Sessions in Chronological Order

Forecasting for Government I	64	LUZERN
Cointegration in Financial Series I	65	EDELWEISS
Interest Rates	66	ACACIA
Nonlinear Models	68	PILATUS
Manpower Forecasting	69	MATTERHORN
Forecasting and Marketing	70	MONT-BLANC
Exhibitor Session I	71	MIMOSA
Judgemental Forecasting I	72	MONTREAUX

Monday 15:45-17:15

ARIMA Models	74	LOUSANNE
Forecasting for Government II	75	ZURICH
Energy Forecasting I	76	LUZERN
Forecasting Using ARIMA and Fractional ARIMA Models	77	EDELWEISS
Issues in Forecasting II	78	ACACIA
Management in Emerging Markets	79	MIMOSA
Forecasting in Tourism Industry	80	MATTERHORN
Regional Forecasting	81	MONT-BLANC

Tuesday 9:00-10:30

Economic Implications of Accounting Forecasts	82	BASEL
Cointegration Applications	83	ZURICH
Bayesian Forecasting	85	LUZERN
Issues in Forecasting III	86	EDELWEISS
Corporate Financial Forecasting Models	87	MONTREUX
Nonlinear Dynamics and Forecasting in Foreign Exchange Markets	88	PILATUS
New Trends in Competetiveness Strategies	89	MATTERHORN
Scenario Analysis and Strategic Planning	90	MONT-BLANC
Predicting Corporate Performance	91	JUNGFRAU

Sessions in Chronological Order

Tuesday 10:45-12:15

Aspects of Forecasting and Modelling Financial Series	92	ZURICH
Judgemental Forecasting II	93	LUZERN
Economic Policy and Forecasting	94	EDELWEISS
Application of Neural Networks and Genetic Algorithms to Financial	`95	MONTREUX
Rule Based Forecasting	96	PILATUS
Neural Network in Forecasting I	97	MATTERHORN
Forecasting Accuracy of Time Series Methods	99	MONT-BLANC
Forecasting Volatility	100	JUNGFRAU

Tuesday 14:00-15:30

Cointegration in Financial Series II	101	ZURICH
Combining Forecasts II	102	LUZERN
Unit Root and Long Memory Processes	103	EDELWEISS
Forecasting In Investment Management	104	MONTREUX
Issues in Macroeconomic Forecasting	106	PILATUS
Forecasting Tools in Marketing	108	MATTERHORN
Stock Market Efficiency	109	MONT-BLANC

Tuesday 15:45-17:15

Heteroscedasticity	110	LAUSANNE
Analysts' Forecasts of Earnings I	111	ZURICH
Economic Forecasting	113	LUZERN
Applications	114	EDELWEISS
Neural Networks in Forecasting II	115	MONTREUX
Bayesian Forecasting II	116	PILATUS
Combining Forecasts III	117	MATTERHORN
Issues in Forecasting IV	118	MONT-BLANC

Sessions in Chronological Order

Wednesday 8:30-10:00

Outlier Analysis	119	LAUSANNE
Neural Networks in Forecasting III	120	BASEL
Forecasting Software II	121	ZURICH
Improving Forecasting Accuracies	123	LUZERN
Economic Forecasting in the OECD	124	EDELWEISS
Multivariate Models II	125	MONTREUX
Budgeting and Forecasting	126	MIMOSA
Statistical Behaviour of Financial Time Series II	127	MATTERHORN
Exhibitor Session II	128	MONT-BLANC

Tuesday 10:15-11:45

Electricity Demand Forecasting	129	LOUSANNE
Judgemental Forecasting III	130	ZURICH
Energy Forecasting II	131	LUZERN
Macroecenomic Forecasting II	133	EDELWEISS
Stock Prices and Accounting Data	134	MONTREUX
Efficiency in Banking Industry	135	MIMOSA
Analysts' Forecasts of Earnings II	137	MATTERHORN
Sales Forecast Accuracy	138	MONT-BLANC
Issues in Forecasting V	139	PILATUS

