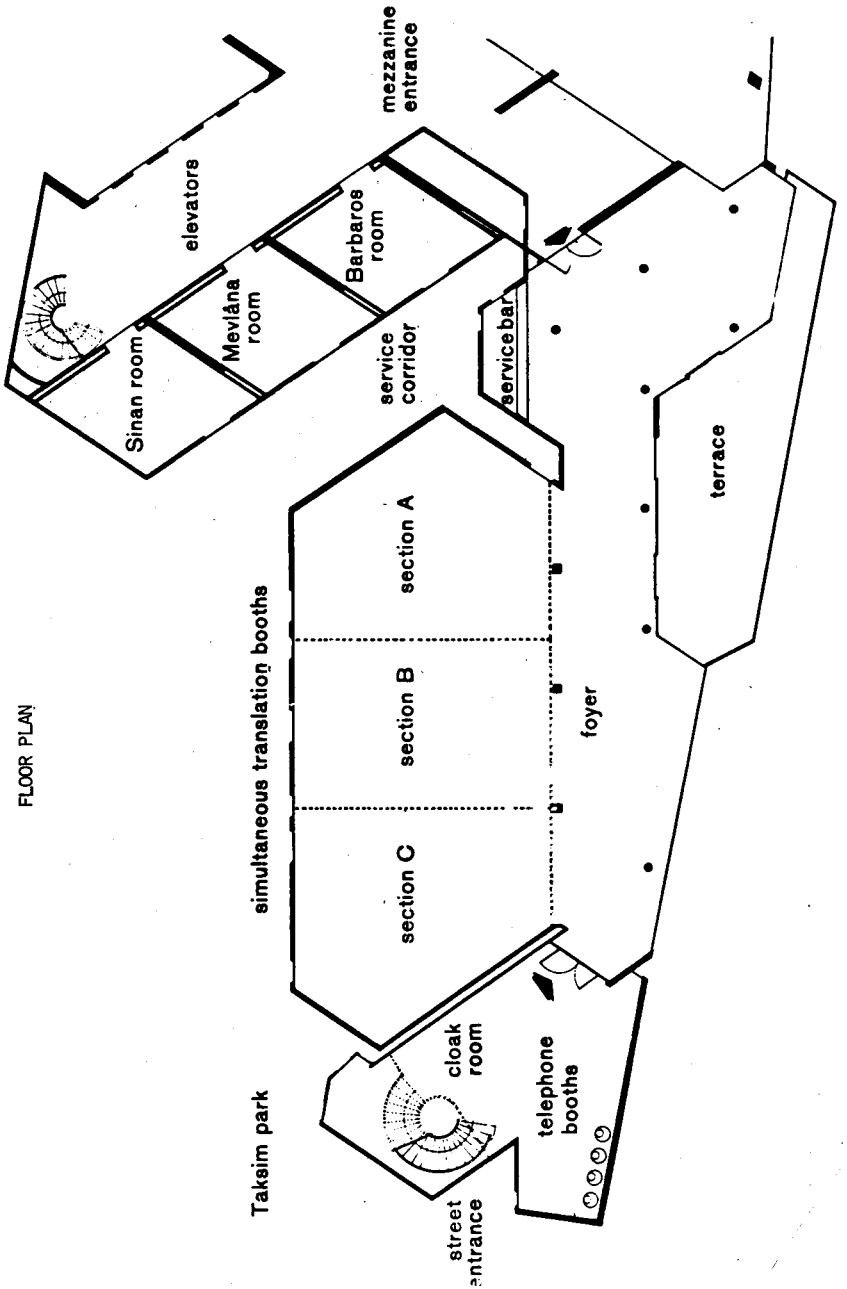
THURSDAY NOON, JULY 8 - 12:00 - 13:00

Keynote address by A. Tversky, Cognitive Illusions in Judgment and Choice (See page 19)

THURSDAY AFTERNOON, JULY 8 - 14:30 - 16:15

Invited Speakers papers, Chairperson, G. Moore (See page 20)

FLOOR PLAN



FINDING SESSIONS

All sessions are coded for your convenience. The session codes should be interpreted as follows:

First letter gives the day: W- Wednesday, T- Thursday, F- Friday

Second letter gives the time: M- Morning, A- Afternoon

Third letter gives the time: E- Early, L- Late

Number gives the order of a session at a specific time.

Last letter gives location of session

A - Section A

B - Section B

C - Section C

R - Barbaros Room

M - Mevlâna Room

S - Sinan Room

E - Merhaba Salon

G - Grand Ballroom

BADGES

All participants and guests are required to wear their badges at all times while in the convention area.

CHECK OUT REGULATIONS

All delegates registered under Plan I, Plan II or Plan E must present themselves at the check out counter of the hotel where they are staying before leaving. Delegates are personally responsible for all additional expenses not covered under the Plans and charged to their rooms. Check out time on July 9 may be extended to 14:00. Please notify the hotel management if this is required.

SESSION SUMMARY AND CHAIRPERSONS

WEDNESDAY, JULY 7 - EARLY MORNING SESSIONS - 8:30 - 10:15

WME1A - Utility Forecasting, O. Tomasek
WME2B - Forecasting Applications I, M. Karasek
WME3C - Forecasting Country Political Risk, J. de la Torré
WME4R - Rational Expectations & Macro Economic Models, A. Budd
WME5M - Decomposition Methods, E. Dagum
WME6S - Forecasting Tourism Flows, T. Var

LATE MORNING SESSIONS - 10:45 - 12:30

WML1A - Practical Aspects of Forecasting, R. Lewandowski
WML2B - Forecasting for Operations Management, L. Johnson
WML3C - Technological/Demographic Forecasting, J. Baal-Schem
WML4R - Supply Side in European Models & Forecasts, O. Hieronymi
WML5M - Tracking Signals for Forecasting & Control, E. Gardner

EARLY AFTERNOON SESSIONS - 14:00 - 15:45

WAE1A - Energy Forecasting, E. Samouilidis
WAE2B - Evaluation of Forecasting, R. Fildes
WAE3C - Psychological Aspects of Forecasting, S. Downs
WAE4R - Bayesian & Subjective Methods of Forecasting, B. Pereira
WAE5M - Adaptive Forecasting, R. Carbone
WAE6S - Forecasting Applications II, M. Oral

LATE AFTERNOON SESSIONS - 16:15 - 18:00

WAL1A - Forecasting Evaluation, M. Hibon
WAL2B - Regression Methodology, D. Montgomery
WAL3C - ARIMA Methods, J. Gooijer
WAL4R - Forecasting With MARMA Models, S. Biffignandi
WAL5M - The MESGRO Forecasting System, G. Chacko

THURSDAY, JULY 8 - EARLY MORNING KEYNOTE ADDRESSES - 8:30 - 10:00

TME1G - R. McNulty, Product Forecasting in High Technology Industries
TME2G - T. Naylor, Corporate Planning Models: Some Challenges for the Future

LATE MORNING SESSIONS - 10:15 - 11:45

TML1G - Panel: Forecasting for Planning & Decision Making, C. Faucheux
TML2R - Forecasting & Planning, P. Lévine
TML3M - New Products Forecasting, J. Petrof
TML4S - Forecasting Telephone Demand & Prices, N. Curien

BEFORE LUNCH KEYNOTE ADDRESS - 12:00 - 13:00

TML5G - A. Tversky, Cognitive Illusions in Judgment and Choice

THURSDAY, JULY 8, EARLY AFTERNOON SESSIONS - 14:30 - 16:15

TAE1G - Invited Speakers, G. Moore

S. McNees, The Productivity Puzzle: Prediction & Realization
A. Sage, Rationality in Human Information Processing
P. Klein/G. Moore, The Leading Indicator Approach to Economic Forecasting -- Retrospect and Prospect

TAE2R - Behavioral, Social, & Political Aspects of Forecasting, R. Olley
TAE3M - Financial Forecasting I, D. Alexander
TAE4S - Forecasting Applications in Brazil, R. Castro Souza

LATE AFTERNOON SESSIONS - 16:30 - 18:15

TAL1G - Financial Forecasting II, R. Talbott
TAL2R - Stochastic Processes, G. Libert
TAL3M - Health-Care Planning, A. Reisman
TAL4S - Forecasting With Econometric Models, A. Gafoor

FRIDAY, JULY 9, EARLY MORNING SESSIONS - 8:30 - 10:15

FME1A - Forecasting Applications in Accounting & Finance, P. Griffin
FME2B - Electricity & Gasoline Forecasting, A. Borges
FME3C - Disequilibrium Economics & Forecasting, A. Aykac
FME4R - Commodities Forecasting, G. Pollio
FME5S - Simulation & Forecasting, C. Parkan

LATE MORNING SESSIONS - 10:45 - 12:30

FML1A - Time Series Analysis & Forecasting, K. Juselius
FML2B - Personnel Related Forecasting, M.A.D. Machuca
FML3C - Support Systems in Forecasting, N. Polhemus
FML4R - Adaptive Forecasting, M. Hüttner
FML5S - Forecasting Applications in Turkey, F. Yağcı

PROGRAM SUMMARY

WEDNESDAY, JULY 7

EARLY MORNING SESSIONS - 8:30 - 10:15

WME1A - Utility Forecasting, Chairperson - Tomasek

Tomasek, Integrating Modeling & Judgmental Forecasts
Levenbach, et.al., Telecommunications Applications of . . . . . .
Damsleth, Postal Time Series: Some Practical . . . . . .
Acton, et.al., Time-of-Use Electricity Rates for . . . . . .

WME2B - Forecasting Applications I, Chairperson - Karasek

Yatrakis, et.al., The Role of Economics in Corporate . . . . . .
O'Brien, Analysis ... The Link From Forecast to Plan . . . . . .
Karasek, Forecasting & Scenario-Building With a Model . . . . . .
Balcı, Credibility Assessment of Model Forecasts Used . . . . . .
Makridakis, et.al., The Limits to Predictability

WME3C - Forecasting Country Political Risk, Chairperson - de la Torré

de la Torré, Modeling Political Risks for Foreign . . . . . .
Yoffie, et.al., Political Forecasting as a Management . . . . . .
Marois, Organizing the Firm to Deal With Political . . . . . .
Mahmoud, et.al., Political Risk Forecasting: . . . . . .

WME4R - Rational Expectations & Macro Economic Models, Chairperson - Budd

Longbottom, Structure Models & Time Series Models . . . . . .
Holly, Forecasting & Expectations
Mascolo, et.al., Rational Expectations in Time Series . . . . . .

WME5M - Decomposition Methods, Chairperson - Dagum (E)

Dagum (E), et.al., Selecting Lead Times of ARIMA . . . . . .
Burman, Model-Based Seasonal Adjustment
Rhoades, Selecting, Filtering, & Forecasting of . . . . . .
Villalba, Forecasting the Demand for Bank Notes

WME6S - Forecasting Tourism Flows, Chairperson - Var

Var, Delphi Method in Forecasting Future Trends . . . . . .
Liu, Forecasting Future Requirements for Hawaii's . . . . . .
Sheldon, et.al., The State-of-The-Art of Tourism . . . . . .
Choy, Forecasting Visitor Flows Using Leading . . . . . .

WEDNESDAY, JULY 7

LATE MORNING SESSIONS - 10:45 - 12:30

WML1A - Practical Aspects of Forecasting, Chairperson - Lewandowski

Schwich, The Forecasting & Planning System of . . . . . .
Bickelmann, Forecasting in Mercedes-Benz
Denizou, Short Term Analysis & Forecasting in . . . . . .
Winkler, et.al., Averages of Forecasts: Some . . . . . .

WML2B - Forecasting for Operations Management, Chairperson - Johnson

Johnson, Design of Forecasting Systems for Production . . . . . .
Brandenburg, Sales Forecast Control for Finished Goods . . . . . .
Evranuz, et.al., A System Dynamics Model for the Production . . . . .
Calvo, Demand Forecasting & Stock Policies
Al-Ramahi, et.al., Production, Utilities, & Direct Materials . . . .

WML3C - Technological/Demographic Forecasting, Chairperson - Baal-Schem

Baal-Schem, The Use of Forecasting Methods in Policy . . . . . .
Reid, A Delphi/Gaming Technic Applied to Public Systems . . . . . .
Linstone, The Multiple Perspective Concept
Ahlburg, Economic - Demographic Forecasting: Implications . . . . .
Dodd, Forecasting Demographic Timeseries, Marriages & . . . . . .

WML4R - Supply Side in European Models & Forecasts, Chairperson - O. Hieronymi

Hieronymi, The Problem of Modeling & Forecasting Supply
Cascio, Linking Macro-Economic & Corporate Supply: The . . . . . .
Gilli, Comparing the Structure of Forecasting Models . . . . . .
Wasserfallen, Forecasting Real Activity & Inflation . . . . . .

WML5M - Tracking Signals for Forecasting & Control, Chairperson - Gardner

Gardner, Automatic Monitoring of Forecast Errors
Sweet, Using an Adaptive Smoothing Method for Forecasting . . . . . .
Ruiz y Ostros, An Automatic & Adaptative Prediction System
Matthews, On Measuring Rates of Change of Value of Real . . . . . .

WEDNESDAY, JULY 7

EARLY AFTERNOON SESSIONS - 14:00 - 15:45

WAE1A - Energy Forecasting, Chairperson - Samouilidis

Samouilidis, et.al., Integrated Energy Demand Forecasting
Schwartz, et.al., Long-Run Effects of the Canadian National . . . . .
El Sawy, et.al., Predictive Model for Coal Sulfur Disposition . . . .
Aswad, et.al., Forecasting Natural Gas Consumption for a . . . . . .

WAE2B - Evaluation of Forecasting, Chairperson - Fildes

Hietikko, Comparison Between Box-Jenkins, Holt-Winters & . . . . . .
Vishwakarma, A Comparison of the State Space Forecasting . . . . . .
Barker, A Comparison of Model-Based Medium-Term Economic . . . . . .
Sankaran, A Comparative Study of the Ex-Post Accuracy of . . . . . .
Schlintl, A Comparison of ARIMA-Transfer-Function-And Econometric . .

WAE3C - Psychological Aspects of Forecasting, Chairperson - Downs

Gill, The Prediction of Managerial Performance: Cross . . . . . .
Pearn, Equal Opportunity & Forecasting Outcomes of Affirmative . . .
Robertson, et.al., The Use of Behavior Samples to Forecast Job . . .
Armstrong, Validation of Role Playing as a Predictive . . . . . .

WAE4R - Bayesian & Subjective Methods of Forecasting, Chairperson - Pereira

Pereira, Some Applied Time Series Work at UFRJ - Brazil
Yates, Analyzing Probabilistic Forecasting Performance . . . . . .
Nebenzahl, Techniques for Deriving Personal Probability . . . . . .
Jaffray, et.al., Decision-Making Under Partial Information . . . . .
Neto, Linear Growth Bayesian Forecasting

WAE5M - Adaptive Forecasting, Chairperson - Carbone

Tempelaar, Forecasting Time-Varying Parameter Structures . . . . . .
Carbone, et.al., Some Results on the Performance of AEP Forecast . .
Carbone, et.al., Seasonal Adjustment & Adaptive Forecasting . . . .
Vicino, et.al., Multivariate Load Modeling for Short Term . . . . .

WAE6S - Forecasting Applications II, Chairperson - Oral

Ünlü, A Generalized Method for Job Scheduling of Forecasting . . . .
Daser, Physical Distribution Systems
Dağlı, Step Wise Most Likely State Approach in Forecasting . . . . .
Waslander, Forecasting Economic Development in the Government . . .
Ekambaram, Forecasting for Planning the Optimal Utilization . . . .

WEDNESDAY, JULY 7

LATE AFTERNOON SESSIONS - 16:15 - 18:00

WAL1A - Forecasting Evaluation, Chairperson - Hibon

Fildes, Model Selection & Predictability in Forecasting
Hibon, et.al., Factors Affecting Forecasting Accuracy
Mahmoud, Accuracy Measurements & Ranking Forecasting Techniques
Chang, On the Use of Statistical Methods for Forecasting . . . . . .

WAL2B - Regression Methodology, Chairperson - Montgomery

Sage, Forecast Aggregation
Pawlowska, A Modification of the Classical Forecasting Method
Naini, et.al., A Test for Infinite Cross-Price Elasticity
Montgomery, Regression Methodology

WAL3C - ARIMA Methods, Chairperson - Gooijer

Gooijer, On the Maximum Likelihood Estimation of the Parameters . .
MacNeill, Change of Parameters at Unknown Times in ARMA Models . . .
Pukkila, On the Distributions of the Differences . . . . . .
Terāsvirta, Mink & Muskrat Interaction

WAL4R - Forecasting With MARMA Models, Chairperson - Biffignandi

Biffignandi, On the Procedures for Studying the Relationships . . .
Zalinger, Forecasting US-Canada Tourism Flows Using Transfer . . . .
Genesio, et.al., Some Properties of Bilinear ARMA Models for . . . .
Isley, et.al., Intertemporal Utility Maximization Aggregate . . . .
Umashankar, On the Use of Multiple Time Series Procedures . . . . .

WAL5M - The MESGRO Forecasting System, Chairperson - Chacko

Chacko, Adaptive Forecasting: Closer Forecasts With Fewer . . . . . .
Chacko, Improved Short-Term Decision-Making With MESGRO . . . . . .
Chacko, Better Long-Term Planning With Extended MESGRO . . . . . .
Chacko, Management Decision Support Systems: Forecasting . . . . . .

THURSDAY, JULY 8

EARLY MORNING KEYNOTE ADDRESSES - 8:30 - 10:00

TME1G - McNulty, Product Forecasting in High Technology Industries

TME2G - Naylor, Corporate Planning Models: Some Challenges for the Future

LATE MORNING SESSIONS - 10:15 - 11:45

TML1G - Panel: Forecasting for Planning & Decision Making, Chairperson - Faucheux

Members - Armstrong, Sage, Talbott, Watson, Yatrakis

TML2R - Forecasting & Planning, Chairperson - Lévine

Lévine, Forecasting Decisions of the Firm: A Case Study
Sevon, Causal Maps of Past & Future
Watkins, Forecast Evaluation: Towards Optional Policy . . . . . .
Dereli, Prediction Ability of Planners in Turkey . . . . . .

TML3M - New Products Forecasting, Chairperson - Petrof

Petrof, Forecasting for New Products
Vlahopoulos, et.al., Concurrent, Post-Dictive & Predictive . . . . . .
Darmon, A Sales Force Forecasting System
Kaynak, et.al., A Comparative Study of Measuring Influence of . . . . . .
Ayeni, The Likelyhood of Purchasing EDP Equipment in Nigeria

TML4S - Forecasting Telephone Demand & Prices, Chairperson - Curien

Curien, et.al., Telephone Traffic Forecasting
Böhm, Telephone Services at Regional & Local Levels
Thaxter, et.al., Forecasting International Telecommunication . . . . . .
Mitchell, et.al., Charging for Local Telephone Calls: Price . . . . . .

BEFORE LUNCH KEYNOTE ADDRESS - 12:00 - 13:00

TML5G - Tversky, Cognitive Illusions in Judgment & Choice

THURSDAY, JULY 8, EARLY AFTERNOON SESSIONS - 14:30 - 16:15

TAE1G - Invited Speakers, G. Moore

McNees, The Productivity Puzzle: Prediction & Realization
Sage, Rationality in Human Information Processing
Klein/Moore, The Leading Indicator Approach to Economic . . . . . .

TAE2R - Behavioral, Social, & Political Aspects of Forecasting, Chairperson - Olley

Phillips, Forecasting the Demand for Single Equation Estimators . . . . . .
Schramm, et.al., Uncertainty & Forecasting
Lasker, Prediction & Forecasting in Social Context
Sarkar, Scenario Development in Planning for Societal . . . . . .

TAE3M - Financial Forecasting I, Chairperson - Alexander

Brush, Interest Rate Forecasting System
Alexander, Foreign Exchange Rate Forecasting: An Analysis . . . . . .
Polasek, et.al., Comparisons of Forecasts for Interest Rates . . . . . .
López, A Comparative Study of Models of Testing the Efficiency . . . . . .

TAE4S - Forecasting Applications in Brazil, Chairperson Castro Souza

Do Coutto Filho, et.al., Dynamic State Estimation in Electric Power . . . .
D'Araujo, et.al., The Application of Forecasting Methods to the . . . . . .
Guimaraes, et.al., An Econometric Model of the International Iron . . . . .
Morettin, et.al., Intervention Analysis Applied to Brazilian Coffee . . . .

LATE AFTERNOON SESSIONS - 16:30 - 18:15

TAL1G - Financial Forecasting II, Chairperson - Talbott

Talbott, Financial Planning: The Importance of Finding the . . . . . .
Khan, On the Prediction of Uncertain Venture Capital Investments
Williams (WH), et.al., A Robust Multivariate Characterization of . . . . .
Arana, Evaluation of Multiequation Simulation Financial . . . . . .
Walldin, Liquidity Forecasts in the Norwegian Credit Bank

TAL2R - Stochastic Processes, Chairperson - Libert

Neves, The Transformation of Variables & the Time-Series . . . . . .
Tansel, et.al., Full Information Maximum Likelihood Estimation With . . . .
Libert, et.al., Stationarity of Economic Time Series
Böcker, Forecasting Via Stochastic Process Models
Ogawara, Decision Making Based on the Stochastic Prediction

TAL3M - Health-Care Planning, Chairperson - Reisman

Steinwachs, et.al., Predicting the Specialty of New Physicians
Reisman, et.al., Manpower Needs Forecasts for the Health Services of . . .
Türksen, Forecasting in Health Care
Ercan, et.al., Planning Health Care Facility

LATE AFTERNOON SESSIONS - 16:30 - 18:15 CONTINUED

TAL4S - Forecasting With Econometric Models, Chairperson - Gafoor

King, The Implementation of Econometric Modeling in U.S. . . . . .
Kooyman, et.al., Forecasting Accuracy of Partically Disaggregated . . .
Gürol, et.al., A Demand Forecasting Model for Construction- . . . . . .
Gafoor, et.al., Policy Options for Sustained Economic Growth: . . . . .

FRIDAY, JULY 9

EARLY MORNING SESSIONS - 8:30 - 10:15

FME1A - Forecasting Applications in Accounting & Finance, Chairperson - Griffin

Griffin, Management Preferences & Accounting Choices . . . . . .
Finardi, Forecasting in Accounting: A Critical Analysis of . . . . . .
Bilson, Evaluation & Use of Foreign Exchange Forecasts
Kingsman, Forecasting Maize Future Prices

FME2B - Electricity & Gasoline Forecasting, Chairperson - Borges

Williams (LJ), Short-Term Electricity Utility Sales Forecasting . . . .
Horrell, et.al., A Transfer Function Analysis of the Demand for . . . .
Alfa, An Equilibrium (Deterministic) Model for Predicting . . . . . .
Borges, et.al., Forecasting Energy Demands in Portugal

FME3C - Disequilibrium Economics & Forecasting, Chairperson - Aykaç

Quandt, Structure & Forecasting in Disequilibrium Models
Dagum (C), Forecasting Under Assumptions of Structural Change
Aykaç, An Econometric Analysis of Wage Behavior
Machuca (J.A.D.), et.al., Business Forecasting in an Oligopolistic . .

FME4R - Commodities Forecasting, Chairperson - Pollio

Brock, Gold Prices: The Long Term Outlook
Pollio, et.al., An Econometric Analysis of the Gold Market
Ercan, et.al., Planning the Future Market Utilizing Miller Lite . . . .
Horrell, Forecasting Hedging Positions in the Commodities . . . . . .

FME5S - Simulation & Forecasting, Chairperson - Parkan

Parkan, Dynamic Adaptive Forecasting Using Simulation
Fishman, et.al., Sampling from a Discrete Distribution While . . . . .
Bart, Market Participants Forecasts of Common Stock Returns
Deligönül, Time Series Approach to Run Length Determination . . . . .
Agahi, A New Simulation Model for Forecasting

LATE MORNING SESSIONS - 10:45 - 12:30

FML1A - Time Series Analysis & Forecasting, Chairperson - Juselius

Juselius, Allowing for Short & Long Term Components in . . . . . .
Harvey, et.al., A Unified Approach to Time Series Model Building . .
Prat-Bartes, et.al., Time-Series Modeling: Transfer Function . .
Edlund, Identification of Multi-Input Transfer Function . . . . . .

FML2B - Personnel Related Forecasting, Chairperson - Machuca (M.A.D.)

Weiermair, Manpower Forecasting for Megaprojects: An . . . . . .
Machuca (M.A.D.), An Optimization Model of Personnel Forecasting . .
Villasuso, Wages Functions as a Forecasting Tool for Policy . . . .
Khairullah, et.al., Predicting the Success of Graduating Seniors . .

FML3C - Support Systems in Forecasting, Chairperson - Polhemus

Ercan, et.al., Matrix Processor & Its Use in Management Decisions
Kaltio, Time-Series Language
Polhemus, Graphical Support Systems for Interactive Forecasting
Zimmer, A Fuzzy Linguistic Algorithm for Human Predictive Reasoning
Bnaya, Energy R&D Decision Making in a Small Country

FML4R - Adaptive Forecasting, Chairperson - Hüttner

Hüttner, Experiences With the Adaptive Filtering Methods
Simos, et.al., Autoregressive Model Forecasting With Varying . . . .
Ishikawa, et.al., Feedforward Control for Effective Planning . . . .
Butler, The Application of the Asymtotic Curve to Forecasting . . .

FML5S - Forecasting Applications in Turkey, Chairperson - Yağcı

PLENARY SESSIONS

THURSDAY AM JULY 8 GRAND BALLROOM
Session TME1G 8:30 - 10:00

Chairperson: Robert Carbone, Faculte des Sciences de l'Administration , Universite Laval, Quebec, Canada.

PRODUCT FORECASTING IN HIGH TECHNOLOGY INDUSTRIES, R. E. McNulty, Assistant Vice President, Integrated Planning and Analysis, American Telephone and Telegraph, 295 North Maple Avenue, Room 5405C1, Basking Ridge, New York 07920, U.S.A.

Today, forecasting models include the impact of manufacturing capacity supply considerations, sales and distribution networks, and advertising and promotion in order to determine a firm's profitability. The task of setting price and demand has become an optimality problem involving customer value, vendor revenue, and costs. In a high technology context, new product erosion of the firm's own installed base and assessments of competitor's behavior need to be included as well. This approach affords a more comprehensive and realistic basis for estimating price, demand, cost, and profitability.

THURSDAY AM JULY 8 GRAND BALLROOM
Session TME2G 8:30 - 10:00

Chairperson: Robert Carbone, Faculte des Sciences de l'Administration , Universite Laval, Quebec, Canada.

CORPORATE PLANNING MODELS: SOME CHALLENGES FOR THE FUTURE , Thomas H. Naylor, Duke University and The Naylor Group Corporate Economics Program, Duke University, P.O. Box 10050, Duke Station, Durham NC 27706, U.S.A.

The presentation will begin with a brief history of corporate planning models over the last twenty years: simulation models, analytical portfolio models, and optimization models. We shall evaluate these models as forecasting models. We shall also discuss their ability to assist management in the solution of the three fundamental problems of strategic planning: (1) the portfolio problem, (2) the investment problem, and (3) the business strategy problem.
A new analytical framework for strategic planning and modeling called the strategy matrix will also be presented and evaluated.
The talk will conclude by discussing some of the methodological and practical challenges confronting corporate model builders in the 1980's.

THURSDAY AM JULY 8 GRAND BALLROOM
Session TML1G 10:15 - 11:45

PANEL: FORECASTING FOR PLANNING AND DECISION MAKING

Chairperson: Claude Faucheux, Foundation for Business Administration, Delft, The Netherlands.

PANEL MEMBERS: S. Armstrong, University of Pensylvania
A. Sage, University of Virginia
R. Talbott, AT&T
J. Watson, Shell
P. Yatrakis, Xerox

The usefulness of forecasting, no doubt is directly related to the degree of its utilization within organizations. The challenge to the profession is not, therefore, the introduction of more methods, but rather how existing methods can be affectively used for planning and other decision making activities. Forecasting has progressively become more difficult and less accurate during the last decade. Ironially, however, the need for forecasting has also increased with the greater environmental uncertainty that has characterized the 1970's and 1980's. Today, there are complaints about the ability of formal forecasting to provide accurate prediction and to warn management of impending dangers. However, what is the alternative? Human judgment for instance, cannot necessarily provide more accurate forecasts. Furthermore, its predictions can be considerably expensive.
The purpose of this panel is to discuss how forecasting can be integrated into the planning and decision making apparatus of organizations. This might not be an easy task, but can businesses afford not to predict the future in some systematic, and formal way? This and the additional question of the relative importance, and role of judgment versus quantitative forecasting models will be the main preoccupation of the panel and the discussions.

THURSDAY AM JULY 8 GRAND BALLROOM
Session TML5G 12:00 - 13:00

Chairperson: Spyros Makridakis, INSEAD, Fontainebleau, France.

COGNITIVE ILLUSIONS IN JUDGMENT AND CHOICE, Amos Tversky, Stanford University, Stanford, California 94305, U.S.A.

Studies of decision making and judgment under uncertainty reveal that intuitive inferences and choices of naive and sophisticated respondents often violate the laws of probability theory and the axioms of rational choice. Furthermore, the observed violations are large, consistent and pernicious, and they resemble perceptual illusions more than computational errors. Several examples of cognitive illusions are described and traced to the operations of judgmental heuristics, and to the impact of decision frames. Practical and theoretical implications of these findings are discussed.

THURSDAY PM JULY 8 GRAND BALLROOM
Session TAE1G 14:30 - 16:45

INVITED SPEAKERS

Chairperson: Geoffroy Moore, Director, Rutgers State University of New Jersey, 180 University Avenue, Newark, NJ 07102 USA.

THE PRODUCTIVITY PUZZLE: PREDICTION AND REALIZATION: Stephen K. McNees, Vice President and Economist, Federal Reserve Bank of Boston, Boston, Massachusetts 02106, USA

The paper will examine the postwar behavior of productivity growth in the United States. Using both quarterly and annual data, it will assess how accurately the path of productivity was predicted. It will speculate on the possible reasons for forecast errors. If time permits, these issues will also be explored for other industrial countries.

RATIONALITY IN HUMAN INFORMATION PROCESSING, Andrew P. Sage, Department of Engineering Science and Systems, University of Virginia Charlottesville, VA 22901, U.S.A.

This paper presents results of research into the use of structural frameworks to enhance the rationality of human information processing in planning and decision support systems. A central goal of the research is to develop a structured information processing framework based on logical reasoning that will allow identification of various forms of cognitive bias due to flawed information formulation, analysis, and interpretation. An ancillary, and equally important, purpose of the research is to develop debiasing procedures to avoid various forms of cognitive bias.

THE LEADING INDICATOR APPROACH TO ECONOMIC FORECASTING -- RETROSPECT AND PROSPECT, Philip A. Klein and Goeffrey H. Moore, Rutgers, The State University of New Jersey, Center for Intl. Business Cycle Research, 180 University Avenue, Newark, NJ 07102, USA.

Leading indicators are economic variables that anticipate future movements in output and employment during business cycles. The paper briefly reviews the theory and empirical evidence underlying the selection of such indicators, illustrates the statistical procedures used to draw inferences from the indicators, and examines evidence on how well the indicators have performed in practice. The tests of performance concentrate on data not used in the selection of the indicators, in the US and in about ten other countries. development The paper concludes with some suggestions for future research and including the application of the approach to the analysis of inflation.

WEDNESDAY AM JULY 7 SECTION A
Session WME1A 8:30 - 10:15

UTILITY FORECASTING

Chairperson: Otto Tomasek, Bell Canada Forecasting Group.

INTEGRATING MODELING AND JUDGMENTAL FORECASTS, Otto Tomasek, Bell Canada Forecasting Group, Bell Canada, 620 Belmont, Room 915, Montreal, Quebec, Canada H3C 3G4.

A critical aspect of any forecasting effort is the modification of the predictions, obtained by the model, through judgmental adjustments. In addition, judgmental forecasts obtained independently of the model, need to be integrated with those of the models. This paper examines the various approaches available and discusses the advantages and drawbacks of each. Its purpose is to provide an approach through which an effective integration of judgmental and model forecasts can be achieved.

TELECOMMUNICATIONS APPLICATIONS OF INTERVENTION AND TRANSFER FUNCTION MODELING: Hans Levenbach and James P. Cleary, American Telephone and Telegraph Company, 295 North Maple Avenue, Basking Ridge, N.J. 07920, USA

This paper discusses a strategy for developing intervention and transfer function models for practicing forecasters. Specific models in the telecommunications area are presented to illustrate the process. Examples include 1) a model relating revenues to employment levels, 2) a model that quantifies the impact of strikes on telephone demand, and 3) a model that relates telephone demand to variations in U.S. housing starts and U.S. industrial production. Comparisons are made of the intervention and transfer function models with univariate ARIMA models for the same series. The telephone demand transfer function model is also compared to a multiple linear regression model including the same explanatory variables.

FORECASTING POSTAL TIME SERIES - SOME PRACTICAL EXPERIENCES: Eivind Damsleth, Norwegian Computing Center, P.O. Box 335 Blindern, Oslo 3, Norway.

Univariate ARIMA time series models for several variables within the postal payment system have been developed. These variables include amounts input and output, number of transactions and total balance. All variables are accumulated to monthly series before analysis. The modeling was done in January 1980, using data from 1972 to 1979. Since then the models have been used for practical forecasting, with updating every three months. In the paper we give some examples of forecasts from the models, and compare the actual forecasting errors with their theoretical distribution. The models were re-estimated in January 1982, including two years of additional data. The paper further discusses the effects of this on the model identification and parameter estimates.

TIME-OF-USE ELECTRICITY RATES FOR LARGE COMMERCIAL AND INDUSTRIAL FIRMS: Jan Paul Acton and Edward Park, The Rand Corporation, 1700 Main Street, Santa Monica, California 90406, USA

Predicts the effect of time-of-use electricity rates on the load curves of large commercial and industrial firms. Time differentiated rates, typically including both energy (kWh) and demand (kW) charges, are increasingly used in the U.S. Similar time-of-use pricing has been in effect in Europe for many years, but a lack of variation in rates within countries has limited econometric analysis of European data. Time-series cross-section data from ten U.S. utilities with different rates allow us to estimate the separate effects of energy and demand prices and other variables on consumption by time of day. Our estimates should help electricity ratemakers and public utility commissions to evaluate proposed time-of-use rates - an important regulatory reform under active U.S. deliberation.

WEDNESDAY AM JULY 7 SECTION B
Session WME2B 8:30 - 10:15

FORECASTING APPLICATIONS I

Chairperson: Mirek Karasek, Arabian Data System.

THE ROLE OF ECONOMICS IN CORPORATE STRATEGY: THE XEROX EXPERIENCE, Richard N. Dino, Donald E. Riley, and Pan G. Yatrakis, Xerox Corporation, Stamford, Connecticut, U.S.A.

This paper presents the system of analysis used by the Xerox Corporation to relate the external environment to company decisions. The system is sophisticated and elaborate, comes to grips with such issues as product forecasting, market monitoring, activity monitoring, materials and labor cost analysis, and product price analysis. In addition, the system examines the longer-term issues associated with corporate strategy, with the more recent initiatives directed toward the strategic focus.
The Xerox case illustrates very well how externally provided forecasts of economic environments, both at home and abroad, can be used as inputs to a variety of econometric products to serve the individual corporation. The challenge in this work is to build the bridges from the external forces to the critical company decisions. That is a task which requires sophisticated tools and skilled professionals to accomplish. This case study shows what can be done.

ANALYSIS ... THE LINK FROM FORECAST TO PLAN TO DECISION: J.A. O'Brien, President, Olson Research Associates, Inc., 10750 Columbia Pike, Silver Spring, MD 20901 USA

The value of a forecast comes from its application. Analysis is essential to apply a forecast in the planning and decision support process. A financial forecast (statement of condition and statement of income and expense) for a U.S. commercial bank is converted to a plan through analysis. Further, a "what-if" analysis illustrates the decision support application. The role of the forecaster in explaining the forecast is described.

FORECASTING AND SCENARIO BUILDING WITH A MODEL OF THE JEDDAH AIR TRAFFIC ENVIRONMENT: Mirek Karasek, Arabian Data Systems, P.O. Box 7610, Jeddah, Saudi Arabia

A model of socio-economic complexities of the air traffic environment at KAIA in Jeddah was built - despite the lack and credibility of some basic data series - by using the 5-element methodology for estimating the structure: (1) rates rather than levels were used allowing us to pool the sources; (2) proxies and ordinal data were included to deal with bahavioral aspects; (3) causal chains and networks were secured first; (4) lexicographical ordering allowed for fast convergency towards "optimum sets of explanatory variables"; (5) analysis of systematic-error-propagation minimized large errors-in-result. Samples of scenarios, run on IBM 3031 (with on-line simulator), and their validation will be discussed.

CREDIBILITY ASSESSMENT OF MODEL FORECASTS USED FOR DECISION MAKING: Osman Balci, Department of Computer Science, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA

This paper deals with the credibility assessment of forecasts that are used for decision making and are obtained by way of using a simulation, a mathematical or an econometric model. The modeling environment is divided into three basic elements as system, conceptual model, and computerized model. The credibility assessment is defined to be a process that involves the following phases: (i) model qualification (theoretical validation), (ii) conceptual model verification, (iii) computerized model verification, (iv) data validation, and (v) model validation (operational validation). The concepts and criteria that are involved in each phase of the credibility assessment process are discussed. Techniques and procedures are suggested and guidelines are given, with respect to different types of models, for assessing the credibility of model forecasts.

THE LIMITS TO PREDICTABILITY, Robin Hogarth, University of Chicago, Graduate School of Business, 1101 East 58th Street, Chicago, Illinois 60637 and Spyros Makridakis, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France.

Lately there has been a great deal of dissatisfaction about our ability to forecast the future. The purpose of this work is, therefore, to look at both empirical and theoretical reasons why we cannot predict accurately and then propose a theory of prediction, postulating under what circumstances future prediction can be accurate when the environment is unpredictable. Furthermore, the paper will deal with such questions as the cost-benefits from predictions and the role of predictability for adaptation.

WEDNESDAY AM JULY 7 SECTION C
Session WME3C 8:30 - 10:15

FORECASTING COUNTRY POLITICAL RISK

Chairperson: Jose de la Torre, INSEAD.

MODELLING POLITICAL RISKS FOR FOREIGN INVESTMENT DECISIONS, Jose de la Torre, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France.

Since the collapse of the Shah's regime in Iran, the issue of political risk analysis has gained popularity and respectability. Just as measures of the fit between market attractiveness and corporate strategy will determine the degree of commitment a firm may be willing to make to various national markets, a rigorous assessment of long-term political risks should be employed to temper or reinforce those decisions. This paper first reviews the principal methods currently in use for assessing political risks internationally. It follows with a comprehensive model for analysing political risks of general applicability. The model is based on the experiences of a major underwriting firm concerned with insuring losses due to political phenomena on a world-wide basis.

POLITICAL FORECASTING AS A MANAGEMENT TOOL: James E. Austin and David B. Yoffie, Harvard Business School, Soldiers Field, Boston, MA 02163 , USA .

Political forces in developing countries permeate and significantly shape the business environment. "Political stability" along with market potential have been cited as the two most critical factors in the foreign investment decision. Yet, the political information used is "general, subjective and superficial". In part this unsystematic approach is due to the lack of an appropriate analytical framework for systematically examining political factors and forecasting the impact on the firm. This paper presents such a framework. This framework focuses on political structure, context and events. It then discusses how the analysis of these factors can be made managerially relevant by integrating them with the industry context and firm- specific characteristics. This approach departs from many of the traditional political forecasting techniques which only concentrate on macro-level factors and indicators. The paper concludes with recommendations regarding strategic approaches to the management of political factors.

ORGANIZING THE FIRM TO DEAL WITH POLITICAL RISK ABROAD: Bernard Marois, Docteur en Gestion, 1, rue de la Liberation, 78350 Jouy-en-Josas, France

The deteriorating climate of investments abroad (as shown by the events in Iran and many other countries) has forced firms to think more seriously about the specific risks involved in their international investments. Firms investing abroad must consider "political risk" management as one of the basic elements of their strategy. Within this context, the present article is intended as a survey of the efforts by French firms to improve their understanding of political risk. It is based on the results obtained from an empirical study carried out on a sample of 20 firms, of French nationality, which own more than 5 production or distribution subsidiaries abroad. The first part of the paper examines how an assessment function of the political risk abroad is developed. The second part deals with the corporate behavior as a result of political risk assessment.

POLITICAL RISK FORECASTING: A MANAGERIAL DECISION FRAMEWORK, Gillian Rice and Essam Mahmoud, Canisius College, Buffalo, NY 14208, U.S.A.

The purpose of this paper is to develop a managerial decision framework for forecasting political risk in an international context. Selecting a forecasting technique depends on problem definition, the time horizon, data availability and structure, cost factors, accuracy considerations in addition to subjective assesment. The framework for forecasting and analysis which is presented here recognizes the weaknesses of aggregate and quantitative approaches to the political risk forecasting problem and emphasizes the importance of subjective assessment, in particular the importance of managerial perceptions. A typology of political risks is presented and industry, firm and project specific factors are considered in relation to it, in the discussion of the framework and its application to specific managerial problems.

WEDNESDAY AM JULY 7 BARBAROS ROOM
Session WME4R 8:30 - 10:15

RATIONAL EXPECTATIONS & MACRO ECONOMIC MODELS

Chairperson: Alan Budd, London Business School.

STRUCTURE MODELS AND TIME SERIES MODELS: THEIR RELATIVE PREDICTIVE PERFORMANCE, Andrew Longbottom, Centre for Economic Forecasting, London Business School, London NW1 4SA, England.

This paper compares the properties of a structural econometric model (SEM) with a time series model. There is an extensive literature on comparing the predictive performance of SEM's with time series models. The early findings suggested that time series models performed better than the SEM's. This has provided an important stimulus to the development of econometric techniques which give greater recognition to the dynamic structure of error processes. The widespread use of these more sophisticated techniques in the specification of macroeconomic models suggests that the relative merits of SEM's and time series models need to be re-examined.
The predictive performance of the London Business School model of the U.K. economy - a large nonlinear structural model - is compared with a time series model. Both ex-post and ex-ante predictions are generated for periods from one to eight quarters ahead. In general the structural model outperforms the time series model though for some economic variables the time series model is better. This suggests some possible areas of mis-specification in the structural model. Even where the structural model is better, there are indications that the time series model does provide extra information not captured by the structural model, and this might also be interpreted as suggesting further mis-specification.

FORECASTING AND EXPECTATIONS, Sean Holly, Centre for Economic Forecasting, London Business School, London NW1 4SA, England.

The purpose of this paper is to explore the relationship between the rational expectations hypothesis and macro-economic forecasting. The rational expectations hypothesis, originally formulated in a classic paper by Muth, has had a major impact on theoretical and applied macro-economics in the last decade. We examine the methodological implications of rational expectations, the problems of expectational consistency for both modelling and forecasting, and the role of information.

RATIONAL EXPECTATIONS IN TIME SERIES AND STRUCTURAL MODELS OF THE BRAZILIAN ECONOMY: Joao Luiz Mascolo and Paulo Guedes, Fundacao Centro de Estudos do Comercio Exterior, Av. Rio Branco 120, grupo 707, CEP 20040, Rio de Janeiro, Brazil

In this paper we elaborate a sequence of small macroeconometric models blending two recent important research lines: (i) the Lucas-Sargent rational expectations models of business cycles for explaining real output fluctuations and the rate of inflation; (ii) the Zellner-Palm approach to dynamic simultaneous equation models (DSEM), mixing the traditional structural equations formulation with time series techniques. Specializing the general multiple time series process with some prior information based on economic theory, that is, assuming that some variables are endogenous whereas the others are purely exogenous, and considering different expectations formation processes, alternative structural forms of DSEM are obtained, with their associated transfer functions and final equations. Each structural form has testable implications, specifically, the orders of the transfer functions and ARMA models for real output, interest rates and the rate of inflation. It is possible, then, to detect which models are in accord with the information in the data, and, consequently, which economic assumptions are not rejected by the empirical evidence in Brazil.

WEDNESDAY AM JULY 7 MEVLANA ROOM
Session WME5M 8:30 - 10:15

DECOMPOSITION METHODS

Chairperson: Estela Bee Dagum, Seasonal Adjustment and Time Series Research Staff, Ottawa.

SELECTING LEAD TIMES OF ARIMA FORECASTS FOR THE X-11-ARIMA METHOD:
Estela Bee Dagum and Guy Huot, Seasonal Adjustment and Time Series Research Staff, 25-A, R.H. Coats Building, Ottawa, K1A 0T6, Canada

The X-11-ARIMA method extends the series with one year of extrapolated values from an ARIMA model to reduce the error of the seasonal factors applied to the most recent observations. The purpose of this study is to measure the effect that longer lead time forecasts have on the mean square error of the concurrent and forecasting seasonal factors. This analysis is made on the frequency response functions of the corresponding linear filters and, the structure of the series generated by the ARIMA model used is also taken into consideration.

MODEL-BASED SEASONAL ADJUSTMENT, Peter Burman, Bank of England, Threadneedle Street, London, EC2R 8AH, England.

Range of seasonal models needed: Statistics Canada's choice of three, an alternative choice of five with maximum of three parameters. Decomposition into trend, seasonal, and irregular - should the irregular be white noise? Feasibility of decomposition. High central weight for trend of bottom-heavy models, difficulty in detecting outliers. Non- monotonic trend spectrum of top-heavy models. Problem of decomposing (012)s model.
Outliers - single stage estimation outside model or simultaneous estimation within model. Effect on stability of seasonals.
Use of prior probabilities. Alternative forms of prior function. Effect on goodness of model fit, effect on stability of seasonals.