Predictability in Financial Markets

Chair: ***Vedat Akgiray***
Faculty of Business Administration, Boðaziçi University, 80815 Bebek, Ýstanbul, Turkey

Maximizing Predictability in the Stock and Bond Market

Andrew W. Lo
Finance Faculty, Sloan School of Management, Massachusetts Institute of Technology, Cambridge,MA 02142,USA
A. Craig MacKinlay
Finance Department, The Wharton School of the University of Pennsylvania, Philadelphia, PA 19104-6397, USA

In this paper construct portfolios of stocks and of bonds that are maximally predictable with respect to a set of ex ante observable economic variables, and show that these levels of predictability are statistically significant, even after controlling for data-snooping biases. We desegregate the sources for predictability by using several asset groups, including industry sorted portfolios, and find that the sources of maximal predictability shift considerably across asset classes and sectors as the return-horizon changes. Using three out-out-of sample measures of predictability, we show that the predictability of the maximally predictable portfolio is genuine and economically significant.

A Method for the Early Detection of a Structural Change and an Application to Mean Reversion in Stock Returns

Sýdýka Baþçý
Erdem Baþçý
Asad Zaman
Department of Economics, Bilkent University, 06533 Bilkent, Ankara, Turkey

We propose a method for the early detection of a structural change in linear econometric models. The method involves the use of two recent results in testing for the presence of an unknown change point by Andrews (1993) and Baþçý, Mukhopadhyay and Zaman (1996). We apply the method for common stock index returns in the Istanbul Stock exchange for the period of 1987-1996. The underlying model is a mean plus noise, with an occasional jump in the level of mean and the problem is the early detection of this jump. The power of the unknown change point test bears utmost importance in the timeliness of the detection of a change. To see this empirically, the detection times of the two unknown change point tests are compared.

Forecasting Stock Prices by Using Alternative Time Series Models

Kývýlcým Metin
Bilkent University, Department of Economics, 06533 Bilkent, Ankara, Turkey
Gülnur Muradoðlu
Bilkent University, Faculty of Business Administration, 06533 Bilkent, Ankara, Turkey

The purpose of this paper is to compare the forecast performance of alternative time series models at the Istanbul Securities Exchange (ISE). Considering the emerging market characteristics of ISE, stock prices are estimated by using money supply, inflation rates, interest rates, exchange rates and the government deficits. First, stochastic properties of the data are examined and cointegration is tested. Next, univariate ARIMA models, VAR's in levels and differences, and an error correction models are specified and estimated using monthly data from 1987(1) through 1993(12). Finally, in an out-of-sample forecasting exercise from 1994(1) through 1995(12) comparisons will be given as to the performance of alternative forecasting models at different forecast horizons of short, medium and long terms respectively.

P/E Ratio as a Forecasting Tool in Istanbul Securities Exchange

Alpaslan Güney
Kürþat Aydoðan
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

We investigate the ability of average market price-earnings (P/E) ratio as a predictor of future returns at the Istanbul Securities Exchange during the 10 year period between 1986-1995. We examine the returns on ISE Composite Index followed by periods of P/E ratio quintiles ranging from low to high. We find that 6-month, 12 month and 24-month returns following periods of low P/E ratios are significantly higher than those after periods of high P/E ratios. In terms of real returns, low P/E periods are followed by positive returns over all horizons, whereas real returns are negative subsequent to periods with high P/E ratios. A market timing strategy based on switching between bonds and stocks according to the level of P/E ratios is tested. We find that performance of those portfolios are superior to a control portfolio that is equally divided between bonds and stocks.

Choice of Methods

Chair: ***Nigel Meade***
Imperial College of Science & Technology, Department of Management Science, Exhibition Road, London SW7 2BX, UK

Extrapolative Forecasting: Detecting Evidence to Aid Choice of Method

Nigel Meade
Imperial College of Science & Technology, Department of Management Science, Exhibition Road, London SW7 2BX, UK

Recent work by Fildes, Hibon, Makridakis and Meade on empirical accuracy of extrapolative methods included a section looking at measuring trend, volatility and proportion of outliers. This paper describes some preliminary work examining whether a description of a series in these or similar terms contains information that suggests which extrapolative methods will best forecast the series.