SELECTING, FILTERING, AND FORECASTING OF LEADING INDICATORS
THE STATISTICS CANADA EXPERIENCE, Darryl Rhoades, Current Economic Analysis Staff, Statistics Canada 25-A, R.H. Coats Building, Ottawa, Canada K1A 0T6.

The purpose of this study is to present the major elements underlying Statistics Canada's leading indicator system. In particular, attention is focused on the principles followed in selecting the component leading indicators, and on design of minimum phase shift filters. The filters are used to smooth the series so that false signals are minimized. Both filtered and unfiltered data are used in detecting emergent cyclical turns in the economy. This permits the analyst to describe the impending turn, over a period of 3 or 4 months, in terms of continuously increasing certainty.
Performance of the system is presented both in terms of turning point measures (average lead time on cyclical turns, and number of false signals emitted), and in terms of projections based on transfer function models.

FORECASTING THE DEMAND FOR BANK NOTES, Daniel Villalba, Bank of Spain, Universidad Autonoma de Madrid, Banco de Espana, Alcala, 50, Madrid, (Spain)

The purpose of the article is forecasting the demand for bank notes in Spain. For this , Multiple Time Series Analysis with the methodology developped by G.C. Tiao, G.E.P. and others, is used. The results show substitution effects for some of the bank notes as well as feedback effects.

WEDNESDAY AM JULY 7 SINAN ROOM
Session WME6S 8:30 - 10:15

FORECASTING TOURISM FLOWS

Chairperson: Turgut Var, Simon Fraser University, Burnaby, Canada.

DELPHI METHOD IN FORECASTING FUTURE TRENDS IN TOURISM, Turgut Var, Simon Fraser University, Faculty of Business Administration, Burnaby, B.C.,V5A 1S6, Canada.

The objective of this paper is to show the application of Delphi technique in tourism forecasting. Delphi as a long range forecasting technique, in recent years, has found several application areas in tourism forecasting. In order to determine the future trend in tourist flows, receipts, and economic and ecological impacts of tourism, a two-round Delphi was conducted among 80 tourism experts in British Columbia in Summer 1981. A similar study but using a single round, was also conducted in Izmir, Turkey in Summer 1980. Although they are conducted in different places, both studies revealed that, Delphi as long range forecasting technique, could be very useful in planning for future development of tourism.

FORECASTING FUTURE REQUIREMENTS FOR HAWAII'S TOURISM INDUSTRY: Juanita Liu, School of Travel Industry Management, University of Hawaii, 2404 Maile Way, Honolulu, Hawaii 96822

As Hawaii's dominant economic activity, tourism has many known linkages with the other major industries. However, few formal studies have examined tourism's direct relationships with agriculture and retailing . This study examines the interindustry linkages of tourism in Hawaii by using the State input-output table. Future product and employment requirements are estimated for projected changes in final demand.

THE STATE-OF-THE-ART OF TOURISM FORECASTING, Pauline Sheldon and Turgut Var, University of Hawaii at Manoa, 2404 Maile Way, Honolulu, Hawaii 96822, U.S.A.

The purpose of this paper is to present a summary of the State-of-the-art of forecasting in tourism. It will be based on a survey of the present methods that have been used in forecasting tourism. Both quantitative (e.g., econometric models, gravity models) and qualitative (e.g., Delphi) techniques will be surveyed as they apply to tourism demand at the local, regional , national, and international levels. In addition, directions for future tourism forecasting will be suggested based on the current trends.

FORECASTING VISITOR FLOWS USING LEADING ECONOMIC INDICATORS: Dexter J.L.Choy, University of Hawaii at Manoa, Hotel, Restaurant and Tourism Administration, 2404 Maile Way, Honolulu, Hawaii 96822

In recent years, traditional forecasting models have not proven to be accurate in many situations due to rapidly changing world economic conditions. This paper develops a model and examines the efficiency of using "leading" economic indicators as a means to forecast visitor flows to a destination. The model is applied to Hawaii's visitor industry focusing upon the major visitor markets to Hawaii, i.e., the United States mainland, Japan and Canada. To assess the efficiency of the model, the forecast estimates will be compared with other estimates generated by using traditional forecasting models.

WEDNESDAY AM JULY 7 SECTION A
Session WML1A 10:45 - 12:30

PRACTICAL ASPECTS OF FORECASTING

Chairperson: R. Lewandwski, Marketing Systems, Germany

THE FORECASTING AND PLANNING SYSTEM OF GERVAIS DANONE, P. Schwich, Chef de Service Etudes Industrielles, Gervais Danone.

Gervais Danone has been using the FORSYS forecasting system since 1971. The sales forecasts given by FORSYS are integrated into the production process and provide the basis for determining inventory levels for each product. The automatic version of FORSYS is used for weakly forecasts of about 1000 products/regions. The results of the forecasts are used to plan the production and distribution of the various products. Management can introduce special actions and simulate various alternatives. The results of using FORSYS has been satisfactory, providing errors of less than 7%. FORSYS has been also used to determine the evolution of products and predict raw material requirements.

FORECASTING IN MERCEDES-BENZ, G. Bickelmann, Stuttgart, Germany.

Forecasting automobile sales is a difficult task because of the cyclical nature of the demand. This talk will highlight how the forecasting fuction is performed at Mercedes-Benz.

SHORT TERM ANALYSIS AND FORECASTING IN COLGATE-PALMOLIVE FRANCE, M. Denizou, Directeur du Service Management, Colgate Palmolive.

The forecasting system at Colgate-Palmolive is used for the analysis and forecasting of about 150 products. The forecasts are provided automatically, through FORSYS, on a monthly basis. They are used, mainly, for marketing and production planning. The system is based on the analysis and determination of trends, seasonal factors, calendar and temperature variations, and special actions. The main advantage of using FORSYS has been its acceptance by all levels of management, its ability to incorporate special actions into the forecasts and the possibility of establishing sales objectives which could subsequently be incorporated into the forecasts. Since 1981 the short term forecasting system has been expanded to include the medium term. This has improved considerably the accuracy of the forecasts as the medium term projections are used to modify the monthly predictions.

AVERAGES OF FORECASTS: SOME EMPIRICAL RESULTS, R. L. Winkler Indiana University, and S. Makridakis, INSEAD, France.

An alternative to using a single forecasting method is to average the forecasts obtained from several methods. In this paper we investigate empirically the impact of the number and choice of forecasting methods on the accuracy of simple averages. It is concluded that the forecasting accuracy improves, and that the variability decreases as the number of methods in the average increases.

WEDNESDAY AM JULY 7 SECTION A
Session WML2B 10:45 - 12:30

FORECASTING FOR OPERATIONS MANAGEMENT

Chairperson: Lynwood A. Johnson, Industrial and Systems Engineering, Georgia Institute of Technology.

DESIGN OF FORECASTING SYSTEMS FOR PRODUCTION AND INVENTORY MANAGEMENT, Lynwood A. Johnson, Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332, U.S.A.

Desirable elements of forecasting systems for production planning and inventory management are identified, and considerations in the design of each component are discussed. Elements include statistical models for forecast generation, methods for forecast control, means of incorporating subjective information, aggregation-disaggregation options, data acquisition methods, and presentation of the forecast.

SALES FORECAST CONTROL FOR FINISHED GOODS PROCUREMENT: G. Brandenburg, Johnson and Johnson International, New Brunswick, New Jersey, USA

Author reports on design concepts of a basic sales forecast control and product ordering procedure. Main purpose is for ordering regular products to stock where there is a multi-month procurement lead time. The various revisions of the forecast are displayed. Deviation and bias are calculated for both monthly and the lead time period. Computer version includes a tracking signal and limit. The forecast and deviation measures are used to calculate order requirements to satisfy a given service level. The procedure is used by affiliates of a multi-national corporation with successful results in terms of stock availability and inventory control.

A SYSTEM DYNAMICS MODEL FOR THE PRODUCTION FORECASTING OF SUITABLE VARIETIES OF FRUITS AND VEGETABLES FOR COLD CHAIN SYSTEM IN TURKEY, Cetin Evranuz, Nur Ozmizrak, Sukru Aydin, Operational Research Division, Marmara Research Institute, Gebze, Istanbul, Turkey.

In this study, a system dynamics model for the production forecasting concerning some fruit and vegetable varieties which are suitable for Cold/Frozen Storage and Distribution is being developed.
As a consequence of significant variations in climate, soil and geographical conditions, various kinds of agricultural products are harvested in Turkey. Production amounts of the suitable products for the cold chain are mainly influenced by agricultural credit, farm machinery, fertilizer consumption, varieties selected for production, irrigation, weather conditions and investments.

In the current study, the credit and investment policies as well as the price policy are considered as the main instrument variables of the system. The results of the study will be used in investment planning of the cold frozen storage facilities and distribution systems in Turkey.

DEMAND FORECASTING AND STOCK POLICIES, J. Bastida Calvo,
Un. Santiago, Departamento de Economia de la Empresa. Fac. de CC Economicas y Empresariales. Santiago de Compostela, Spain.

Due to the fact that demand is one of the most important variable in the determination of the supply policy, the forecast methods used in the configuration of the stock policy acquire a special significance within the inventory and material management field. The purpose of this paper, is to analyse these forecast techniques and present some of the ideas that can be derived from the existing relations between the forecasting needs and the stock policies of a company.

PRODUCTION, UTILITIES AND DIRECT MATERIALS FORECASTING IN AMMONIA PLANTS : F.F. Al-Khadra and Adel Al-Ramahi,
Petrochemical Industries Company K.S.C., P.O. Box 1084, Kuwait

This paper covers practical methods for forecasting production, utilities and direct materials in ammonia plants of Petrochemical Industries Company, Kuwait. Production forecasts are based on optimum regularity factor by utilizing actual production during previous years, taking into consideration all constraints such as annual turn-around along with major plant operating problems, bottle- necks, major maintenance, tie-ins of capital project, equipment and human resources, and sales. Utilities and direct materials forecasts are based on correlation with actual production for previous successive years to obtain optimum consumption/production ratios. Also correlation between closely interrelated utilities are covered in this paper.

WEDNESDAY AM JULY 7 SECTION C
Session WML3C 10:45 - 12:30

TECHNOLOGICAL / DEMOGRAPHIC FORECASTING

Chairperson: J. Baal-Schem, Interdisciplinary Center for Technical Analysis and Forecasting,Tel-Aviv University.

THE USE OF FORECASTING METHODS IN POLICY DECISION-MAKING :
J. Baal-Schem, Interdisciplinary Center for Technological Analysis and Forecasting, Tel Aviv University, Tel Aviv, Israel.

Technological Forecasting was essentially developed in order to anticipate future technologicql developments and to reduct technological uncertainties in Research and Development planning.
Already at early stages of Technological Forecasting methodology development, it was recognized that some of it's methods can assist in policy decision-making, either for a corporation or for a government. In a specific case this might include corporate policy on reliability.
The main methods to be discussed are:

a. The Delphi method
b. The cross-impact method
c. The Relevance Tree

- The Delphi method is a dynamic prodecure for forming consensus among participants through the use of questionnaires, with no face-to-face discussion (or even identification) by the members of the group. It is a form of controlled conference accomplished in discrete steps. Judgments are elicited from a group, areas of consensus and dissensus are identified, reasons for extreme positions are elaborated and judgments are re-examined in light of the earlier group consensus and the reasons given for extreme positions.
- The cross-impact approach is a methodology for forecasting which draws its strength from the recognition of reciprocal effects between events and developments. A combination of the Delphi technique with cross- impact analysis can provide an appreciation of the interplay of individual problems and opportunities, e.g. the impact of forecasted technological opportunities on policy outcomes.
- The Relevance Tree method allows the calculation of relative utilities for different policy alternatives, by identifying objectives, missions, tasks, etc., setting criteria at each level and weighing the relative importance of upgrading items at each level .

As an illustration of the possibility of assisting policy decision-making by forecasting methods, a greater part of the paper will be dedicated to a description of the process and outcomes of a study performed by the author on the impact of telecommunication on the development of industrial areas. Hitherto unpublished statistical results of a Delphi forecast on trends in Israeli industry for 1985 will be presented and discussed. The outcomes of a modified unidirectional cross-impact analysis will be provided, leading to conclusions on the required policy decisions to be made in the area of telecommunications in order to assist the expansion of industry.

A DELPHI/GAMING TECHNIC APPLIED TO PUBLIC SYSTEMS FORECASTING :
George Reid, University of Oklahoma, Norman, Oklahoma 73019, U.S.A.

The author has used gaming, and delphi technics in a variety of public institutional forecasts. These have been on the supply of and demand for educational programs, at the University of Oklahoma and a regional vo-tech; for water requirements and site selections for the Republic of Indonesia; for waste water requirements for the State of Oklahoma, Saudia Arabia and Arabic countries (ECWA); and for multiple commitment urban system model for the USA.
These models have received various degrees of acceptance, by the profession and by the ultimate user. The author is particularly concerned with less reliance on elegant mathematical routines, and more with giving attention to participant involvement.
The paper starts by justifying the use of such methods in public problems, resorting to brief discussions on a variety of applications of delphi and gaming technics and their concentrations on one particular application using both the delphi and gaming technics in an iterative model in the urban sector.
This model starts with a cohort type (or system dynamics) population forecast, followed by a house/home model deeply involving life style, then a house assignment, or land use model using a delphi followed by a game technic, the assigned houses, then generate physical, and unphysical consequence model, e.g. water, sewage, health, education, security, etc.
The method stresses the importance of limiting of preconceived decisions, and using real people for decisions.

THE MULTIPLE PERSPECTIVE CONCEPT: Harold Linstone, Director, Portland State University, P.O. Box 751, Portland, Oregon 92707, USA

In the area of sociotechnological systems the science/technology based paradigms of analysis have serious limitations. Building on the work of Graham Allison, we explore the use of multiple perspectives to develop greater insights; specifically, an organizational/societal perspective and a personal/individual perspective augment the conventional "technical" perspective. Application of the three perspectives to several technology assessments and other complex decision areas indicates that the concept can effectively narrow the gap between model and reality for decision making.

ECONOMIC-DEMOGRAPHIC FORECASTING: THE IMPLICATIONS FOR PUBLIC AND PRIVATE DECISION MAKING AND PLANNING: Dennis A. Ahlburg, University of Minnesota, 537 Business Administration Building, Minneapolis, Minnesota 55455, USA.

The author presents forecasts of births, marriages and divorces for 1980 - 1990 from an economic-demographic model of the U.S. Births are forecasted to rise significantly relative to recent experience and the number of marriages and divorces are forecasted to exceed recent levels. The birth forecasts imply that, relative to recent experience, there will be increasing demand for baby products, schools and teachers. This forecast implies a reversal of current planning and decision making in these areas. The marriage forecast taken together with the birth forecast, implies an increasing demand for conventional family dwellings. The increased divorce rate indicates that government policy in the area of alimony, child support and welfare needs to be re-examined. A second group of models provide long-run forecasts of every other generation cycles in fertility. These models suggest that there may also be derived long cycles in baby products markets, demand for schooling, housing and in labour markets. These cycles have obvious implications for long-run private and public decision making and planning.

FORECASTING DEMOGRAPHIC TIME-SERIES, MARRIAGES AND BIRTHS :
David A. Dodd, Manager, Forecasting and Analysis, Ross Laboratory, 625 Cleveland Avenue, Columbus, OH 43216, USA

Fluctuations in births over the short-term have frequently confounded individuales required to forecast births or birth-related data over such a period. The failure of U.S. official long-term estimates to accommodate such planning has only aggravated the problem. In recent years, several demographers have reviewed the autoregressive nature of fertility and births, urging the inclusion of this information in any fertility and birth forecasting models. In this article a representation of short-term births was developed from autoregressive integrated moving average (ARIMA) models. It is demonstrated that seasonal parameters should be included and that in so doing, an ARIMA model satisfactorily represents subannual births. An actual model is developed for U.S. quarterly births and shown to provide usable forecasts six quarters into the future. Also analyzed is the additional information contributed to forecasting short- term births from marriages and marriage rates. A review of these results and the univariate ARIMA model is also presented. A review of how these forecasts are integrated into a business planning system is presented where the basic element of the system is the birth forecast.

WEDNESDAY AM JULY 7 BARBAROS ROOM
Session WML4R 10:45 - 12:30

SUPPLY SIDE IN EUROPEAN MODELS & FORECASTING

Chairperson: Otto Hieronymi, Head, Program of Economic Analysis and Forecasting, Geneva.

INTRODUCTION : THE PROBLEM OF MODELLING AND FORECASTING SUPPLY :

Otto Hieronymi, Head, Program of Economic Analysis and Forecasting, 7 route de Drize, 1227 Carouge, Geneva, Switzerland

Economists have to try to forecast both demand and supply in the economy as a whole or in given markets. Yet, most econometric models are strongly demand oriented. The problem of the "supply side" thus goes beyond the current debate about the appropriate fiscal policies stimulating savings and investments, and hence supply. In addition to the general statement of the problem, the introduction to the session will give brief examples of the various approaches to modelling and forecasting supply.

LINKING MACRO-ECONOMIC AND CORPORATE SUPPLY: THE EXAMPLE OF ENI:

Martino Lo Cascio, ENI, Rome, Italy

ENI is a multisectorial group which operates in the areas of energy, chemicals, textiles, mechanical products, engineering and services. In some sectors (e.g. supply of crude and natural gas) it covers a share of total national output larger than 50%. The evolution of the group demand and supply is linked tightly with the corresponding national values. Both for drawing the annual budget and the five year investment plan , ENI has prepared an integrated macro-economic and sectoral model and a firm-wide input-output model linked together by a procedure which specifies the feed-backs between national economy and economic financial structure of ENI, and between investment and growth of the group and the national economy. The paper puts into evidence :

a) the basic structure of the various models
b) some examples of the linkage national growth - growth of the group from the viewpoint of price formation, investment process, productivity, costs.

COMPARING THE STRUCTURE OF FORECASTING MODELS:

Manfred Gilli, University of Geneva, Geneva, Switzerland

The availability of computers and adequate program-packages makes model- building in the sense of quantification easier and easier. This situation gives rise to the creation of many econometric models whose size and complexity are increasing. Many methods have been developed to understand the working of models, most of them are based on the analysis of their quantitative properties (e.g., simulation, perturbation, eigenvalues, etc.). The approach we propose is a qualitative one, based only on the causal structure of a model, i.e. the content in variables of each relation in the model. The results we obtain are independent of a particular quantification, they are more general but evidently remain compatible with a particular quantified structure. Operational methods will be described in the paper and the method will be used to analyse the supply- side in a number of European models.

FORECASTING REAL ACTIVITY AND INFLATION - THE SWISS EXPERIENCE,

Walter Wasserfallen, University of Bern, Bern, Switzerland.

Forecasts of real output and the rate of inflation are calculated using quarterly data for the Swiss economy over the post-war period. The performance of two methods from time-series analysis, ARIM- models and transfer functions, are evaluated in that respect. Actual forecasting situations are simulated throughout. The various models are fitted over a certain number of periods and then used to form expectations over the subsequent year. The empirical estimates are updated before the next year's forecasts are produced. Several measures are presented to examine the resulting series of forecast errors with respect to accuracy and rationality.

WEDNESDAY AM JULY 7 MEVLANA ROOM
Session WML5M 10:45 - 12:30

TRACKING SIGNALS FOR FORECASTING & CONTROL

Chairperson: Everette S. Gardner Jr., Virginia Beach.

AUTOMATIC MONITORING OF FORECAST ERRORS: Everette S. Gardner, Jr., 6348 Dartmouth Way, Virginia Beach, VA 23464, USA

This paper evaluates a variety of automatic monitoring schemes to detect biased forecast errors. Statistically significant results are presented to support the following conclusions. When forecasting with models other than exponential smoothing, an autocorrelation tracking signal developed in this paper is the best choice. For exponential smoothing, the best signal is the ratio of smoothed forecast error to MAD or variance. This paper also contradicts previous research, which holds that backward cumulative sum (cusum) methods are superior to smoothed-error tracking signals. Simulation results show that the performance of backward cusum and smoothed-error signals is virtually identical.

USING AN ADAPTIVE SMOOTHING METHOD FOR FORECASTING SEASONAL SERIES, A. L. Sweet, Purdue University, Grissom Hall, West Lafayette, Indiana 47907, U.S.A.

In the previous paper, (AIIE Trans., Sept., 1981) the author extended Brown's adaptive smoothing method to seasonal series. In this paper, the startup problem will be discussed. Then, only one smoothing constant is present in the model, and applied to some data sets in order to examine the stability of the forecasts.

AN AUTOMATIC AND ADAPTATIVE PREDICTION SYSTEM, Francisco A. Triguero Ruiz y Otros, Departamento de Matematicas, Facultad de Economicas, University Malaga, Malaga, Spain.

In this paper, we build-up a statistical test in order to identify the break points in the behaviour of the trend for one of the three components that the Time Series are decomposed into for this analysis. This subject is based on the hypothesis:

1. Poligonal Trend
2. Autoregressive Process non degenerate

Moreover, and looking for the establishment of a selection test for the autoregressive process order, we build our own test, based on the last results of Shibata, R. and Kayshap, R. Also we show that it is consistent and assymtotically efficient into the autoregressive

models. As well, due to the fact that the AIC test is not consistent, there is no rational justification to choose the AIC test against the one proposed in this paper. Hence, agree with the former results, we demonstrate and build an automatic prediction system adaptative to disturbances in the trend.

ON MEASURING RATES OF CHANGE OF VALUE OF REAL PROPERTY USING PAIRED OBSERVATIONS: John P. Matthews, Department of Quantitative Analysis, University of Wisconsin, 1155 Observatory Drive, Madison, Wisconsin, 53706, USA

When local governments tax real property is based upon value, the estimation of value must be equitable and accurate. Estimation of value is especially difficult during periods of rapid change in market value. The market values, in particular, single family homes, in the U.S. has increased until recently at widely varying rates. These rates range from slightly negative (1981) to over 20% annually (1976-77). The author will present a methodology he has employed since 1976 on over 2,000 pairs of observations. Linear regression is employed to a log-transform of ratios of values in order to estimate rates of change of value. These estimated rates of change are then used to adjust property values for appreciation over time.

WEDNESDAY PM JULY 7 SECTION A
Session WAE1A 14:00 - 15:45

ENERGY FORECASTING

Chairperson: J.-E. Samouilidis, National Technical University of Athens, Greece.

INTEGRATED ENERGY DEMAND FORECASTING, J.-E. Samouilidis, C. S. Mitroupoulos, and N. Kokalakis, National Technical University of Athens, Chair for Industrial Management, 23is Oktovriou 42, Athens 147, Greece.

Energy demand and GNP are related via a two-way linkage. Its main characteristic is that GNP changes affect energy demand but any energy demand change does not have a proportionate impact on GNP. This property generates a spiral --usually stimulated by energy price increases-- where energy demand declining drives GNP towards lower values, which in turn have a further negative effect on energy demand and so forth.
In this paper a comprehensive model is developed to describe the energy -GNP interaction. Energy, capital and labour are considered as the primary inputs for GNP. A production function coupled with analytical relationships for energy, capital and labour constitutes the model. Energy price is assumed exogenously determined, at least for net energy-importers, and investments remain, in essence, the only decision variable.
The model is linearized and formulated in a way allowing stochastic components to account for the non systematic movements of the variables. Kalman filter has been employed, due to its computational advantages, to provide future energy demand, capital and GNP estimates. The outputs are conditional to energy prices and investment decisions.
As a full scale application of this integrated energy demand forecasting methodology forecasts are produced for the Greek economy. The predictions are based on the economy's history as well as on the anticipation of its future behaviour and cover a medium term horizon.

LONG RUN EFFECTS OF THE CANADIAN NATIONAL ENERGY PROGRAMME, S. L. Schwartz, and Z. T. Ziemba, University of British Columbia, Vancouver, V6T 1W5, Canada and J. D. Fullner, University of Waterloo, Ontario, N2L 3G1, Canada.

This paper analyzes long run effects of the new Canadian national energy programme and the recent Federal - Provincial price and revenue sharing agreements. These programmes call for a greater Canadian ownership of the country's energy resources, a continuation of the single price policy for oil and gas (with exports subsidizing imports), world prices for new oil and old oil prices rising gradually toward the world price and relationship betwen oil and gas prices. A long term energy policy model for Canada that relates the major supply options to end use demands via a process model of interfuel, substitution, transmission and distribution is used for the analysis. The model determines output levels and energy prices in the East and West that balance supply and demand in each period over the horizon (1980 - 2030) to maximize consumers' plus producers' welfare. The scenario projections provide guidance concerning export and self sufficiency possibilities, growth in the energy economy and various supply industries, interfuel substitution options, conservation and output shares of the various demand sectors.

A PREDICTIVE MODEL FOR COAL SULFUR DISPOSITION IN DIRECT LIQUEFACTION: Abdel H. El Sawy and Norman H. Mines, The Mitre Corporation, Metrek Division, 1820 Dolley Madison Boulevard, McLean, Virginia 22102 USA

This paper is part of a project to assist the U.S. Environmental Protection Agency (EPA) in developing an information base for synthetic fuel processes. Based upon conceptual designs for producing liquid fuels by alternative direct coal liquefaction processes (SRC-II, H-Coal, and Exon Donor Solvent), this paper provides an estimate of (1) the distribution of the original coal feed sulfur among the products, by-products and waste streams of the coal conversion processes, and (2) correlates the coal liquefaction process operating conditions (i.e., temperature, pressure, and hydrodynamics of the coal dissolver) with the extent of coal desulfurization as measured by the amount of coal feed sulfur left in the liquid fuel products.

FORECASTING NATURAL GAS CONSUMPTION FOR A METROPOLITAN UTILITIES COMPANY: A. Aswad and O. Ulgen, Department of Industrial and Systems Engineering, The University of Michigan-Dearborn, 4901 Evergreen, Dearborn, MI 48128, U.S.A.

Time series analysis techniques are applied to gas consumption data for a large metropolitan area. The techniques applied include Exponential Smoothing, Box-Jenkins methodology, and the heuristic learning and identification algorithm of the Group Method of Data Handling. The various forecast results are investigated, the advantages and disadvantages of applying each technique are discussed, and the applicabilty of the "best" technique for planning and decision making is examined.

WEDNESDAY PM JULY 7 SECTION B
Session WAE2B 14:00 - 15:45

EVALUATION OF FORECASTING

Chairperson: Robert Fildes, Manchester Business School, England.

COMPARISON BETWEEN BOX-JENKINS, HOLT-WINTERS AND STEP-WISE AUTOREGRESSION FORECASTING OVER SIMULATED ARIMA TIME SERIES:

Harri Hietikko, Department of Mathematical Sciences, University of Tampere, P.O. Box 607, SF-33101, Tampere 10, Finland.
Tampere 10, Finland

The study described in this paper compares the automatic forecasting methods of Holt-Winters and stepwise autoregression with some simple ARIMA models. This is done by generating 50 realizations from each model. These include non-seasonal series as well as seasonal models and models with the linear trend. The purpose of the study is to compare the post-sample forecasting accuracy among the two automatic methods and the ARIMA models.

A COMPARISON OF THE STATE SPACE FORECASTING PROGRAM SARAS WITH THE BOX-JENKINS METHOD,

Keshav P. Vishwakarma, La Trobe University, School of Economics, Bundoora, Victoria, Australia 3083.

An easy-to-use computer program called SARAS has been developed for time series analysis. It comprises a variety of stochastic models in the state space form of modern control theory. Several options are included. For example, choice of linear or exponential trend is allowed. Similarly, an additive or a multiplicative seasonal component may be included. Possibility of excluding the state transition noise or the measurement noise is also provided. Maximum likelihood estimation and calculation of forecasts are inbuilt. SARAS furnishes both the expected level and the 95 per cent confidence interval for the probabilistic forecasts.
This paper compares SARAS with the well-known Box-Jenkins method. A number of indicators of economic and business activity, such as the interest rate, housing construction and retail sales, are employed in the study.

A COMPARISON OF MODEL-BASED MEDIUM-TERM ECONOMIC FORECASTS FOR THE UK RECESSION 1980-1981:

T. S. Barker, Department of Applied Economics, University of Cambridge, Sidgwick Avenue, Cambridge CB3 9DE, England.

The paper will compare the methods used and forecasts made by 4 non-government UK economic modellers (Cambridge Econometrics, London Business School, National Institute of Economic and Social Research and the Cambridge Economic Policy Group) for the UK recession 1980-81. The paper will concentrate on medium-term annual ex-post projections and forecasts. It will aim to assess the performance of the groups in forecasting the onset, length, depth and character of the economic recession in the UK which began in 1979.

A COMPARATIVE STUDY OF THE EX-POST ACCURACY OF PUBLISHED CANADIAN FORECASTS,

Swaminathan Sankaran, Faculty of Administration, University of Regina, Regina, Saskatchewan, Canada S4S 0A2.

This paper reports the results of a study comparing forecasts of specific macro economic variables made by twelve different forecasters over a six year period, with the actuals for those years. The study is also concerned with the relative accuracy of the latest forecast, presumably incorporating additional information, vis-a-vis earlier forecasts for the same year made by each forecaster. Further, different methods of combining forecasts from various sources with a view to improving accuracy will also be studied.

A COMPARISON OF ARIMA- TRANSFERFUNCTION- AND ECONOMETRIC FORECAST MODELS,

Gerhard Schlintl, National Bank of Austria/WABIL, Karntnerring 9 - 13 1010 W i e n, Austria

At the beginning of 1982 the National Bank of Austria changed its current account definition. This, and the circumstance that current account in recent years has become a sensible variable of macroeconomic attention, suggested a reconsideration of the forecasting procedure.
For the last 36 months ex-ante forecasts with ARIMA - transferfunction- and econometric models were produced, and different kinds of forecast errors examined. For these different kinds of estimation procedures the stability of the parameters were evaluated, and for the econometric analysis the Kalman Filter technic was applied, and the tests suggested by Brown, Durbin and Evans (1975) were taken into account.

WEDNESDAY PM JULY 7 SECTION C
Session WAE3C 14:00 - 15:45

PSYCHOLOGICAL ASPECTS OF FORECASTING

Chairperson: Sylvia Downs , ITRU, River House, Wey Road, Weybridge Surrey KT13 8HR, GB.

THE PREDICTION OF MANAGERIAL PERFORMANCE: CROSS-CULTURAL CONSIDERATIONS IN THE USE OF ASSESSMENT CENTER TECHNIQUE: Roger Gill, Director of Management Programs and Services, State University of New York at Binghampton, Binghampton, N.Y. 13901, U.S.A.

EQUAL OPPORTUNITY AND FORECASTING OUTCOMES OF AFFIRMATIVE ACTION PROGRAMMES: THE EXPERIENCE OF NORTHERN IRELAND, Michael Pearn, 8 Halifax Road, Cambridge CB4 3PX, U.K.

The paper presents an analysis of equal opportunity in employment from statistical, legal and practical viewpoints. An investigation is described in which the presumed religious affiliation of employees in a major public body is inferred from demographic data, the religious composition of the organization is analyzed in great detail to determine where, in what manner and for what reasons equal opportunity on religious grounds was not being afforded. Attempts to explain the present distribution of Catholics and Protestants are made by fitting different manpower planning models. Different models are used to predict the distribution of Catholics and Protestants (especially in the top grades) in x years with current trends of movements in, out, and within the organization, and also as a level of affirmative action programmes (using goals, targets, and quotas) of different degrees of intensity. The paper closes with a discussion of the statistical and methodological problems involved in the analysis and forecasting of equal opportunity.

THE USE OF BEHAVIOUR SAMPLES TO FORECAST JOB PERFORMANCE, I. T. Robertson and J. M. Smith, University of Manchester Institute of Science and Technology, P. O. Box 88, Manchester M60 1QD, GB.

One of the main areas in which psychologists have been involved in forecasting is in the area of personnel selection, i.e. using samples of current behaviour to predict future job performance. Many techniques have been used including interviewing, paper and pencil tests of intelligence, aptitude, personality, etc. The predictive validity of these techniques has varied and with some approaches useful prediction has been achieved. Some of the less tractable problems confronting researchers concern the choice and design of behaviour samples, the collection and interpretation of data concerning the behaviour sample and the development of appropriate (criterion) measures of job success. This paper describes research designed to assess the predictive value of alternative ways of collecting data derived from a particular sort of behaviour sample.

VALIDATION OF ROLE PLAYING AS A PREDICTIVE TECHNIQUE FOR CONFLICT SITUATION, J. Scott Armstrong, Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania 19104, U.S.A.

Prior research, though limited, suggests that for conflict situations role playing provides more accurate forecasts than can be obtained from opinions. This study adds additional support. Twenty-nine pairs of subjects made predictions for two real but disguised conflicts. Another fourteen pairs met with groups playing the opposing side in a role playing session; they then stated what they expected would be the outcome of their meeting. The opinions-only predictions agreed with the actual outcome only once (3 percent), while the expected role playing outcome agreed with reality for 71 percent of the pairs.

WEDNESDAY PM JULY 7 BARBAROS ROOM
Session WAE4R 14:00 - 15:45

BAYESIAN & SUBJECTIVE METHODS OF FORECASTING

Chairperson: Basilio de Braganca Pereira, Universidade Federale do Rio de Janeiro.

SOME APPLIED TIME SERIES WORK AT UFRJ - BRAZIL, Basilio de Braganca Pereira, Instituto de Matematica and Coordenacao dos Programas, de Pos-Graduacao de Engenharia - Universidade Federal do Rio de Janeiro (IM and COPPE-UFRJ).

The purpose of this paper is to present some of the works on time series at UFRJ in which the author was or is involved. A resume is given of the following work.
- An earlier application of Bayesian Forecasting in electricity demand. - Combining adaptive filtering with subjective information of operators of the Open Market to forecast interest rate of bank reserves. - Modelling the total suspended particulates and related meteorological variables. - Determination of the period of procreation of lobster in Ceara (Brazil) using spectral analysis and decomposition by principal components. - Modelling the terciary sector of the Ceara economy by principal component analysis of the multivariate series. - Comparison of multivariate time series forecasting methodologies.

ANALYZING PROBABILISTIC FORECASTING PERFORMANCE: THE COVARIANCE DECOMPOSITION OF THE MEAN PROBABILITY SCORE, J. Frank Yates, The University of Michigan, Department of Psychology, 330 Packard Road, Ann Arbor, Michigan, 48104, U.S.A.

The probability score (PS) is one of several scoring rules which are used for indexing probabilistic forecasting performance quality. One of the advantages of PS over other scoring rules is that its mean (PS) lends itself to various methods of partitioning. The elements of the resulting decompositions of PS often have meaningful interpretations in terms of the forecaster's distinctive judgmental habits and abilities. A recently identified "covariance" decomposition is described and illustrated with scalar and vector probabilistic forecasts from areas including meteorology, medicine, academic performance, and oddsmaking. Comparisons and contrasts with other procedures are also made.

TECHNIQUES FOR DERIVING PERSONAL PROBABILITY ESTIMATES FROM EXECUTIVES: Israel D. Nebenzahl, Bar-Ilan University, Ramat-Gen, Israel.

Personal probability estimates can be utilized in forecasting variables for which past data are not available. Often, however, those who are in the best position for making such estimates do not possess the required technical knowledge and do not think in probability terms. This paper discusses different techniques for assisting non-technical executives in providing personal probability estimates. With the aid of these techniques estimates of probability distributions can be derived from persons who have no statistical background.

DECISION-MAKING UNDER PARTIAL INFORMATION ON EVENTS' PROBABILITIES: A NORMATIVE MODEL, Jean-Yves Jaffray, Laboratoire d'Econometrie, Universite Paris VI, 4, Place Jussieu, Paris 5e, and Michele Cohen, Universite Paris I, 12 Place du Pantheon, Paris 5e. 12 Place du Pantheon, Paris 5e

Under partial information on the events, a decision-maker who feels unable to assess a probability distribution, may judge that a certain set of distributions is compatible with his information. We propose a normative model for this case; this model, which uses jointly the rationality assumptions for decision-making under complete ignorance and those standard under risk, can be characterized axiomatically. Examples of applications are provided. Methods of assessment of parameter values in the model are suggested.

LINEAR GROWTH BAYESIAN FORECASTING: J.J. Farias Neto, DEE-PUC Grupo de Sistemas, Rua Marques de Sao Vicente, 225, Rio de Janeiro, Brazil.

This paper presents an overview of the so called "Bayesian Forecasting Methods", developed by Harrison and Stevens, focusing particularly the Linear Growth Model (LGM) and its four-states version. The LGM is compared with its classical counterparts (the Hold model, the ARIMA (0,2,2) model, etc ...) from a theoretical point of view, the four-states version being related to the "adaptive methods". Finally, some results from applications to real Brazilian economic time series are summarized.

WEDNESDAY PM JULY 7 MEVLANA ROOM
Session WAE5M 14:00 - 15:45

ADAPTIVE FORECASTING

Chairperson: Robert Carbone, Universite Laval, Quebec.

FORECASTING TIME-VARYING PARAMETER STRUCTURES WITH KALMAN FILTERING TECHNIQUES, Dick Tempelaar, University of Gronigen, Econometric Institute, P.O. Box 800, 9700 AV Gronigen, Pays Bas.

In recent years the 'classical' assumption of econometric analysis, that the structure of economic models is time-invariant, has been questioned more and more (see e.g. the special issue of the Annals of Economic and Social Measurement, 1973). This notion has contributed to a large extent to the research into time-varying parameter structures, both in the area of random-coefficient models and in the area of systematic (non-random) variation models. This paper combines both these approaches, and gives a procedure for joint estimation of the time-varying parameters and the transitions in a Markovian type parameter model, based on Kalman filter algorithm. Contrary to most publications in this area, the a priori knowledge of the transition matrix is not assumed.

SOME RESULTS ON THE PERFORMANCE OF AEP FORECAST BOUNDS: Pierre Lefrancois, Department des Sciences Economiques et Administratives, Universite de Quebec, Chicoutimi, Quebec, G7H 2B1, Canada, Allan Andersen, University of Sydney, New South Wales 2006, Australia, Robert Carbone, Faculte des Sciences de l'Administration, Universite Laval, Quebec G1K 7P4, Canada.

This paper presents results of an empirical analysis to examine the performance characteristics of a penalty approach to set forecast bounds. The approach is integrated within the adaptive estimation of time dependent parameters of a AEP forecasting model. It accounts for user judgment and asymmetric distributions of forecast errors. Results of a large scale Monte- Carlo study for some familiar processes and real world examples show the effectiveness of the method in comparison to forecast intervals generated through ARIMA methods.

SEASONAL ADJUSTMENT AND ADAPTIVE FORECASTING: Robert Bilongo and Robert Carbone, Faculte des Sciences de l'administration, Universite Laval, Quebec, G1K 7P4, Canada.

Seasonality plays an important role in time series analysis and forecasting. This paper presents an adaptive modeling structure which decomposes a time series into three components: short term, long term and seasonal effects. In this structure, seasonality is treated in relative term and the time-varying parameters of the three components are simultaneously adjusted with time via a feedback mechanism. No identification steps are necessary. Results using 111 time series show the effectiveness of the method in improving forecast accuracy over other methods.

MULTIVARIATE LOAD MODELLING FOR SHORT TERM FORECASTING, R. Anelli, ENEL- DSR, Centro Ricerca di Automatica, Milano, Italy, R. Genesio and A. Vicino, POLITECNICO DI TORINO, Instituto di Electrontecnica Generale, Torino, Italy.

Short term load forecasting in electric power systems is an essential tool for economic generation scheduling and for system security. It is well known that the electric load variations can be affected by weather variables such as temperature and sky brightness: predictions from a few hours to few days are expected to be improved by taking them into account. This paper presents a multivariate approach to load forecasting based on a combined transfer function-noise model and provides an accurate analysis of the relationships among the variables involved. Experimental load data from an area of the Italian network are processed and results are reported for comparison with predictions obtained by load univariate analysis.

WEDNESDAY PM JULY 7 SINAN ROOM
Session WAE6S 14:00 - 15:45

FORECASTING APPLICATIONS II

Chairperson: Muhittin Oral, Department of Industrial Engineering, Bosphorus University, PK2 Bebek, Turkey.

A GENERALIZED METHOD FOR JOB SCHEDULEING OF FORECASTING PROBLEMS :

Fevzi Unlu, Department of MAthematics, Faculty of Science, EGE University, Bornova-IZMIR, Turkey.

us-Culture is a newly developed "discrete mathematical structure" method for registering information. The letters u and s are the two parameters for specifying the dimension and the size of the structure under consideration. Utilizing different weighting procedures, the elements of us-culture can be systematically ordered in different sequential forms or matrix forms. This makes us-culture applicable for many forecasting problems such as forecasting the demand for energy, new products, health care planning, etc. In this paper a general us-cultural job scheduling procedure has been developed by applying an algorithm which implemented a programming language which allows us to tackle all kinds of scheduling tasks.

A SHORT-TERM SALES FORECASTING MODEL FOR PHYSICAL DISTRIBUTION SYSTEMS:

Sayeste Daser, School of Business Acountancy, Wake Forest University, P.O. Box 7285, Winston-Salem, NC 27109, U.S.A.

The objective of this research is to devise a forecasting approach to meet the short-term planning and decision making needs of management in charge of physical distribution systems. A simulated model is built with flexibility along the dimensions of the level of detail of forecast and the technique of forecasting. A comparison of several techniques is made to determine the most appropriate short-term forecasting method.

STEP WISE MOST LIKELY STATE APPROACH IN FORECASTING EXTREME VALUES OF HYDROLOGICAL TIME SERIES,

C. H. Dagli, Industrial Engineering Department, Middle East Technical University, Ankara, Turkey.

Forecast of extreme values of hydrological time series is extremely important in operations management of reservoirs. In this paper the applicability of step wise most likely state approach is assessed using the monthly time series data for Euphrates (Firat) river, for a period of 31 years. Results of the approach are examined using the standard statistical tests and relatively satisfactory findings are obtained.

FORECASTING ECONOMIC DEVELOPMENT IN THE GOVERNMENT OF CANADA: PERSPECTIVE AND PROCESS,

H. Bert Waslander, Economic Analysis Division, Ministry of State for Economic Development, 122 Bank Street, Ottawa, Ontario, K1A 1E7, Canada.

The paper argues that quantitative economic forecasts for sectors and regions are not as a rule very useful to the formulation of economic development policy.
Messages have to be extracted, implications spelled out. Analysis of broad economic forces - which may or may not fully manifest themselves in the forecast and framing of normative questions not only gives focus to the forecasting activity, it also can influence the general orientation of the policymaker with ultimate effects on policy action. The paper analyses structural change in Canada, raises some related issues and describes how this type of work affects policymaking.

FORECASTING FOR PLANNING THE OPTIMUM UTILIZATION OF MONSOON RAINFALL:

S. K. Ekambaram, Chairman, Institute of Managerial Statistics and Economics, G-113, Plot No. 600, Annagar East, Madras-600 102, India

Forecasting for planning the optimum utilization of Monsoon rainfall has certain specific information requirements for management decision making at the appropriate time. The matching of forecasting capability and the required management information is facilitated by cumulating in time (Seasons) and aggregating in space (zonal climate). The cumulated time (season from June to September) and aggregated space (coastal zone from Bombay to Cochin) are considered. The data of 81 years from 1901 to 1981 are used for analysis to select a matching forecast and management information requirement. Monsoon rainfall is appreciated as a renewable and dependable natural resource for planning. The forecast aids in utilization by adding value to management information, in the cycle of operations of the total system.

WEDNESDAY PM JULY 7 SECTION A
Session WAL1A 16:15 - 18:00

FORECASTING EVALUATION

Chairperson: Michele Hibon, INSEAD, Fontainebleau, France.

MODEL SELECTION AND PREDICTABILITY IN FORECASTING: Robert Fildes, Manchester Business School, Booth Street West, Manchester M15 6PB, England.

Two alternative procedures are regularly employed when selecting a class of time series models for use in forecasting. The first selects the class to be considered a priori. The second procedure selects that class which would have performed best if it had been employed in the past. It is this second procedure which has been recommended by most researchers in forecasting. This paper compares the utility of these two approaches to model selection and examines whether the more complex (and academically respectable) procedure can be said to be worth the extra cost.

FACTORS AFFECTING FORECASTING ACCURACY: Spyros Makridakis and Michele Hibon , INSEAD, Fontainebleau 77305, France

Forecasting accuracy is a major criterion used for selecting appropriate forecasting methods. This paper attempts to quantify the various components determining forecasting accuracy. The objective of the research described is to estimate the expected accuracy of a given method, for some specific data series without having to run the method first. The theoretical advantages of such an approach can be considerable in terms of time and effort saved. In order to estimate forecasting accuracies, a multiple regression approach is used which expresses forecasting accuracy (both for the model fitting and the post sample data) as a function of several factors affecting accuracy. The data needed for developing the regression equations came from a forecasting competition in which experts, in various fields, forecasted up to 1001 series. The regression equations found shed considerable light on the factors affecting forecasting accuracy and the comparative advantages/limitations of various time series methods.

ACCURACY MEASUREMENTS AND RANKING FORECASTING TECHNIQUES : Essam Mahmoud, Canisius College, Buffalo, NY 14208, U.S.A.

When selecting forecasting techniques, managers seek those methods which provide more accurate forecasts. A rank order of forecasting techniques according to their relative performance is therefore desirable. This paper reports the results of an empirical study of the application of various forecasting techniques. The study included an evaluation of short-term sales forecasting techniques according to different accuracy measures. A rank order of forecasting methods with respect to Gardenfor's "I" value, mean squared error, mean absolute percentage error and the cost of forecasting error was determined.