The Accuracy of Adaptive Filtering Model on Different Data Structures

Ramazan Aktaþ
Turkish Army Academy, Harbiye, Istanbul, Turkey
Funda Demirel
The Republic of Turkey, Prime Ministry Undersecretariat of Foreign Trade, Bahçelievler, Ankara, Turkey

In this study, adaptive filtering model which was developed by Wheelwright and Makridakis was examined with respect to its accuracy on different data structures. First, we created different data structures such as horizontal, trend, seasonal and different mixtures of them. Then, we examined the accuracy of this model on these different data sets. The results indicate that the model performs well in predicting the trend and horizontal data sets but its performance is not as good for more complex data structures.

Adaptive Forecasting and Early Trend Detection Using Learn-and-Optimize, Functional Analysis and Filtering

D. Howard Phillips
Rafic Z. Makki
Electrical Engineering Department, The University of North Carolina at Charlotte, Charlotte, NC 28223, USA

Many applications require trend forecasting using a small number of data points per trend. This is a common situation when trend reversals occur frequently. One example is trend identification and trend reversal when observing daily closing prices in financial markets. The early trend forecasting methodology reported in this paper includes a **combination** of three technologies (learn-and-optimize, functional analysis and filtering). A public demonstration of adaptive forecasting has shown a **forecasting accuracy of 80%** when forecasting the prices of the 30 stocks in the Dow Jones Industrial Average (DJIA). This demonstration began in February 1995 and has continued for more than one year during which daily forecasts have been posted on the world wide web. The URL is http://www.duke.edu/~dhp/

Empirical Comparisons of the Forecasting Accuracy of Major Methods: Plans to Conduct a New Competition

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

At present there are many forecasting methods available and still a fair amount of discussion is taking place as to which are the most appropriate to accurately forecast various situations. We are currently making plans to conduct a major comparison of forecasting methods including neural network and expert systems. We shall increase the number of series used in the evaluation and finally we shall complete the entire study over the INTERNET to facilitate both the running of the various methods and their evaluation.

Forecasting Performance of VAR Models

Chair: ***Francisco Ramos***
Faculdade de Economia, Universidade do Porto, 4200 Porto, Portugal.

Structural and VAR Models of Lending Rate Determination: A Comparison of Their Forecasting Performance

Abdul Ghafar Ismail
Department of Economic Analysis and Public Policy, Universiti Kebangsaan Malaysia, Bangi 43600 Selangor D.E,
Malaysia
Norman Mohd Saleh
Mohamat Sabri Hassan
Department of Accounting, Universiti Kebangsaan Malaysia, Bangi 43600 Selangor D.E, Malaysia

The profitability of banks depends on how the prices the charge for loans with their costs of funds and operations.Indeed, because loans represent the central activity of banking and are the basis of most banks' relationship with their major customers, loan pricing tends to be the focal point of both revenues and costs. McKinnon (1973) and Shaw (1973) propose the increase in nominal deposit rate. Concomitant with this increase in the deposit rate, commercial banks are able to increase the lending rate. However, authors like Stiglitz and Weiss (1981) and Jaffee and Russell (1976),believe that the deposit rates may not be monotonic with respect to the lending rates under the conditions of asymmetric information.Therefore,the lending rate is mark-up over the marginal cost of deposits, and the mark-up will change over the economic or credit cycle. This has raised the question on the rigidity or flexibility of lending rate determination. Therefore,the aim of this paper is to develop a model of lending rate determination. The structural and VAR models of lending rate determination will be developed. And the forecasting performance of each model will be examined.