ON THE USE OF STATISTICAL METHODS FOR FORECASTING - A COMPARATIVE ANALYSIS : Tsong-how Chang, Chairman, University of Wisconsin-Milwaukee, P.O. Box 784, Milwaukee, Wisconsin 53201, USA

This paper presents some research results on the use of statistical forecasting methods including regression models, exponential smoothing and Box-Jenkins time series modelling approach. Both the statistical properties and the actual applications of the various statistical methods will be analyzed for comparative evaluations. Business and production data are used for modelling illustration.

WEDNESDAY PM JULY 7 SECTION B
Session WAL2B 16:15 - 18:00

REGRESSION METHODOLOGY

Chairperson: Douglas Montgomery, Georgia Institute of Technology

FORECAST AGGREGATION, Andrew P. Sage, Department of Engineering Science and Systems, University of Virginia, Charlottesville, Virginia 22901, U.S.A.

Forecasts of the impacts of proposed action alternative or plans may evolve from any or a combination of approaches. These vary from wholistic intuitive expert perception to wholistic analytic judgment. Often two or more different forecasts are available and it is desired to combine, or aggregate, these in some veridical fashion. This paper presents a discussion and interpretation of approaches which enable this.

MODIFICATION OF THE CLASSICAL FORECASTING METHOD: Jolanta Pawlowska, Instytut Organizacji Zarzadzania i Deskenalenia Kadr ul. Wawelska 56, 02-067 Warsaw, Poland

In this paper a two-stage method of forecasting is presented based on the multiple linear regression model. A new formula is derived for calculating the changes in the values of the parameter estimates in the case of transition from sample period to the subsequent forecasting periods. This formula allows a new pattern, which in turn allows to compute the forecasts of dependent variable values. This new pattern differs from the classical one in that it contains a new component improving the value of forecast. The efficiency analysis of this proposed method, performed with the help of the prediction error variance, is presented for two cases: (i) when the model parameters are estimated by the least squares method and (ii) when these parameters are estimated by the generalized least squares method. In case (i) the conditions are presented where the proposition is more effective than the classical one. In case (ii) the approach is shown in which the expression proposed by Goldberger, as an estimate of the random error realization in the forecasting period, is taken - is always more efficient than the Goldberger method.

A TEST FOR INFINITE CROSS PRICE ELASTICITY: Abbas A. Naini, Faculty of Management, The University of Calgary, Calgary, Alberta T2N 1N4, Canada and U.L. Gouranga Rao, Department of Economics, Dalhousie University, Halifax, Nova Scotia, B3H 3J5, Canada

Managers often wish to forecast the effect of new price strategy of other sellers on their demand, as well as to measure the degree of homogeneity or heterogeniety of their products among other sellers in the market. It is the purpose of this paper to distinguish among different cross-price elasticities and develop models which will allow managers to assess the effect of price changes on demand.

REGRESSION METHODOLOGY FOR FORECASTING: Douglas Montgomery, Georgia Institute of Technology, Atlanta, Georgia, 30332, USA.

WEDNESDAY PM JULY 7 SECTION C
Session WAL3C 16:15 - 18:00

ARIMA METHODS

Chairperson: Jan G. de Gooijer, Department of Economic Statistics University of Amsterdam, Holland.

ON THE MAXIMUM LIKELIHOOD ESTIMATION OF THE PARAMETERS OF A GAUSSIAN AUTOREGRESSIVE MOVING PROCESS

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

Recently Godolphin and de Gooijer (1982) have derived an iterative procedure for the maximum likelihood estimation of the parameters of a Gaussian MA process. This procedure, which includes the covariance determinant, gives an expression for the estimator of each parameter as a linear combination of a suitably large set of sample serial correlations and has many computational advantages over other estimation procedures. In this paper we extend this likelihood estimation of the parameters of a Gaussian ARMA process. We compare by simulation the properties of our estimation procedure with an iterative maximum likelihood estimation procedure which does not take account of the determinant, and with the exact maximum likelihood procedure proposed by Ansley (1979). It is shown that in terms of bias, mean square error and predictive ability these three procedures lead to virtually the same set of estimates for sample sizes likely to be encountered in practice.

CHANGE OF PARAMETERS AT UNKNOWN TIMES IN ARMA MODELS: IMPLICATIONS FOR FORECASTING

Ian B. MacNeill, Department of Statistical and Agricultural Sciences, Faculty of Science, The University of Western Ontario, London, N6A 5B9, Canada

It is well known that ARMA models are effective for forecasting. It is also known that change of parameters at unknown times can lead one to fit models that are incorrect both in the values of the fitted parameters and in the orders of the models. The consequences of using such fitted models for forecasting are explored. Methods of detecting changes in parameters of ARMA models at unknown times are given, and model fitting methods better suited to forecasting are discussed.

ON THE DISTRIBUTIONS OF THE DIFFERENCES

T.M. Pukkila, Department of Mathematical Sciences and Statistics, University of Tampere, P.O. Box 607, SF-33101 Tampere 10, Finland.

Simulation studies carried out indicate that the test statistic developed by the author might react more strongly to departures from white noise than the usual Ljung-Box statistic when testing the hypotheses of white noise using the observed time series of length n. In the simulations in question, "coloured noise" series of length n = 50,100 were generated from: MA(1) and AR(1) models using the values 0.1, 0.2 and 0.3 for the parameters h and f of the models. The simulations clearly indicated that the power of the test Q increases more rapidly than the power of the test Q(1) as the parameter of the model increases from 0.1 to 0.3.
In the present paper the distributions of the differences r(k)-f(kk), k = 2,3,... are considered in the case of white noise, and approximations to these distributions are given. Goodness of fit between the theoretical distributions obtained and the corresponding observed distributions is studied using simulated time series of various lengths.

MINK AND MUSKRAT INTERACTION: A STRUCTURAL ANALYSIS

Timo Terasvirta, Research Institute of the Finnish Economy, SF-00120 Helsinki, Finland

There is not a unique way of representing a linear vector process but these processes are often in practice characterized by their ARIMA representations. In this paper it is argued that for the purposes of interpretation the choice of canonical form may be important and the chosen representation should as closely as possible correspond to existing prior information about the process. This point is demonstrated by reanalyzing the mink and muskrat data of Hudson's Bay Company and also analyzing corresponding data from Saskatchewan for the years 1914 to 1957. The present results are easier to interpret and are more informative than the corresponding ARIMA models.

WEDNESDAY PM JULY 7 BARBAROS ROOM
Session WAL4R 16:15 - 18:00

FORECASTING WITH MARMA MODELS

Chairperson: Silvia Biffignandi, Instituto di Matematica e Statistica Bergamo, Italy

ON THE PROCEDURES FOR STUDYING THE RELATIONSHIPS BETWEEN MONETARY AND ECONOMIC VARIABLES: Silvia Biffignandi, Instituto di Matematica e Statistica, Via Salvecchio 19, 24100 Bergamo, Italy.

The paper reviews briefly the Granger's concept of causality and some procedures for detecting causality which are based on the overmentioned concept and then on improvement of forecasting ability through the multivariate context. Special attention is devoted to Haugh, Pierce, Haugh and Box, Haugh and Pierce procedures and tests and to the Box-Jenkins transfer analysis. These approaches are then applied for the study of the bivariate relationships between some italian monetary variables. The results are discussed at forecasting level in order to evaluate the implications of the procedures and data periodicity on the relational pattern.

FORECASTING U.S. - CANADA TOURISM FLOWS USING TRANSFER FUNCTIONS, David Zalinger, Peat, Marwick and Partners, Ottawa, Ontario, Canada.

The development of multiple input transfer function models for automobile travellers between The U.S. and Canada is discussed. The automobile flows were disaggregated into short-term and long-term (defined as a visit of one or more nights in duration) travellers since the more numerous short-term traveller may mask movements in the long-term traveller flows which most of the expenditures using monthly data for the years 1972-1979, transfer function models were developed using exchange rate, consumer price indices and gasoline price data as input variables. The forecast performance of the transfer function models is compared to the univariate models for a forecast period of 20 months.

SOME PROPERTIES OF BILINEAR ARMA MODELS FOR TIME SERIES ANALYSIS: R. Genesio and A. Vicino, Istituto di Elettrotecnica Generale, Politecnico di Torino, Torino, Italy

In recent years much attention has been devoted in the literature to the description of time series by means of linear autoregressive moving average (ARMA) models, leading to successful results of forecasting in many scientific fields. On the other hand, little work has been done in the area of nonlinear time series representation even if a general result exists on the prediction optimality (Masani and Wiener, 1959) of nonlinear autoregressive structures. This paper is concerned with nonlinear ARMA models, and particularly analyses some statistical properties of bilinear ARMA models. In fact, they appear as the most direct extension of linear models and they are able to describe several physical systems (in biology, economics, etc.) as shown by the great attention recently deserved to them in system theory.

INTERTEMPORAL UTILITY MAXIMIZATION, AGGREGATE SAVING, AND TIME SERIES IDENTIFICATION: Phyllis Isley and Ugur Yucelt, Norwich University, Department of Economics and Business Administration, Northfield, Vermont 05663, USA

The majority of models which have been employed to examine aggregate savings behavior rely on a priori assumption regarding mathematical form and lag structure in order to restrict the number of free parameters which must be estimated. As Sims has pointed out this may be appropriated in a partial eqilibrium analysis but is inappropriate for dynamic processes. This investigation of aggregate savings behavior employs the multiple time series technique of state space analysis to properly time-series, identify a model of savings based on intertemporal utility maximization.

ON THE USE OF MULTIPLE TIME SERIES PROCEDURES FOR ANALYZING THE EFFECT OF PRICE ON THE SALE OF FROZEN ORANGE JUICE : Sushila Umashankar, The University of Arizona, Department of Marketing, Tucson, Arizona 85721, U.S.A.

Marketers are continually interested in using decision variables to affect sales response in the market place. Given that sales are affected by changes in price and promotion activities, the question needs to be addressed whether inclusion of such decision variables would improve the forecasting ability of a time series model. In this paper two competing orange juice brands' sales and price series have been analyzed to determine the value of including price in the model.

WEDNESDAY PM JULY 7 MEVLANA ROOM
Session WAL5M 16:15 - 18:00

THE MESGRO FORECASTING SYSTEM

Chairperson: George K. Chacko, University of Southern California.

ADAPTIVE FORECASTING: CLOSER FORECASTS WITH FEWER DATA-POINTS:
George K. Chacko, University of Southern California, Institute of Safety and Systems Management - Eastern Region, 6809 Barr Road, Washington D.C., 20816, USA.

Sixteen successful applications to both short-term and long-term forecasts for planning and decision-making suggest the practical use of a new method of forecasting which will be discussed in three papers covering (i) Methodology, (ii) Short-Term, and (iii) Long-Term Applications. Instead of imposing on the data, linear or non-linear models, we fit the model to the data. Using only the first and second data points, the third is forecast. The actual is compared with the forecast, and a fit index is computed to develop a new model to forecast the 4th data point. Thus, each new model is adapting to the experience with forecasting the data up to that data-point. The experience to date is that by the 5th data point, the forecast is quite close, and from the sixth on , it tracks the data like a heat-seeking missile. With every new data-point not only a new model, but also the stage-of-growth is calculated. The changes in the growth stage suggest underlying changes of structure of the time-series. To reflect the Modified Exponential Smoothing and the Growth Stage elements, the algorithm is called MESGRO.

IMPROVED SHORT-TERM DECISION-MAKING WITH MESGRO: George K. Chacko
(address as above.)

U.S. Industry and Government Systems Acquisition Management offices provided data on ongoing multi-billion dollar programs. The primary question was: which components of the program should be controlled, and by how much, in order to keep the program costs within acceptable limits? MESGRO forecasts of the actuals for n+1th time-period are compared with the plans for the n+1th time-period. If te actuals exceed plans, there is cost excess. MESGRO identifies the two or three components of the program which account for most of the expected cost excess. It specifies the appropriate control factor which can realistically be imposed. Ranges of the cost excess are given. The accurate forecast of expected cost excess enables the planning of corrective action ahead of time.

BETTER LONG-TERM PLANNING WITH EXTENDED MESGRO: George K. Chacko,
(address as above.)

Major defense systems acquisition, achieved through public purchase of private production, requires reliable long-term forecasts. Industry and Government Systems Acquisition Management Industry offices provided data on multi-billion dollar programs, which could be classified into (i) Commencement Phase, (ii) Continuing Phase, and (iii) Concluding Phase. An example of (iii) is the data for the first 18 months of a contract which must mandatorily end in Month 36. Using only the given 18 data points, EXTENDED MESGRO forecast the cost at completion within 0.77% of the actual. Given two similar contracts, the closest fit among three to the first set is applied to the second set for realistic planning. It is found that the approach is valid to Sales data as well as Cost data. In one instance of (ii), when a dip in sales was forecasted for 8 months hence, the management planned and implemented intensive promotional activity which resulted in averting the dip and achieving a 50% increase. In an instance of (i), given quite erratic movements of actual costs for 11 months, EXTENDED MESGRO developed forecasts of the cumulative cost for months 12-20 with 99.7% accuracy.

MANAGEMENT DECISION SUPPORT SYSTEMS: FORECASTING FOR CONTROL:
George K. Chacko (address as above)

The raison d'etre of forecasting is decision support. How well the user is able to use forecasting for decision-making depends on three contexts - E(nvironment) of external demands for the products and services of the entity, to meet where the decision-maker uses the entity's capabilities of T(echnology) for transforming inputs into outputs. Each decision-maker has to simultaneously view the short-, the intermediate-, and the long-term giving rise to conflicts (Context C(onflict)) in the decision-making role. Context C also makes any single set of forecasts inappropriate for all the different timeframes simultaneously. The interaction of Context E and T gives rise to a Decision Support Matrix of 1,134 elements; and the interaction of Context C with the transformation of data into information gives rise to a Utilization Matrix of 729 elements. Context C demands upon a decision-maker are developed with respect to the Program Manager of a major weapon system, suggesting the different types of forecasting he needs to satisfy his several decision hierarchies.

THURSDAY AM JULY 8 BARBAROS ROOM
Session TML2R 10:15 - 11:45

FORECASTING & PLANNING

Chairperson: P.Levine, Laboratoire d'Econometrie, Universite de Paris VI , France.

FORECASTING DECISIONS OF THE FIRM. A CASE STUDY: P. Levine, Laboratoire d'Econometrie, Universite Paris 6, 4 Place Jussieu, 75230 Paris Cedex 06, France.

Analysing the decision process within an organization helps to reveal the constraints which structure the decisions of the organization in the long period. This approach may be used to forecast the behavior of the firm or to predict if a given decision will be efficiently implemented. The French P.T.T. Program "Telematique" is taken as an example to illustrate the method. The constraints related to the behavior of the various factors (Government, the Telecommunication industry), related to the internal organization of the P.T.T. and to its history allow us to predict several features of the P.T.T. strategy if no drastic organizational change occurs.

CAUSAL MAPS OF PAST AND FUTURE, Guje Sevon, Swedish School of Economics and Business Administration, Helsinki, Finland.

Inferential judgment is the object of four studies based on two major premises: the notion of a difference between probabilistic inference tasks concerning explanation and those concerning prediction, and the assumption that people differentiate between what has happened (the past) and what has not yet happened (the future). Explanatory tasks were designed in which people generated causes for both past events (explanations) and future events (potential explanations). When these explanations were compared to each other and also to predictions, it was found that people perceive the future as more dramatic than the past, and consequences as more dramatic than causes. The studies show that people use a greater number of events to explain a phenomenon than to predict from it, and a greater number of events to infer about the past than to infer about the future. Moreover, inferences about the past are made with more confidence than inferences about the future. People were asked to report on their mode of thinking while they performed the inferential tasks. On the basis of self-report, explanations are made with more analytical, less intuitive thinking than predictions are. These results are discussed in relation to decision making situations.

FORECAST EVALUATION: TOWARDS OPTIONAL POLICY JUDGMENT IN THE PRESENCE OF INDIFFERENCE, Paul R. Watkins, University of Southern California School of Accounting, Bridge Hall 306, Los Angeles, CA 90007, USA.

Complex policy making judgments which incorporate forecasts are often unsatisfactory due to unmitigated human biases. This paper describes an experimental study utilizing policy makers who make future-oriented decisions utilizing forecast information. Multidimensional scaling and conjoint measurement methods are incorporated into the treatment group as multiattribute decision aids across scenarios where difference among proposed policies is present. Results are presented showing the relative effectiveness of the decision aids in providing more optimal policies. In addition, the decision aids themselves become a forecasting device to assist in assessing future policy judgments.

PREDICTION ABILITY OF TURKISH PLANNERS: I. Noyan Dereli, Liverpool Polytechnic, Tithebarn Street, Liverpool L2 2ER, England.

Since 1962 the Turkish State Planning Organization has published macroeconomic targets in Five-Year Plans as well as in yearly Programmes, which might be considered as medium-term and short-term forecasts. The realization figures differ from these forecasts. The aim of this paper is to evaluate these errors made, using statistical techniques. There are a number of statistical measures for forecast evaluation. Each of these deals with different aspects of error distribution of a variable. In this paper numerical forecast evaluation measures have been calculated using the Turkish data. However, it became clear that the results cannot be used straight away to determine the prediction success on different variables. Thus to classify the variables, each with many characteristics (in this case different numerical forecast evaluation measure values) multivariate methods can be used. In this paper cluster analysis is used and a classification of macroeconomic variables as to the predictability is obtained.

THURSDAY AM JULY 8 MEVLANA ROOM
Session TML3M 10:15 - 11:45

NEW PRODUCTS FORECASTING

Chairperson: J.Petrof, Universite Laval, Faculte des Sciences de l'Administration, Cite Universitaire, Quebec, G1K 7P4 Canada.

CONCURRENT, POST-DICTIVE AND PREDICTIVE VALIDITY: ITS APPLICATIONS IN MARKETING RESEARCH, Pandelis I. Vlahopoulos and Emmanuel J. Cheron Universite du Quebec, 300, avenue des Ursulines, Rimouski (Quebec) Canada G5L 3A1.

This paper focuses on the description of three interrelated domains in the research process. The conceptual domain related to ideas in abstract form, the methodological domain concerned with research designs, measures and analytic techniques, and the substantive domain comprising the relations with real world events and processes. The implications of the interrelations of these domains and the associated effects on the various subclasses of validity are discussed. Basic issues with the applications of three forms of validity in marketing research are presented. Specifically, post-dictive, convergent and predictive validity are reviewed and evaluated from the marketing researcher viewpoint.

A SALES FORCE FORECASTING SYSTEM, Rene Y. Darmon, McGill University 845 Sherbrooke Street West, Montreal, P.Q. Canada, H3A 2T5.

This paper describes a Markovian approach to sales force system forecasting. As an application, the procedure highlights how to forecast a salesperson's long-run profit performance. Based on historical personnel and accounting data, it takes into account the flows of revenues and costs that a company is likely to experience when a "typical" salesperson of a prespecified profile is kept on territory.
In the reported case study, salesmen with an Arts degree (and to some extent with a Science degree) and previous non-sales experience could be identified as the best long-run profit producers. The results showed important differences with the conclusions of a more conventional analysis which emphasized short-run sales performance.

A COMPARATIVE STUDY OF MEASURING INFLUENCE OF ADVERTISING AND FORECASTING SALES OF CIGARETTES: Erdener Kaynak, Mount Saint Vincent University, 166 Bedford Highway, Halifax, Nova Scotia B3M 2J6, Canada and Ugur Yucelt, Norwich University, Northfield, Vermont 05663, USA.

Measuring the influence of advertising on sales is a difficult task as well as the most significant. The difficulty is the isolation and identification of the influence of advertising from the influence of other socio-economic and decision variables. This study using the OLS model investigated the influence of advertising on sales of cigarettes. In particular, it attempted to identify and predict the influence of restriction of cigarette commercials on television after 1966. The data were gathered in the United States and Canada, and it is hoped that findings might help to identify the influence of advertising in different cultural settings.

THE LIKELIHOOD OF PURCHASING EDP EQUIPMENT IN NIGERIA: J.O.A. Ayeni, Department of Computer Sciences, University of Lagos, Lagos, Nigeria.

Factors affecting the purchase of Electronic Data Processing (EDP) equipment in Nigeria are considered. Subjective single event and conditional probabilities are solicited from experts in the governments, Universities and Industries. The obtained probabilities are used to compute the likelihood of occurrence of the likely combinations of the factors. The results of this study can be extended to make forecasts for the future purchase of EDP equipment in Nigeria.

THURSDAY AM JULY 8 SINAN ROOM
Session TML4S 10:15 - 11:45

FORECASTING TELEPHONE DEMAND & PRICES

Chairperson: N.Curien, Direction Generale des Telecommunications, Paris, France.

SEPARABLE PREFERENCES THEORY: AN APPLICATION TO TELEPHONE TRAFFIC FORECASTING:, N. Curien, E. Vilmin and S. Guerlin, Direction Generale des Telecommunication, Piece 912 Tour Main Montparnasse, 33 avenue du Maine, 75755 Paris, France.

Microeconomic theory of separable preferences takes into account the rational behavior of a consumer provided with a partitioned preferences ordering defined on a consumption space consequently broken down into classes of commodities. Optimization of the consumption vector then results from a decentralized program, the global budget being disaggregated into the different classes in a first step and each sub-budget being in turn allocated to basic commodities in a second step. Such a scheme properly describes the situation of telephone consumption choices where the subscriber has to partition his telephone expenditure by selecting different types of calls according to destination, time of day and duration. The paper, referring to this theoretical framework, deals with an econometric model carried out by the French Direction Generale des Telecommunications in order to assess the impact on the volume and structure of the traffic profile, to be expected from a change in the rate structure. Econometric fitting of the model is discussed and results from simulation runs are produced.

FORECASTING TELEPHONE SERVICES AT REGIONAL AND LOCAL LEVELS, Erich Bohm, Telecommunications, Bundesministerium fur des Post-und Fernmeldewesen, Adenauerallе 81, 5300 Bonn 1, Germany.

In comparison with the sophisticated models used for national telephone forecasting, simpler methods have to be applied at the regional and local levels. Recently, econometric models of the following type have been successfully tested in a large-scale field trial: A so-called "extended logistic function" having two parameters is used for flexible shaping of the general growth pattern. Independent variables are included: time, average household income, tariff and advertising indices (in some cases also the 1 year lagged dependent variable). The co-efficients are determined by multiple regression analysis, after a "logit transformation" of the demand variable. For practical evaluation inexpensive stand-alone microcomputers are used by local forecasters. The proposed paper will give an overall report on the experiences gathered in a field trial covering hundreds of regional and local areas.

FORECASTING INTERNATIONAL TELECOMMUNICATION DEMAND, David C. Thaxter, American Telephone and Telegraph International, Operation Planning, 295 North Maple Avenue, Rm. 17-1230K3, Basking Ridge, NJ 07920, and David R. Wheeler, Marketing Department, Suffolk University, Beacon Hill, Boston, MA 02114, U.S.A.

American Telephone and Telegraph is starting the development of international telecommunications marketing. In 1980, it formed a subsidiary to become a major supplier of telecommunications equipment and services to the world. This marketplace is 40 billion dollars and growing rapidly. AT and T International faces two problems as it attempts to understand the markets worldwide: 1) The international inexperience of the company; and, 2) the lack of cross-cultural studies of consumer behavior.
This proposed paper will present the development of AT and T International's telecommunication index. This index establishes the parameters of countries that fit the goals and objectives of AT and TI. Focus groups (composed of vice-presidents and members of marketing staff at AT and TI) are developing the relevant parameters of the countries. These macromarketing elements include: Environmental trends and opportunities, marketing characteristics, market segment analysis, and demand measuring and forecasting.
Once the specific countries have been identified through the telecommunication index, AT and TI will use the following research methodologies to understand the needs/wants of consumers in those countries. From the consumer point of view, content analysis and focus (telecommunications) groups will be used. The target market consumers in each of the selected countries will be researched in terms of: Relevant motivations for telecommunications; their behavior patterns; product-specific cultural patterns; consumer decision making (flexibility to new ideas); and, the appropriate institutions for the diffusion of telecommunications.

CHARGING FOR LOCAL TELEPHONE CALLS: PRICE ELASTICITY ESTIMATES FROM THE GTE ILLINOIS EXPERIMENT: Bridger M. Mitchell, Rolla Edward Park, and Bruce M. Wetzel, The Rand Corporation, 1700 Main Street, Santa Monica, California 90406, U.S.A.

Reports price elasticities for local telephone calls using data from a pricing experiment conducted by General Telephone Company in central Illinois that levies separate charges for calls and for minutes. We estimate the effects of both prices by fitting a model that is consistent with the theory of telephone demand. The nonlinear generalized least squares estimates of the various elasticities are fairly small - about .1 or less in absolute value at experimental price levels - but they are estimated with high precision. We discuss some considerations concerning the application of our results to predicting the effects of local measured service in other cities.

THURSDAY PM JULY 8 BARBAROS ROOM
Session TAE2R 14:30 - 16:45

BEHAVIORAL,SOCIAL & POLITICAL ASPECTS OF FORECASTING

Chairperson: Robert Olley, University of Saskatchewan, department of Economics and Political Science, Saskatoon, Canada .

FORECASTING THE DEMAND FOR MONEY: SYSTEMATIC ERRORS FOR SINGLE EQUATION ESTIMATORS THAT IGNORE TECHNOLOGICAL INNOVATION, Almarin Phillips, Department of Economics, University of Pennsylvania, Philadelphia, Pennsylvania, U.S.A.

Forecasts of the U.S. demand for money have demonstrated systematic error or apparent functional instability in recent years. The forecast demand for money has been significantly in excess of the realized demand for money. The typical fitted demand for money equation is some form of (1) Md = f(r, dr/dt, P, dP/dt, w) where r connotes the rates of interest, P is the price level and W is (a vector of) width.
A more realistic and theoretically satisfactory treatment of the demand for money requires a simultaneous equation model. Such a model captures the endogenous effects of r,dr/dt, P, and dp/dt on the rate of turnover of money. The latter has risen primarily due to induced changes in the technology underlying the payment system. As technology has changed, given levels of nominal income are accompanied by endogenous, non-stochastic downward shifts in an equation such as (1). The errors have not been due to instability in the universe being forecast but rather to misspecification of that universe.
This paper provides an approach to a multi-equation, dynamic system and some preliminary parameter estimates.

UNCERTAINTY AND FORECASTING, Marie R. Corio, National Economic Research Associates and Richard C. Schramm, American Telephone and Telegraph, 8th Floor, 499 South Capitol, Washington, D.C., U.S.A.

The authors review the structural changes in the telecommunications industry in the U.S., principally in the period subsequent to 1968. During this period, regulation and residual regulatory efforts at market allocation between the established carriers and new carriers disturbed existing price structures. This trend was imposed despite substantial evidence of scale and scope economies of the dominant carrier. Regulatory, legislative and legal concerns for the viability of the new carrier to eliminate its presence in local markets and to enhance competition in high profit inter-city markets. These same concerns cause continued uncertainty as to the permissible scope of the dominant firm's market and freedom of price response. Consequently, the future rate of technical change, demand patterns and price structure in the industry are in doubt. The demand for all forms of telecommunications services grew during the period, but new technologies' introduction was apparently slowed. Published studies show substantial subsidies from the competitive to the monopoly markets of the dominant carrier.

PREDICTION AND FORECASTING IN SOCIAL CONTEXT: George Eric Lasker, University of Windsor, Windsor, Ontario, Canada

The "a priori" availability of prediction information or a forecast in a social environment may generate the subsequent activities in this environment, that can significantly influence the course of future events and invalidate the accuracy of the original prediction. It is shown that under certain conditions it is possible to design a large variety of prediction and forecasting strategies that can learn to anticipate the occurences of such situations and utilize the anticipatory information to maximize the accuracy of prediction and ensure the validity of the forecast.

SCENARIO DEVELOPMENT IN PLANNING FOR SOCIETAL RESPONSIVENESS,
Asit K. Sarkar, University of Saskatchewan, Saskatoon, Sask. Canada.

Any organization having to deal with a number of stakeholders, often with conflicting objectives, is increasingly dependant on a strategic planning system based on a reasonably accurate prediction of expected stakeholder behaviour under alternative situations. One planning tool which is being depended upon by a number of multinational corporations involves the development of "alternative scenarios" in different time dimensions as well as under different degrees of certainties. In many national jurisdictions, business organizations are having to deal with stakeholder concerns not unlike those faced by multinational corporations. Yet most business organizations in Canada where such concerns are particularly pervasive have generally taken an issue-by-issue approach. In this paper it is argued that the process of scenario development would be able to facilitate the adoption of a more proactive approach to societal concerns. Within this contest, the paper also emphasizes the importance of choosing right actors in the scenario development process.

THURSDAY PM JULY 8 MEVLANA ROOM
Session TAE3M 14:30 - 16:45

FINANCIAL FORECASTING I

Chairperson: Don Alexander, Assistant Vice President, Manufacturers Hanover Trust Co., New York, USA.

DEVELOPMENT OF AN INTEREST RATE FORECASTING SYSTEM: John S. Brush, Columbine Capital Services, 450 Holly Sugar Building, Colorado 30903, U.S.A.

A machine based interactive interest rate forecasting system was developed to forecast twelve U.S. Government securities varying in maturity from overnight to thirty years. The system offers users a choice of three interest rate forecasting approaches, Box-Jenkins, multivariate/econometric, and interactive, and provides forecasts at one, three and six month future horizons. More than one hundred separate forecasting equations were required to implement the system. The paper will discuss the generation of these one hundred equations from a core of six base equations selected as optimal at the boundary points of the time horizon, maturity surface. The procedure used recognizes the requirement for a unique equation for each model choice, forecast horizon, and maturity combination, yet exploits obvious similarities among combinations. The system was designed to offer easy to understand simple choices of model approaches. Since the system specifically addresses uncertainty of forecast and the possibilities of nonstationary relationships, it had to be moderately complex. The resolution of the trade off between these two factors will be discussed. The system is now available interactively through Service Bureau Company.

FOREIGN EXCHANGE RATE FORECASTING - AN ANALYSIS OF RECENT PERFORMANCE:
Don Alexander, Assistant Vice President, Manufacturers Hanover Trust Co., 350 Park Avenue, New York, N.Y. 10022, USA

The purpose of this paper is to evaluate the recent performance of various forecasting methods in predicting future exchange rates. The forecasting techniques will include momentum models, univariate and multivariate time series models, as well as other structural models. The structural models will include a monetary, an asset market, purchasing power parity, and multiequation models. The discussion will include types of performance measures, the time horizon in each forecast, the cost of obtaining the additional information and the usefulness of the information provided by the forecast. The summary will include a comparison of the usefulness of each approach and steps toward incorporating the information into a composite forecasting approach.

COMPARISONS OF FORECASTS FOR INTEREST RATES ESTIMATED BY AN AIC- AND A BOX-JENKINS ANALYSIS, Wolfgang Polasek and G. Winckler, Institut fur Statistik und Informatic, Universitat, Wien, 1090 Vienna.

Several time series of the Austrian monetary market (e.g. debit interest rate, deposite rate, bonds, call money rate, etc.) are investigated by time series methods in the frequency and the time domain. In the frequency domain the spectra are estimated by a fast Fourier transform (FFT) and by windowing procedures of the autoregressive model fitting procedure of AKAIKE (1976). The order of the autoregressive processes are determined by the AIC (average information) criterion and the BIC (Bayesian information) criterion. In the time domain the minimum AIC estimates (MAICE) of the AR-processes are compared with a Box-Jenkins analysis: How much can be gained by a careful specification of the seasonal behaviour or by moving average terms. For some time series also intervention models have to be tested. The resulting models are finally compared for their forecasting behaviour, using the mean square error criterion.

A COMPARATIVE STUDY OF MODELS OF TESTING THE EFFICIENCY OF STOCK MARKETS: THE SPANISH STOCK MARKET, Jose A. Redondo Lopez, Facultad de Cienceas Economicas y Empresariales, Dto. Empresa., Santiago de Compostela, Spain.

The behaviour of Stock Prices has had a great number of theories about the explication of it. Particularly, stock valuation model and the usefulness of traditional financial analysis have to be questioned. In this sense, the theory of Random Walk holds that Stock Price Changes are independent and uncorrelated, and the knowledge of historical sequence of price will not be helpful in the prediction of future price changes.
Voluminous evidence has been accumulated in support of the Random Walk hypothesis of the most important Stock Markets. This leads to test whether the Random Walk hypothesis also will hold good for the Stock Market of Spain and the implications of it.

THURSDAY PM JULY 8 SINAN ROOM
Session TAE4S 14:30 - 16:45

FORECASTING APPLICATIONS IN BRAZIL

Chairperson: R.Castro Souza, Departamento de Engenharia Electrica, Rio de Janeiro, Brazil.

DYNAMIC STATE ESTIMATION IN ELECTRIC POWER SYSTEMS: A.M. Leite da Silva and M.B. Do Coutto Filho, Departamento de Eng. Electrica, PUC/RJ, Caixa Postal 38063, Rio de Janeiro and J.F. de Queiroz, Programa de Eng. Electrica, COPPE/UFRJ, Caixa Postal 1191, Rio de Janeiro.

A state estimator is a data processing algorithm for converting the redundant meter readings and all other available information into an estimate of the state vector which is defined by the nodal voltages of the electrical transmission network. So far, this problem has received a static treatment by most of the presented formulations. The state vector of a power system varies with time due to the dynamic nature of the system loads. Therefore, it is necessary to establish a dynamic model for the time evolution of the state vector. This is known by dynamic state estimation. A new dynamic state estimation algorithm is proposed using a multiple correlation model to forecast the state vector one step ahead. The predicted state is filtering through a tracking estimator based on weighted least square method. Results of some initial computer simulation tests are presented and discussed.

THE APPLICATION OF FORECASTING METHODS TO THE EXPANSION AND OPERATION PLANNING OF HYDROTHERMAL POWER SYSTEMS: Roberto Pereira d'Araujo and Luiz Eduardo Pazito Mendes, Av. Osvaldo Cruz 95/311, 22250 Flamengo, Rio de Janeiro, Brazil.

The problem of expansion and operation planning of hydrothermal power systems plays an important role in developing countries, considering the great influence of this sector on the Economy as a whole. Good planning depends on accurate estimates for supply and demand. In power systems, forecasting the supply generally means forecasting water inflows to reservoirs. The demand for electrical energy depends strongly on the economic activity and several macro variables which determine the long range behavior of demand. This paper discusses an application of forecasting in a large Brazilian Electrical Utility company. It includes time-series models like Box-Jenkins and the Recursive- Bayesian approach, for the short-term forecasting, and a macro-economic input- output model, used to establish alternative electricity demand scenarios, for the long run.

AN ECONOMETRIC MODEL OF THE INTERNATIONAL IRON ORE MARKET: S. Guimaraes, R. Melo and B. Szpigel, CVRD, Rio de Janeiro, Brazil and C.A. Assis, Reinaldo Castro Souza, M.L.S. Bemegury and J.J.Farias, PUC/RJ, Rio de Janeiro, Brazil.

The present situation of the International iron ore market is difficult to deal with. In order to determine the sales of the Brazilian company, Vale do Rio Doce (CVRD) (operating the largest ore project in the world) an econometric model has been developed. The model's formulation will serve as the basis for the following: (a) scenarios of iron ore production of CVRD competitors; (b) scenarios of world iron ore demand; (c) strategies to increase CVRD's share of the iron ore market. The model includes a dozen endogenous and exogenous variables. Its purpose is to analyze long term trends in the following countries:
Demand Side: USA, EEC,
Supply Side: Brazil, South Africa, Venezuela, Liberia.

INTERVENTION ANALYSIS APPLIED TO BRAZILIAN COFFEE AND MILK TIME SERIES Pedro A. Morettin, University of Sao Paulo, Sao Paulo, Brazil and Francisco A. Pino, Institute of Agricultural Economics, Sao Paulo, Brazil

The effects of governmental policies, historical events and climatic changes (as frosts and droughts) on agricultural variables like production and productivity are discussed. Two case studies concerning coffee and milk production in Brazil are examined using intervention analysis and the Box-Jenkins approach. Forecasting models for milk production and productivity in the State of Sao Paulo were obtained. The effects of the frosts and some historical events like slavery abolition and World War II showed to be significant over Brazilian coffee production. Prices received by coffee farmers in the State of Sao Paulo were also affected by the strongest frosts.

THURSDAY PM JULY 8 GRAND BALLROOM
Session TAL1G 17:00 - 18:15

FINANCIAL FORECASTING II

Chairperson: J. Robert Talbott, American Telephone and Telegraph, Basking Ridge, NJ, USA.

FINANCIAL PLANNING: THE IMPORTANCE OF FINDING THE KEY ELEMENTS, J. Robert Talbott, American Telephone and Telegraph, 295 North Maple Avenue, Room 5405C1, Basking Ridge, NJ 07920, USA

Using the information industry as an example, proposals are made for product and financial planning, especially in a time of radical change.
Specific simple steps are outlined for dealing with new and complex environments, markets, technologies, obsolescence. Equally important, specific more elegant procedures are recommended for dealing with planning in this environment. It is suggested that these are applicable to most businesses at all times.

ON THE PREDICTION OF UNCERTAIN VENTURE CAPITAL INVESTMENTS: A.M. Khan, Department of Industrial Engineering, University of Texas, Arlington, Tx 76019, U.S.A.

Venture capital is a term applied to send money for funding a new business. By their very nature, these investment decisions often have to be based on limited information that cannot be easily quantified, and the venture capitalist is forced to express his judgment as a "gut feel for a deal". A different approach to such investment prediction is to model statistically, the actions of the venture capitalists themselves, using decision criteria utilized by them. Mathematical surrogates for human judgment, and the procedure necessary to develop a predictive model for new venture assessment are discussed.

A ROBUST MULTIVARIATE CHARACTERIZATION OF FINANCIAL PERFORMANCE, E. S. Binkowski, and W. H. Williams, AT and T, 195 Broadway, 01-813A, New York 10007, U.S.A.

Clearly, the business a firm is in determines much about its financial performance. Furthermore, companies within an industry ought to have similar financial performance because they tend to have similar physical plant and operating characteristics. Consequently, it ought to be possible to develop multivariate methods which characterize individual industries financially. Furthermore, if different industries have different financial characteristics multivariate methods may even be useful to distinguish among industries. In the paper the power and utility of traditional approaches to data reduction and classification such as principal components and discriminant analysis is augmented by:

- judicious use of power transformations to homogenize estimates of the covariance matrix across groups;
- robust estimation of the group covariance matrices;
- iterative weighted estimation of the discriminant factors; and
- graphical representation of the discrimination regions through empirical probability contours.

Examples of cross-industry characterization of financial performance are used to demonstrate the usefulness of such modifications with particular emphasis on a unique and powerful approach to evaluating and forecasting corporate balance sheets.

EVALUATION OF MULTI-EQUATION SIMULATION FINANCIAL PLANNING MODELS, Ramon M. Arana, Universidad Autonoma de Madrid, Jorge Juan, 38, Madrid - 1, Spain.

The evaluation of econometric multiequation simulation models has been studied widely. But the problem of evaluation has scarcely been payed attention in financial planning multiequation simulation models. Nevertheless, they present some special characteristics: many of their equations are accounting identities, some parameters correspond to objectives or "ratios" provided by management, in many parameters estimation, the assumption of "independent samples from a constant universe", ect., cannot be accepted. These and other special characteristics of multi-equation financial planning models make its evaluation to be developed by peculiar methods. This work's objective is the study of these peculiar methods.

LIQUIDITY FORECASTS IN THE NORWEGIAN CREDIT BANK, Knut-Erik Walldin, Box 3071, 161 03 Bromma, Sweden.

Report of a forecasting system in use since 1976 of the daily liquidity variations, one year ahead, for the Norwegian banks. The system is based on forecasts of the flow of public money and foreign exchange transactions. Experience from the use of ARIMA methods. Modifications due to external changes. All forecasts are calculated on a microcomputer. Use of the forecasts and estimated gains.

THURSDAY PM JULY 8 BARBAROS ROOM
Session TAL2R 16:30 - 18:15

STOCHASTIC PROCESSES

Chairperson: G. Libert, Faculte Polytechnique, Mons, Belgium.

THE TRANSFORMATION OF VARIABLES AND THE TIME-SERIES MODELING PROCESS: Cesar das Neves, PET/COPPE/UFRJ, Caixa Postal 68.512, 21.910, Rio de Janeiro, Brazil.

This paper analyzes the role of transformations on the time series modeling process. It is shown that transformations are particularly important at the forecasting stage although at the identificaion stage the behavior of the autocorrelation function tends to be not sensitive to transformations. An approximate expression is derived to calculate the mean of the inverse forecasting function in the case of the Box-Cox class of transformation. The use of the Box-Cox class of transformation indistinctly to a time-series is questioned, showing that it is necessary to analyze the bahavior of data (its mean and variance) to postulate an adequate transformation. The empirical analyses are realized using the time series published in Anderson's book "Time Series Analysis and Forecasting", Butterworths, 1976. Comparisons are made to current business practices based on a recent survey.

FULL INFORMATION MAXIMUM LIKELIHOOD ESTIMATION WITH AUTOCORRELATED ERRORS, Aysit Tansel and Richard Boyce, ABT Associates Inc. and S.U.N.Y. Binghamton, England

The purpose of this work is efficient estimation. That is, we seek to incorporate all a priori knowledge into our model building and estimation technique. The model considered is a nonlinear simultaneous equation model. The disturbances are assumed to follow a first order autoregressive process. The method of estimation is full information maximum likelihood. We focus on specifying a covariance structure and the associated likelihood function, whereby initial observations are incorporated. An algorithm for computation is developed within the frequent methods. The unique feature of the algorithm is that the likelihood function is numerically concentrated with respect to the elements of the variance-covariance matrix and the autoregressive coefficients.

STATIONARITY OF ECONOMIC TIME SERIES: G. Libert, Faculte Polytechnique Rue de Houdain 9, B-7000, Mons, Belgium

Time series analysis by the Box-Jenkins procedure requires the series stationarity. Unfortunately, this assumption isn't always valid in practice due, especially, to the autocorrelation function variations during time. In this case, if forecasts are needed, it seems more advisable to use the model building, the most recent data which better characterize the current evolution of the series. This paper proposes an automatic method selecting a sub-series for which the autocorrelation function stationarity is checked. The sub-series includes the last data and is of maximum length so as to realize an accurate parameters estimation.

FORECASTING VIA STOCHASTIC PROCESS MODELS: Franz Bocker, Professor of Marketing, School of Business, University of Regensberg, 8400 Regensberg, Germany.

Bernoulli, Markov, Linear Learning and Exponential Smoothing Models have been developed in order to explain and/or predict consumer brand choice behavior. When applying the models its validity is usually measured with the help of the x2-criterion or the probability to reject the model. Both criteria are only measures of internal validity (ex - post-validity) and do not elaborate the models' projective validity. Some approaches to quantify projective validity are developed and applied to a set of potato products' data collected via a consumer panel. The coefficients of projective validity are exposed as a function of the projection period.

DECISION MAKING BASED ON THE STOCHASTIC PREDICTION, Masami Ogawara, Chiba University of Commerce, 3-1, Konodai 1 Chome, Ichikawa-shi, Chiba-ken, 272 Japan.

Stochastic prediction, F(y/x), is defined by means of the set of conditional minimax invariant prediction regions and predicted y = x(t+s) by the observed time series X = (x(t), x(t-1), . . .X(t-L)), where F(y/x) has formally the property of distribution.
Furthermore, we define the stochastic prediction of the second kind by integrating the conditional distribution F(y/x;p) w.r.t. the 'likelihood distribution' m(p;T) of parameter p, T being the sufficient statistic for p. That is a kind of Bayesian prediction and, in some cases, it coincides with te 'first kind' and applicable to the prediction of denumerable Markov processes.
The utility of stochastic prediction by the 'best' model may be proved by the loss function L(y,d), where d = d(x) is the decision function, in some cases it may be the cost of countermeasure. For any prediction H(y/x), the minimum risk can be defined by a set of minimax invariant equations. Some theorems and some examples are given.

THURSDAY PM JULY 8 MEVLANA ROOM
Session TAL3M 16:30 - 18:15

HEALTH-CARE PLANNING

Chairperson: Arnold Reisman, Case Western University, Cleveland, Ohio, USA.

PREDICTING THE SPECIALTY OF NEW PHYSICIANS, Donald M. Steinwachs, Health Services Research and Development Center, John Hopkins University, Baltimore, Maryland 21218, USA, and D. Jack Elzinga, University of Florida,

A recent report by the Graduate Medical Education National Advisory Committee to the Secretary of the Department of Health and Human Services concluded that by 1990 the United States will have an excess of physicians and the specialty distribution of physicians will not be consistent with the Country's needs. These conclusions are based on extensive analysis and modeling of both physician supply and requirements in the major specialties. Policy recommendations made by the Committee included reductions in the size of medical school graduates, and efforts to influence the specialty of residency training among graduating physicians. This paper describes the modeling of specialty choice and residency training and its application to the development of policy options. Implications of data sources and modeling assumptions for forecasting the future physician supply are discussed. The potential impact of alternative policy options are assessed from the perspectives of short-run adjustments and their implications for achieving a long-run equilibrium.

MANPOWER NEEDS FORECASTS FOR THE HEALTH SERVICES OF THE UNITED STATES OF MEXICO, Arnold Reisman, Case Western University, Cleveland, Ohio 44106, U.S.A., Lilia Duran and Jose Becerra of the Centro Universitario de Tecnologia Educational Para La Salud, Mexico City.

The Republic of Mexico is in the process of review and reorganization of its health care delivery systems. Planning for the reorganization requires a manpower needs forecast under various delivery scenarios in each of 27 prioritized health problem areas. This paper discusses the 1987 and the 1992 manpower needs forecasts in one of the 27 health priorities, e.g., the mental health services field. A panel representing national leadership from all relevant provider professions (psychiatry, psychology, social work, etc.), working in the public and private provider and academic institutions, was used to reach a consensus via the Delphi process on each of a number of parameters needed to generate the forecast.

FORECASTING IN HEALTH CARE - A SURVEY, I.B. Turksen, Department of Industrial Engineering, University of Toronto, Toronto, Ontario, M5S 1A4

Forecasting methods and their application to health care delivery and planning are surveyed with retrievals of articles from the computerized medical and engineering data bases covering the last 10 years. The forecasting methods, such as delphi, regression analysis and exponential smoothing, etc., and the areas of application such as planning for primary care, dental care, hospital beds, manpower, etc., are considered in a cross-classification analysis of the existing literature. Indicators of effectiveness are to be stated if such indicators were provided within the articles surveyed.

PLANNING HEALTH CARE FACILITY: S. Sami Ercan, Management Quantitative Methods, Roosevelt University, Chicago, IL 60605, U.S.A., and Ergun Yener, University of Wisconsin-Stevens Point, Stevens Point, Wisconsin, U.S.A.

This study is aimed at exploring the needs and perceptions of Taylor County residents regarding local health care facilities and various services they provide. The research results, using ranking method, attempt to answer questions related to the strategic, organizational, operational, and staffing decisions. These answers are limited to the views and preferences of service users and aim at improving the quality of general health services, including emergency, prevention, health monitoring, counseling, diagnosis and treatment of illness, and rehabilitation.

THURSDAY PM JULY 8 SINAN ROOM
Session TA14S 16:30 - 18:15

FORECASTING WITH ECONOMETRIC MODELS

Chairperson: A.L.M Gafoor, Econometric Institute, University of Groningen, The Netherlands.

THE IMPLEMENTATION OF ECONOMETRIC MODELING IN U.S. GOVERNMENT ECONOMIC POLICYMAKING AGENCIES: THE CASE OF DATA RESOURCES, INCORPORATED: John L. King, Computer Science and Management, University of California, Irvine, CA 92717, USA

This paper investigates the factors that are essential to success in the adoption and implementation of econometric models for economic forecasting and policy simulation in U.S. Government economic policymaking agencies such as the Council of Economic Advisers, the Treasury Department, the Office of Management and Budget, the Federal Reserve, the Congressional Budget Office, and various Congressional committees. The research it draws from focuses on the case of the Date Resources, Incorporated National Model of the U.S. Economy, by far the most widely-used of the major econometric models available to federal agencies. Nine major factors accounting for the unusually successful implementation of DRI's model are presented, and an analysis of the relationship between the economic, technical, organizational, and political aspects of model use is provided.

THE FORECASTING ACCURACY OF PARTICALLY DISAGGREGATED ECONOMETRIC MODELS: Marius A. Kooyman and Volken J. de Jong, University of Groningen, Econometric Institute, P.O. Box 800, 9700 AV Groningen, The Netherlands.

In this paper it is investigated whether the accuracy of forecasts yielded by a macro-economic model can be improved by using a so-called partially disaggregated model. This is a model where some of the relevant endogenous variables are disaggregated. As a criterion for comparison of two predictors for an endogenous variable, we shall use their prediction powers. Conditions under which the use of disaggregated data for some of the endogenous variables in the model will be preferred are derived and interpreted. Our analysis is applied to the Grecon 81-A model, a short term forecasting model of the Dutch economy. The results indicate that for the employment and consumption variables partial disaggregation does seem useful.

A DEMAND FORECASTING MODEL FOR CONSTRUCTION RELATED INDUSTRIES: Metin N. Gurol, Marketing Department, University of Baltimore, 1420 North Charles Street, Baltimore, Maryland 21201, USA and Mirat D. Gurol, Department of Civil Engineering, Drexel University, Philadelphia, Pennsylvvania 19104, U.S.A.

An application-oriented demand forecasting model was developed for construction related industries. The model is based on a "leading indicator" and "time lags". It is applicable in countries where obtaining a "construction permit" and an "occupancy permit" for new buildings is required. The model will predict the monthly figures for the number and type of construction projects to be completed by using the information in construction permits issued, and the estimated time lag distributions. The estimations of civil engineers as to the time at which various materials (i.e., cement, steel, tiles, paint, electrical components, faucets, sinks) are needed during the construction process, along with the predictions of this forecasting model can help the manufacturers of these materials to plan their monthly production schedules more efficiently. This paper will also present an application and verification of the model using real data.

POLICY OPTIONS FOR SUSTAINED ECONOMIC GROWTH: THE CASE OF SRI LANKA: A.L.M. Gafoor and M.A. Kooyman, Econometric Institute, University of Groningen, P.O. Box 800, 9700 AV Groningen, The Netherlands.

In this paper we examine some alternative policy options that were available to Sri Lanka in the late seventies, given the constraints of external commodity prices, to achieve a constant ten percent economic growth in real terms. Applying optimal control methods to an econometric model, we examine the requirements in terms of fiscal and monetary policies and investment and export promotion efforts and their effect on domestic prices, imports and consumption. Then making some assumptions regarding the world commodity prices, we examine the future prospects for the first half of this decade.

FRIDAY AM JULY 9 SECTION A
Session FME1A 8:30 - 10:15

FORECASTING APPLICATIONS IN ACCOUNTING & FINANCE

Chairperson: Paul Griffin, Graduate School of Administration, University of California, Davis, USA.

MANAGEMENT PREFERENCES AND ACCOUNTING CHOICES: PREDICTIVE ABILITY RESULTS, Paul A. Griffin, Graduate School of Administration, University of California at Davis, Davis, California 95616, U.S.A.

Research attempting to explain or predict a firm's or an individual's preferences with respect to an accounting rule or standard is a relatively new branch of accounting research. The research finds encouragement in tentative new "theories" of regulatory behavior based on notions of Self-interest. Factors affecting a manager's welfare are purported to be taxes, regulation, political costs, and compensation. This research seeks to evaluate empirically whether such factors (and others) are helpful in predicting a manager's decision to respond to or criticize a proposed change in accounting rules (for computing profits and financial condition). The specific rule analyzed is the Financial Accounting Standards Board's Statement 52 that requires U.S. multinational corporations to adopt the "current rate method" of translating foreign currency financial statements into U.S. dollars. The model uses current economic data as well as information about how managers responded to earlier, similar changes in the rules for translating foreign currency financial statements. While the model adequately describes management's behavior, and is consistent with earlier research, its predictive ability is only a very modest improvement over naive prediction rules.

FORECASTING IN ACCOUNTING: A CRITICAL ANALYSIS OF STATISTICAL METHODS: Alessandra D'Amico Finardi, Istituto Universitario di Bergamo, Via Salvechio 19, I-24100 Bergamo, Italy.

This paper discusses a forecasting problem in the field of accounting. In the first part, it reviews the current literature on statistical methods for bankruptcy predictions and the evaluation of the effectiveness of the different approaches in practical experience. In the second part, the work examines two problems: the former is the choice of useful ration, among those introduced by accounting analysts, to illustrate each firm preformance from an economic and financial point of view; the latter is to establish a criterion whereby firms are assigned to different classes of financial risk according to their failure possibilities. The statistical approaches for these kinds of problems are multivariate analysis methods in order to consider jointly the most important firm parameters. Furthermore, some methods of factor and cluster analysis are discussed for accounting data, in order to obtain effective tools in practical experience.

EVALUATION AND USE OF FOREIGN EXCHANGE FORECASTS, John F. O. Bilson, University of Chicago and National Bureau of Economic Research, 1101 East 58th Street, Chicago, Illinois 60637, U.S.A.

Given the corporation's tolerance for risk and desire for return, information about currency forecasting errors and their correlation determines a unique position in the forward exchange market. The problem, then, is to build an approach which creates this unique position from the set of available information. The construction is a two stage process. The first stage, the available forecasts are evaluated and a composite or consensus forecast is created. In addition, the variance of the forecast errors and the correlations between the forecast errors are estimated. With this information in hand, it is possible to estimate the risk and return associated with the addition of a particular forward position to the existing portfolio. In the second stage, the optimal portfolio of open positions is estimated. In estimating the optimal portfolio, it is extremely important to take account of transaction costs. Portfolio management programs which ignore transaction costs are liable to take extreme spread positions with whip-saw trading patterns.

FORECASTING OF MAIZE FUTURES PRICES, ONE DAY TO ONE YEAR AHEAD, B. G. Kingsman, University of Lancaster, Gillow House, Bailrigg, Lancaster, LA14YX, U.K.

European importers of maize, who wish to improve on a hand-to-mouth policy, must use the Chicago futures market. Their purchases of futures, which can later be converted into physical shipments, must be planned ahead in a rational manner. To do this properly, accurate forecasts of maize prices throughout the next year are required. These forecasts are calculated from econometric models which explain and predict price behavior and the months providing the best buying opportunities.
Models for futures prices have been developed, taking into account new information as it arrives. The models include description of how prices have adapted to high inflation and currency fluctuations. Forecasting performance over the last five years is shown to be superior to forecasts made from futures prices alone.
After choosing buying periods, of one to two months duration, day-to-day purchasing decisions must be made. New statistical models are estimated from fifteen years of daily futures prices. Short term forecasts are obtained and used to make daily buying recommendations. These give cheaper purchases than forecasts based upon random walk theory.
Both the econometric and statistical forecasting methods will be illustrated by showing how a major European importing organization could have planned their purchases and imports more efficiently.

FRIDAY AM JULY 9 SECTION B
Session FME2B 8:30 - 10:15

ELECTRICITY & GASOLINE FORECASTING

Chairperson: Antonio Borges, INSEAD, Fontainebleau, France

SHORT-TERM ELECTRIC UTILITY SALES FORECASTING BY CUSTOMER CLASS USING MULTIVARIATE ARIMA METHODS, Larry J. Williams, Energy Analysis Department, Electric Power Research Institute, Palo Alto, CA 94303, U.S.A.

Three-year electricity sales forecasts (including the present year) are of significant importance to all aspects of an electric utility's operation. Plans for fuel procurement, customer services, financing, and rate hearings all depend critically on a monthly 3-year ahead estimate of electricity sales. This paper will present a multivariate ARIMA model which appears to perform significantly better than traditional approaches. The formulation of the model depends on the equivalence between a state space representation of the underlying Markov process and the multivariate ARIMA model. The state vector and intrinsic system parameters are identified through the Minimum Akaike Information Criterion (MAICE). The system variables analyzed include monthly electricity sales by customer class, number of customers in each class, weather variables, electricity prices, personal income, employment, retail sales, and appliance saturations.

A TRANSFER FUNCTION ANALYSIS OF THE DEMAND FOR GASOLINE BASED ON PRICE AND INCOME, Gwilym Jenkins, Gordon McLeod, Gwilym Jenkins and Partners, and James Horrell, University of Oklahoma at Norman, Division of Finance, College of Business, 307 West Brooks, Adams Hall, Norman, Oklahoma 73019, U.S.A.

Based on quarterly data, a transfer function was built for the endogenous time series Yt = gasoline demand and the exogenous series X1t = real income and X2t = real price. To represent the effect of price on demand it was necessary to separate price into three components, (i) a continuous component, (ii) an irregular component to account for the unusual price behavior in 1974, and (iii) an irregular component to account for the unusual price behavior in 1979-80.
Confidence intervals for the percent change in demand due to the counter forces of percent changes in real income and real price are developed. Forecast models for demand using the univariate demand series and the transfer function are developed. The one quarter ahead forecast error standard deviation for the former is approximately three times as large as that of the latter.

AN EQUILIBRIUM (DETERMINISTIC) MODEL FOR PREDICTING THE TEMPORAL DISTRIBUTION AND ROUTE ASSIGNMENT OF PEAK TRAFFIC DEMAND: Attahiru Sule Alfa, Dept. of Civil Engr., Ahmadu Bello University, Samaru-Zaria, Nigeria.

It is believed that a commuter selects both his departure time from home and route for travel in order to minimize his total costs; this total cost is the sum of the costs of delay in travelling to work and costs for arriving at work late or early. On this basis stochastic models for predicting the temporal distribution and route assignment of peak traffic were developed by the author. In this paper, an equilibrium (deterministic) model for predicting the temporal distribution and route assignment of peak traffic is presented. The differences and suitability of both types of models for this problem are also discussed.

FORECASTING ENERGY DEMANDS IN PORTUGAL, Antonio Borges, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France and Diogo Lucena, Universidade, Nova De Lisboa, Campo Grande 185, 1900 1900 Lisboa, Portugal.

This paper develops an econometric model of energy demand in Portugal, at a disaggregate level. Based on a comprehensive data base on energy balances and prices, demand equations are estimated econometrically and integrated in a coherent forecasting model. The equations capture substitutability among energy forms as well as dynamic effects. Functional focus incorporate the methodologies developed by Berndt, Christensen, Jorgenson, Sweeney, Taylor and others.
The model is used o provide forecasts of energy demand by sector and by fuel. These are linked to alternative scenarios about Portugal's economic growth and structural change as well as energy prices.

FRIDAY AM JULY 9 SECTION C
Session FME3C 8:30 - 10:15

DESEQUILIBRIUM ECONOMICS & FORECASTING

Chairperson: Ahmet Aykac, INSEAD, Fontainebleau, France.

STRUCTURE AND FORECASTING IN DISEQUILIBRIUM MODELS, Richard E. Quandt, Princeton University, New Jersey 08544, U.S.A.

The paper will first review the fundamental structural differences between equilibrium and disequilibrium models. Both theoretical and econometric differences will be noted and problems of estimation discussed. Attention will be paid to the impact that disequilibrium may have on predictions from a model and to the similarity of disequilibrium models to other latent variable models.
A particular aspect of disequilibrium models, namely the role of dynamics, deserves special mention. We shall consider problems in connection with the traditional price-adjustment equations and entertain alternative solutions. The problem of serially correlated error terms will also be discussed. We shall conclude with a brief research agenda.

FORECASTING UNDER ASSUMPTIONS OF STRUCTURAL STABILITY AND STRUCTURAL CHANGE: Camilo Dagum, University of Ottawa, 550 Cumberland Street, Ottawa, Ontario K1N 6N5, Canada

This study analyses the different assumptions made on the structural stability of economic variables when forecasting, such as, total and partial structural stability, and structural change with and without information of its direction. The analysis of forecasting under the assumption of structural change includes the important cases studied by the theory of catastrophes. This research concludes with the introduction of a distance function between structures and an associated test of hypothesis to determine the existence of a significant structural change.

AN ECONOMETRIC ANALYSIS OF WAGE BEHAVIOR, Ahmet Aykac, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France.

Although the theoretical developments in studying the labor market argue that there are good reasons for wage stickiness, this has not, as yet, been used in developing wage equations at the macro level. The 'stickiness' of wages is basically a manifestation of disequilibrium in the labor markets. In this study such a "disequilibrium model of wages will be developed within the context of an open economy. The wage equation will be estimated using disequilibrium estimation techniques on French data. In addition to the forecasting of wages, various hypotheses concerning real versus nominal rigidity, symmetricity of wage behavior in cases of excess demand or excess supply on the labor markets, and speeds of adjustment will be tested.

BUSINESS FORECASTING IN AN OLIGOPOLISTIC MARKET, J.A. Dominguez Machuca, S. Durban Oliva, and R. Ruiz Martinez, F.O. Economicas y Empresarial Avda. Ramon y Cajal, s/n, Sevilla, Spain.

We are developing a System Dynamics model of an oligopoly composed by three firms, two privates and one public, which compete in the same economic sector. Among our main goals we want to point out the attainment of a better knowledge of the competitive behaviour of the business in the mentioned case as well as its long term forecasting when faced with different situations.

FRIDAY AM JULY 9 BARBAROS ROOM
Session FME4R 8:30 - 10:15

COMMODITIES FORECASTING

Chairperson: Gerald Pollio, Economic Research Department, Chemical Bank, New York, USA.

GOLD PRICES: THE LONG TERM OUTLOOK, Horace W. Brock, Strategic Economic Decisions, Inc., 905 Sherman Avenue, Menlo Park, CA 904025, U.S.A.

Forecasting long term commodity prices has been an extremely difficult and often frustrating task. This has been particularly true with gold prices whose long term trends of more than 20 years were reversed in the last two years. The present study looks at gold prices using a new forecasting approach. This approach is based on the principle of the economics of uncertainty and incorporates several ideas from Bayesian probability. The output of the model developed is forecasts for gold prices for the medium-to-the-long-term future. The model has been developed for Anglo-American, the worlds largest producer of gold, and has been used for planning and strategic decision making.

AN ECONOMETRIC ANALYSIS OF THE GOLD MARKET, Gerald Pollio, Economic Research Department, Chemical Bank, 20 Pine Street, New York, N.Y., 10005, U.S.A. and Emad Zikry, Chase Manhattan Bank, 1 Chase Manhattan Plaza, N.Y., N.Y., 10005, U.S.A.

This paper will explore the workings of the international gold market within a framework where expectations are assumed rational in the Muth sense. A key feature of the study, therefore, is the resolution of the proper methodology for handling rational expectations within a model of this kind.
The supply of new gold production is determined by the mining policies of the South African government, the world's leading gold producer and exporter. An important aspect of the supply equation is the inverse response of gold output to current and expected prices. Higher prices lead to the mining of lower grade ores, and hence a decline in new gold production, while lower prices encourage high-grading and a corresponding expansion of supply. These shifts reflect the South African government's strategy of maximizing sales by the Soviet Union, auctions by the International Monetary Fund and the U.S. Treasury, and changes in the gold holdings of central banks in the major industrial countries. Soviet gold sales are determined with reference to the country's hard currency needs. This effect is captured by the ratio of the black market price of the ruble to the official exchange rate; a deterioration in the ratio is taken to signify a worsening external balance, which leads to stepped-up gold exports to finance the shortfall.

Other supply factors are taken as being determined outside the model. The demand for gold is related to the needs of industrial users and the portfolio decisions of international investors, including central banks in non-OECD countries. A standard portfolio equation is specified , which takes account of the yield on alternative investments, the expected appreciation of gold, and foreign exchange instability.
The final section considers whether the marked fluctuations in the price of gold observed in recent years were a destabilizing input into world instability in the world economy. A resolution of this question has important policy implications, given the current interest in reestabilishing some form of the gold standard.

PLANNING THE FUTURE MARKET UTILIZING MILLER LITE BEER: S. Sami Ercan, Management and Quantitative Methods, Roosevelt University, Chicago, IL 60605, U.S.A., Jackie Gonzales, Phillip Chen and Bruce Bernt, Graduate Students at Roosevelt University.

The intent of this paper is to illustrate how to capture a higher percentage of a transition group to use of Miller Lite Beer by direct marketing activities to a college level population. In testing the expansion probabilities of Markov Chain, the paper also includes the testing of certain product innovations as enhancements to the initial promotional activities. By using Liker's scaling technique to poll the target population for results, the values can be used to determine if new product(s) should be introduced as complement or substitution, and which of those would capture the largest market share.

FORECASTING HEDGING POSITIONS IN THE COMMODITIES FUTURE MARKET: Jim Horrell, The University of Oklahoma at Norman, Division of Finance, 307 West Brooks, Adams Hall, Norman, Oklahoma 73019, USA

By making use of the recently developed autoregressive-integrated-moving average (ARIMA) stochastic models the hedge contribution to fixed cost and remaining variable cost for the production of eggs can be forecasted. This forecasted value can be compared to future contracts that can be bought or sold at the present time. When the disagreement of forecasted values and futures contract quotations is as large as two standard deviations from the historical futures contract quotations, then an appropriate long or short position can be assumed, thus locking in a profit with probability .95. For deviations less extreme, an appropriate long or short position can be assumed, locking in a profit with the corresponding (tail probability) smaller probability. The principle illustrated in this example can be generalized, allowing for its application to the development of hedging positions in a wide variety of commodity future markets.

FRIDAY AM JULY 9 SINAN ROOM
Session FME5S 8:30 - 10:15

SIMULATION & FORECASTING

Chairperson: Celik Parkan, Faculty of Management, University of Calgary, Alberta, Canada.

DYNAMIC ADAPTIVE FORECASTING USING SIMULATION, Celik Parkan, Faculty of Management, the University of Calgary, Calgary, Alberta T2N 1N4. Canada.

Most of the development in the area of forecasting techniques for business related applications have depended heavily on the manipulation of the past observations for the determination of parameters and their values underlying various interrelationships which almost always have been assumed invariant over time. The actual process of forecasting, then, has consisted of a careful interpolation/extrapolation of such interrelationships. However, whenever the values of a variable are determined primarily by behavioral forces such as the expectations of people in a certain location, at a given point in time, as regards future events of economic, political, social, technological, climatic, aesthetic, etc. nature, the problem becomes much more difficult.
A dynamic forecasting approach is proposed, which focuses on the estimation of the impact of a set of relevant current events on the expectations of those who collectively determine the value of a variable in a certain environment at a given point in time. Computer simulation is utilized in reconstructing the available data from previous observations by considering how past events may have affected expectations. The degree of impact of each event may vary according to certain trends which are also revealed. The trend represents a reference value which is adjusted by the estimate of people's reactions reflecting their expectations about future.
Operationally, the approach consists of a close scrutiny of, for example, weekly events as reported in the news media; the estimation of their impact on people's expectations and reaction based on observations on past events; the adjustment of a reference forecast value obtained by a well known method.

SAMPLING FROM A DISCRETE DISTRIBUTION WHILE PRESERVING MONOTONICITY, George S. Fishman and Louis R. Morre, III, University of North Carolina at Chapel Hill, Smith Building 128 A, Chapel Hill, NC 27514, U.S.A.

This paper describes a cutpoint method for sampling from an n-point discrete distribution that preserves the monotone relationship between a uniform deviate and the random variate it generates. This property is useful when developing a sampling plan to reduce variance in a Monte Carlo or simulation study. The alias sampling method generally lacks this property and requires 2n storage locations while the proposed cutpoint sampling method requires n + M storage locations, where M denotes number of cutpoints. The expected number of comparisons with this method is independent of n, and is bounded above by (n + M - 1)/n. The paper describes an algorithm to implement the proposed method as well as two modifications for cases in which n is large and possibly infinite.

MARKET PARTICIPANTS FORECASTS OF COMMON STOCK RETURNS, John T. Bart, Brock University, School of Administrative Studies, St. Catharines, Ontario L2S 3A1, Canada.

This paper reports on the measurement and methodological issue involved in eliciting forecasts of expected return from transactors in, and owners of, common stocks.
Market participants' forecasts of return are widely acknowledged as the basis for decisions to buy, sell or hold shares. Despite the prominence of the ex-ante return construct in capital markets theory, the virtual absence of forecasted return data in empirical research attests to the considerable obstacles to obtaining these data from market participants.
The present paper addresses this absence in the forecasting literature by reporting on the resolution of the empirical issues encountered in a survey of the capital-gain and dividend-income forecasts of over 800 transacters in, and owners of, three of Canada's most widely-held and actively-traded common stocks.* Two sets of issues are involved.

1) Issues bearing on the design and validation of a measuring device(s) to elicit unbiased, multi-outcome, capital-gain and dividend-income forecasts from various types of market participants.
2) Issues bearing on identifying and surveying scientific samples of transactors in, and owners of common stocks on a timely basis.

The paper concludes with a state-of-art assessment of empirical research involving the elicitation of forecasted return data from market participants. This material identifies specific directions for future research on the issues involved with using ex-ante data in capital markets.

A TIME SERIES APPROACH TO RUN LENGTH DETERMINATION FOR SIMULATION MODELS: Z. Seyda Deligonul, Department of Management, Middle East Technical University, Ankara, Turkey.

The a priori determination of an appropriate large sample size necessary to attain some prespecified statistical reliability for a simulation parameter in its steady state is a salient problem encountered frequently in simulation practice. While the literature is replete with power function analysis for cases with independent observations, it is hardly complete in thorough treatment on the topic when the observations are sequentially dependent. This is not particularly surprising owing to the complexity of the relevant density functions. A covariance stationary stochastic approach to the determination of sample size for a simulation model is therefore adopted. An expression for variance of the mean for an univariate ARMA model is presented and a relative reliability statement on the mean is used as a basis for the determination of the required sample size. An algorithm is also discussed for incorporating the determination and collection of the sample size into a subroutine that can be called during the ongoing simulation run.

A NEW SIMULATION MODEL FOR FORECASTING: Reza Agahi, P.O. Box 959, Mashhad, Iran.

Time Series Analysis has been proved to be an effective tool to forecast the behaviour of various large scale systems. It has been shown that the speed process of a single car in a traffic system has autocorrelation and spectral density functions with known mathematical characteristics. This process may be obtained by solving a second order differential equation of a continuous autoregressive process of second order. The sampling of such a process will yield an autoregressive-moving average (ARMA 2,1) process. In this paper it is shown that, if the parameters of the above ARMA process are estimated from some actual data, the original process can be simulated. We show that the simulated speed process and the calculated acceleration process are very close to the record of actual speed and acceleration. We propose that this simulation model may be used effectively to forecast the behaviour of original stochastic process.

FRIDAY AM JULY 9 SECTION A
Session FML1A 10:45 - 12:30

TIME-SERIES ANALYSIS & FORECASTING

Chairperson: Katarina Juselius, Swedish School of Economics, Helsinki, Finland.

ALLOWING FOR SHORT AND LONG TERM COMPONENTS IN AN AGGREGATE DEMAND MODEL FOR NONDURABLES: AN APPLICATION TO DEMAND FOR SOFT DRINKS :

Katarina Juselius, Swedish School of Economics, Arkadiagata 22, Helsinki 10, Finland.

The aim of the paper is to specify a dynamic model that incorporates both short and long run consumer responses. The general approach used in the model building process is based on the so called "error correction mechanism" advocated among others by Davidsson et.al., Hendry and von Ungern-Sternberg, and Hendry, 1980. Into the general dynamic model some features specific to the empirical data to be analyzed are incorporated, i.e. 1) strong nonconstant seasonality and 2) retailer stock effects as a nuisance variable when estimating consumer demand. Finally the long run adaptation is allowed to adjust to growth trends in the per capita demand caused by the increase of new consumers as the per capita real income grows. The derived model is applied to monthly data (1955-1978) from the beverage industry in Finland.

A UNIFIED APPROACH TO TIME SERIES MODEL BUILDING AND FORECASTING,

A. C. Harvey and P. Todd, London School of Economics, Houghton Street, London WC2A 2AE, England.

This paper introduces a class of additive univariate time series models based on the traditional decomposition into trend, seasonal and irregular components. The relationship between this class of model and other statistical models such as those proposed by Box and Jenkins, and Harrison and Stevens is explored. A set of criteria for evaluating statistical models is developed, and these criteria are then used to assess the practical value of fitting both additive and ARIMA models to a number of economic time series. It is concluded that the value of additive models is two-fold. In the first place they offer a viable alternative to other methods of statistical forecasting, and secondly they offer a unified framework for understanding the strength and weaknesses of different approaches.

TIME SERIES MODELLING; TRANSFER FUNCTION OF MULTIVARIATE MODEL; A COMPARATIVE CASE STUDY,

A. Prat-Bartes and M. Marti Recobert, Catedra de Estadistica, ETII, av. Diagonal 647, Barcelona 28, Spain

The object of the communication is to compare, in the case of unidirectional causality between several time series, the transfer function method Box, Jenkins (1970), and the multivariate stochastic model Tiao et al. (1979)
First, the differences in the formulation and parametrization of the two models are discussed. The greater felexibility of the second method is outlined. Also the gain, the impulse response weights and final models obtained using the two methods in a case study are compared.
We considered two time series. The input, X(t) is the monthly electricity production of a company in Barcelona. The output, Y(t), is the monthly electricity consumption of its customers. First the univariate stochastic models for both series are obtained. After fitting a bivariate model using the Wisconsin Multiple Time Series Program, we confirmed the absence of feed- back in the relationship, as was suspected "a priori". A transfer function model is then fitted to the data and the results compared with those of the bivariate approach.

IDENTIFICATION OF MULTI-INPUT TRANSFER FUNCTION MODELS (B-J-TYPE):

Per-Olov Edlund, Department of Business Administration, University of Stockholm, S-106 91 Stockholm, Sweden

In this paper we discuss different ways to identify the order of the Box-Jenkins transfer function model. The discussion is based on the situation when we have several input variables that are correlated with each other. We find that most of the methods proposed are unsuitable, some are not reliable when there are correlated input variables, and some are expensive or difficult to use. We therefore propose an extension of a regression approach used by Pukkila (1980). The new approach is based on the solution of some of the difficulties connected with the application of the regression method in our particular situation, namely the multicollinearity problem and the problem of autocorrelated residuals. It is found that the use of biased regression estimators on variables transformed with respect to the noise model should give better estimates than the usual ordinary regression estimator. To test the new approach, we have designed and performed a small simulation experiment. The results from the simulations indicate that the proposed method may be of value to the practitioner.

FRIDAY AM JULY 9 SECTION B
Session FML2B 10:45 - 12:30

PERSONNEL RELATED FORECASTING

Chairperson: M.A.D.Machuca, C/Mar Negro 2, Sevilla, Spain.

MANPOWER FORECASTING FOR MEGAPROJECTS: AN ILLUSTRATION OF MANPOWER FORECASTING IN THE CANADIAN OIL AND GAS INDUSTRY, K. Weiermair, Faculty of Administrative Studies, York University, 4700 Keele Street, Downsview, Ontario, M3J 1P3, Canada.

The first part of the paper discusses methodological problems associated with micro models of manpower forecasting which are being presently contemplated for corporate planning in the Canadian energy field.
Specifically, we will discuss the use of COFOR, a national manpower forecasting model used by the Department of Employment and Immigration and its potential for adaptation in the forecasting of labour market conditions facing megaproject developments in Western Canada.
The second part will illustrate the aforementioned problems using two recent megaprojects in which the author was involved.

AN OPTIMIZATION MODEL OF PERSONNEL FORECASTING IN HEALTH INSTITUTIONS, Miguel Angel Dominguez Machuca, C/Mar Negro 2, Sevilla, Spain.

We have developed a model whose main goal is to forecast the minimum number of doctors necessary to attend the emergency service of a medical center when historic data about arrivals of sick people are available.
In our communication we shall discuss the linear program used to solve this problem and we shall show how the forecasting of future arrivals of ill people constitutes a fundamental input for the elaborated model.

WAGES FUNCTIONS AS A FORECASTING TOOL FOR POLICY MAKING, Juan M. Villasuso, Universidad de Costa Rica, Ciudad Universitaria "Rodrigo Facio", Costa Rica, America Central.

The Costa Rican labor sector has been growing very rapidly in the last few years and estimation of wages is becoming of great importance for policy makers, particularly in the present inflationary situation.
There has been in the economic literature many theoretical studies and empirical works regarding wage functions, but efforts have been mainly oriented to explain rather than forecast wage levels.
The purpose of this paper is to present estimated wage functions for the Costa Rican economy; to use them to forecast future behavior of this variable, and to evaluate their forecasting capability. The information to estimate these functions comes from the Ministry of Labor's National Household Survey. Regressions are made by occupational category.

PREDICTING THE SUCCESS OF GRADUATING SENIORS IN SECURING A JOB IN PUBLIC ACCOUNTING: Zahid Y. Khairullah, Joseph C. Rue and Durriya Z. Khairullah, Saint Banoventure University, Saint Bonaventure, New York 14778, U.S.A.

In this paper we first identify characteristics (of students graduating from college with a major in accounting) which appear to be important factors in securing employment in public accounting. Major accounting firms responded to questionnaires which included ranking candidate profiles in order of preference for a position in their firm. Salience weights are estimated for the characteristics presented in the profiles. The salience weights may then be used to predict the success of individuals seeking a job in public accounting.

FRIDAY AM JULY 9 SECTION C
Session FML3C 10:45 - 12:30

SUPPORT SYSTEMS IN FORECASTING

Chairperson: Neil Polhemus, Princeton University, New Jersey,USA.

MATRIX PROCESSOR AND ITS USE IN MANAGEMENT DECISIONS: S. Sami Ercan, Management and Quantitive Methods, Roosevelt University, Chicago, IL 60605, U.S.A. and Robert Sherwood, Marketing Manager, Harris Corporation, Chicago, IL, U.S.A.

This Matrix Processor Software is prepared for the needs and perceptions of academicians to be used in classrooms as well as for the use of business applications in our daily life. The software has twelve functions including general matrix multiplication, generalized matrix inverse and its determinent, solving systems of linear equations in all cases (Unique Solution, No Solution, and Infinitely many Solutions, a Parametric Solution). The User's Manual illustrates implementations and applications of the module to Marketing, Accounting, Management, Production, and Personnel problems. The preparatory objective of the module was its use and execution by inexperienced clientele.

TIME SERIES LANGUAGE: Seppo Kaltio, TMT-Team Oy, P.O. Box 452, SF-00101, Helsinki 10, Finland

The methods used in time series analysis are the domain of the mathematical specialists. The goal of this method is to bring time series analysis into the province of common user. The method is based on a special notation called TSL (Time Series Lanugage). The notation consists of fourteen mathematical symbols which define the functions needed in time series analysis. The notation can be used in explaining the past and in forecasting the future. It is based on the ARIMA model and transfer function model from Box-Jenkins techniques. The notation has been made operational by means of APL-language.

GRAPHICAL SUPPORT SYSTEMS FOR INTERACTIVE FORECASTING, Neil Polhemus, Princeton University, Department of Civil Engineering, Princeton New Jersey, 08540, U.S.A.

Recent advances in interactive computer graphics have made possible the direct integration of various graphical techniques into the interactive forecasting process. Effective use of these new developments requires careful design of the user-machine interface. This paper discusses a prototype development of a graphical support system for interactive forecasting.

Issues discussed include syntactical structure the design of menu drivers, efficiency tradeoffs, and user flexibility. Illustrations of the system in time series forecasting are presented, including various classical, Box-Jenkins, and adaptive techniques.

A FUZZY LINGUISTIC ALGORITHM FOR HUMAN PREDICTIVE REASONING, Alf C. Zimmer, Westfalische Wilhelms-Universitat Munster, 4400 Munster, den Schlaunstrabe 2. Germany.

Human predictive reasoning is modelled by a fuzzy linguistic algorithm, which takes into account metaknowlege about the topic of prediction and empirical support for generalizations applied in the deduction of consequences.
It is shown that misconceptions about the change of variables in time and about interactions between them quire often impair predictions. These misconceptions are due to attempts to cope with the complexity of the situations, in which and for which predictions are required. Among others the following heuristics for a reduction in complexity have been identified:
nf - linearization of growth and decay processes - assumption of merely additive effects - equal weighting of all important variables
Empirical results indicate that these negative effects in human predictive behavior can be overcome by a step-wise updating of situational variables.

ENERGY R AND D DECISION MAKING IN A SMALL COUNTRY, SOME FORECASTING TOOLS FOR DECISION MAKERS, David Bnaya, Head of Technology System Department, ICTAF., T.A. University, Ramat-Aviv, Tel-Aviv 69978, Israel.

Eight years with the so called "Energy Crisis" drove home to most governments the lesson that there is no simple 'technical fix' that will provide ample energy at low price now. The object of this paper is to present an approach developed and implemented for "Energy R and D Decision Making in a Small Country". The decision maker (in this instance the chief Scientist of the Ministry for Energy) has the following inputs available to him:

* The goals of the national energy policy
* Forecasts of energy demand.
* Forecasts of fossile and nuclear energy supply (including price forecast).
* Tehnological Forecasts of New and Renewable energy resources.
* R and D expenditure ceilings.
* Technological Assessment of the economically realisable potential of New and Renewable energy resources.

The model and methodology approach developed allow the decision maker to allocate resources for R and D according to a 'priority list' derived from the perceived utility of the various alternatives in achieving the goals of the national energy policy in the context of technological and economic constraints. The method is an application of a multi-attribute utility function to the problem at hand. The results are a list of projects or domains of R and D weighted according to the perceived subjective utility of the decision maker.

FRIDAY AM JULY 9 BARBAROS ROOM
Session FML4R 10:45 - 12:30

ADAPTIVE FORECASTING

Chairperson: Manfred Huttner, Universitat Bremen, Germany.

EXPERIENCES WITH THE ADAPTIVE FILTERING-METHOD, Manfred Huttner, Universitat Bremen, Postfach, 2800 Bremen 33, Germany.

"Adaptive Filtering" originated in the field of Electrical Engineering, where the so-called Widrow-Hoff-Algorithm was developed. Later Wheelwright/ Makridakis applied this method to forecasting problems. Though, this use has been subject to criticism. Then Makridakis/Wheelwright developed an extension, their "Generalized Adaptive Filtering" (GAF). At the University of Bremen in the context of a broader computerpackage called FIDES: "Forecasting, Information, and Data Editing System", a computer program GAF was developed. First, the univariate version is presented, in a similar manner. Finally, analogous to Dagum a new CENSUS-variant X 11-GAF is demonstrated.

AUTOREGRESSIVE MODEL FORECASTING WITH VARYING PARAMETER REGRESSION, Evangelos O. Simos and Demirhan Yenigun, University of New Hampshire, Durham, New Hampshire 03824, U.S.A.

There have been several studies of time series autoregressive (AR) models as a forecasting alternative to econometric models, which have found, based on ex-post forecast, that the former can often provide better forecasts of macroeconomic variables than the latter. However, ex-post forecasts of AR models are based on fixed coefficients equations, representing a stochastic structure that does not change over time. A change in either the constant or the parameters of the lagged dependent variables could change the "drift-line", hence ex-post forecast based on constant coefficients would yield a different pattern than those based on a shifted over time relationship. In this paper, using the varying parameter regression which enables the researcher to estimate the coefficients one period out of the sample, we develop two ex-post forecasting procedures that combine autoregressive models with varying parameter regression estimation. The first procedure is the autoregressive-varying parameter (ARVP) technique which provides ex-post forecasting based on the coefficients of only one period ahead. The second procedure is the autoregressive iterative (dynamic) varying parameter technique (ARIVP) which enables the researcher to reduce the cumulative phenomenon of forecast errors. The first forecast out of the sample (T + 1) is based on the T + 1 varying parameter coefficient estimate, i.e. the ARVP technique.

However, for the second forecast period (T + 2), the model is re-estimated to produce new coefficient estimates for T + 2 which are used to forecast the dependent variable. This is, in each period out of the sample, the forecast is based on the recent forecasted values of the regression coefficients. The two proposed techniques ARVP and ARIVP along with the conventional AR model are used to develop ex-post forecasts for four macroeconomic variables for the United States, namely GNP, prices, unemployment, and a short-term interest rate. Finally, the forecast performance of the three techniques are evaluated.

FEEDFORWARD CONTROL FOR EFFECTIVE PLANNING AND STRATEGY: Akira Ishikawa, Rutgers, The State University of New Jersey, Graduate School of Management, USA and Muneya Sato, Yokohama City University School of Commerce, 22-2 Seto Kanqzawa-Ku, Yokohama 7236, Japan.

In order to enrich and advance the concepts and techniques of forecasting, one of the authors has attempted to define the nature and characteristics of the feedforward planning and control and applied them to the management information systems, corporate planning and control systems, fuzzy information systems, zero-base budgeting systems, and strategic budgetary planning and control systems. This paper is an extension of these previous studies in the area of accounting information systems, particularly the cost control systems.

THE APPLICATION OF THE ASYMPTOTIC CURVE TO FORECASTING TOURIST FLOWS, R. W. Butler, Department of Georgraphy, University of Western Ontario, London, Ontario, Canada N6A 5C2.

The asymptotic or S shaped curve has been frequently used in predicting populations of wildlife, and also in predicting the life-cycle of manufactured products. It is argued that the curve is appropriate to use to predict flows of tourists to specific destination areas, as such areas themselves resemble products and experience initial sales success, stabilization and in most cases subsequent decline. The application of the curve is tested for specific areas, and the implications discussed in the context of a hypothesized life-cycle of tourist destination areas.

FRIDAY AM JULY 9 SINAN ROOM
Session FML5S 10:45 - 12:30

FORECASTING APPLICATIONS IN TURKEY

Chairperson: Yagci, Turkey

Various forecasting applications in Turkey will be described and their usefulness and relevance discussed. Even though forecasting is not used on a widespread basis, it has been employed by many of the larger companies in Turkey to guide their planning an strategy.

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An International Journal published under The Wiley Interscience Imprint
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PAPERS APPEARING IN VOLUME 1

1. Ahlburg, Dennis A., University of Minnesota, "How Accurate are the U.S. Bureau of the Census' Projections of Total Live Births?"

2. Armstrong, J. Scott, The Wharton School, University of Pennsylvania, "Research on Scientific Journals: Implications for Editors and Authors".

3. Ascher, William, Department of Political Science, The Johns Hopkins University, "Political Forecasting: The Missing Link".

4. Askin, Ronald G., Department of Systems Engineering, The University of Iowa, "Multicollinearity in Regression: Review and Examples".

5. Beyth-Marom, Ruth, Decision Research, University of Oregon, "How Probable is Probable? A Numerical Translation of Verbal Probability Expressions".

6. Brown, Robert Goodell, Materials Management Systems, Inc., "The Balance of Effort in Forecasting".

7. Carbone, Robert, Facùlté des sciences de l'administration, Université Laval, "Evaluation of Extrapolative Forecasting Methods: The Viewpoint of Academicians and Practitioners".

8. Cholette, Pierre, Statistics Canada, "Prior Information and ARIMA Forecasting".

9. Dagum, Estela Bee, Statistics Canada, "Revisions of Time Varying Seasonal Filters".

10. Dino, Richard N., Riley, Donald E., and Yatrakis, Pan G., International Headquarters of Xerox Corporation, "The Role of Forecasting in Corporate Strategy: The Xerox Experience".

11. Einhorn, Hillel J. and Hogarth, Robin M., Center for Decision Research, Graduate School of Business, University of Chicago, "Prediction, Diagnosis, and Causal Thinking in Forecasting".

12. Fischhoff, Baruch and MacGregor, Don, Decision Research, University of Oregon, "Subjective Confidence in Forecasts".

13. Godet, Michel, CESTA, Ecole Polytechnique, "From Forecasting to 'La Prospective' A New Way of Looking at Futures".

14. Hillmer, S.C., The University of Kansas, "Forecasting Time Series With Trading Day Variation"

15. Jenkins, Gwilym M., GJP Ltd., Forecasting and Business Consultants, "Some Practical Aspects of Forecasting in Organizations".

16. Karasek, Mirek, International Airports Projects, "Forecasting & Planning the Jeddah Air Traffic With a Mini Model".

17. Lemaire, Jean, Université Libre de Bruxelles, "Claims Provisions in Liability Insurance".

18. Levenbach, Hans, American Telephone and Telegraph Company, "Time Series Forecasting Using Robust Regression".

19. Lewandowski, Rudolf, Marketing Systems, "Sales Forecasting by FORSYS".

20. Makridakis, S., INSEAD, Anderson, A., University of Sydney, Carbone, R., Université Laval, Fildes, R., Manchester Business School, Hibon, M., INSEAD, Lewandowski, R., Marketing Systems, Newton, J. and Parzen, E., Texas A&M University, and Winkler, R., Indiana University, "The Accuracy of Extrapolation (Time Series) Methods: Results of a Forecasting Competition".

21. McLaughlin, Robert L., Turning Points, "A Model of an Average Recession and Recovery".

22. McNees, Stephen K., Federal Reserve Bank of Boston, "The Role of Macroeconometric Models in Forecasting and Policy Analysis in the United States".

23. Parzen, Emanuel, Texas A&M University, "ARARMA Models for Time Series Analysis and Forecasting".

24. Polhemus, Neil W., School of Engineering and Applied Science, Princeton University, "Requirements for Effective Use of Graphical Methods in Interactive Forecasting".

25. Reeves, Gary R., Department of Management Science, University of South Carolina and Lawrence, Kenneth D., Planning & Financial Analysis, AT&T Long Lines, "Combining Multiple Forecasts Given Multiple Objectives".

26. Sjöberg, Lennart, Department of Psychology, University of Göteborg, Sweden, "Aided and Unaided Decision Making: Improving Intuitive Judgment".

27. Smyth, David J., Department of Economics, Zayne State University, "Short-Run Macroeconomic Forecasting: The OECD Performance".

28. Young, Richard M., Trinity University, "Forecasting With an Econometric Model: The Issue of Judgmental Adjustment".

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"The Importance of the Forecast in the Implementation of Economic Policy"

Robert U. AYRES.....Carnegie-Mellon.....Technological Forecasting
Robert G. BROWN.....Materials Management Systems.....Operations Forecasting
Baruch FISCHHOFF.....Decision Research.....Judging Forecasts & Forecasting Judgments
Rudolf E. KALMAN.....Swiss Federal Inst. of Technology....Problems with Statistical Forecasting
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JUDGMENT: David Dreman, New York; Robin Hogarth, U. of Chicago; F. Thomas Juster, U. of Michigan; Daniel Kahneman, U. of British Columbia; Sarah Lichtenstein, Decision Research; Paul E. Meehl, U. of Minn.

COMMENTARY

On Julian Simon's "HOW TO FORECAST NATURAL RESOURCES" by Bill Ascher, Johns Hopkins; Hans Landsburg, Resources for the Future; and others.

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« The Importance of the Forecast in the Implementation of Economic Policy »

and

Robert U. AYRES, Carnegie-Mellon, Pennsylvania - Technological Forecasting
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