Estimating and Forecasting Exchange Rate: Comparison of Structural and VAR Models

Belma Evin Fýrat
Kurumsal ve Ekonomik Araþtýrmalar Bölümü, Yapý ve Kredi Bankasý, YKB Plaza A Blok 9. Kat, 80620 Levent, Istanbul, Turkey

The aim of this study is to compare the alternative exchange rate models according to their out of sample forecasting accuracy. For this reason three structural models of exchange rate have been developed under different assumptions and their time series representations have been utilized. Structural models of exchange rate are divided into portfolio balance approach and monetary approach to exchange rate. Furthermore, these models are diversified according to the flexibility of prices in the short run and in the long run. For the time series representations of the vector autoregression models vector autoregression (VAR) and the Bayesian approach to vector autoregression models are used. In this context, it has been shown that, in out of sample forecasts of short time horizons, Bayesian VAR Models in general produce better forecasts.

Forecasting Market Shares Using VAR and BVAR Models: A Comparison of Their Forecasting Accuracy

Francisco F. R. Ramos
Faculdade de Economia, Universidade do Porto, 4200 Porto, Portugal.

This paper develops a Bayesian vector autoregressive model (BVAR) for the leader of the Portuguese car market to forecast the market share. The model includes five marketing decision variables. The Bayesian prior is selected on the basis of the accuracy of the out-of sample forecasts. We find that BVAR models generally produces more accurate forecasts. The out-of sample accuracy of the BVAR forecasts is also compared with that of forecasts from an unrestricted VAR model and of benchmark forecasts produced from univariate (e.g., Box-Jenkins ARIMA) models. Additionally, competitive dynamics are revealed through variance decomposition and impulse response analyses.

Forecasting Software I

Chair: ***Michael Lawrence***
School of Information Systems, University of New South Wales, Sydney 2052, Australia

A Tutorial on Writing Specifications for a Forecasting Engine

David Reilly
AFS, Inc., 759 Ivyland Road, P.O. Box 563, Hatboro, PA 19040, USA

It is becoming increasingly popular to select the "Best of Breed" components for a production/logistics initiative. This paper details some of the pitfalls to avoid and highlights critical components that should be considered when selecting your forecast engine. The effect of outliers, changes in parameters and the incorporation of causal variables, both lead and lag, will be presented along with portability and model storage/recall issues. Attendees will receive a checklist of action items that will empower them to subsequently choose the best engine.

Predicting and Adapting Relationships of Reusable Software Parts

K. Zeroual
Départment de mathématiques et d'informatique, Université de Sherbrooke, Sherbrooke, Québec, Canada J1K 2R1

Basic to the construction of software by reusable parts is the concept of software repository. Repositories require investigating, recognizing, classifying, searching, and adapting reusable parts. When a software designer considers different options in the design of a new product, he must predict how each option would affect the final product. In this framework, we present a reuse-based software design approach based on a connexionist method that organizes and describes the parts relationships. This adaptive classification method allows designers to generate classification structures according to different design issues. Our approach does not require to explicitly incorporate the parts refining and combining rules into the software design tool. Rather, it provides designers with the capability to search and progressively understand the most relevant parts needed in a software design problem. The connexionist classification method allows software designers to deal with refining specifications in an evolving knowledge context as well as exploring several design options by predicting the relationships among the selected software parts that may compose the investigated product.

Design and Testing of a Decomposition Based Decision Support System to Reduce Bias in Forecasting a Non-Seasonal Time Series

Michael Lawrence
School of Information Systems, University of New South Wales, Sydney 2052, Australia

This paper explores a tool, potentially more acceptable to many business forecasters than a normal quantitative forecasting model, which is designed to help reduce bias in extrapolating a non-seasonal time series. It decomposes the extrapolation into (i)choosing whether the direction of the next segment slope is up or down; (ii) estimation of the forecaster's confidence in this direction and (iii) estimation of the forecast conditional on the direction being correct. Using the estimation of confidence, the Decision Support System (DSS) discounts the conditional forecast to arrive at the unconditional forecast. The motivation for the model is that empirical judgemental forecast data shows these forecasts to be frequently in the wrong direction with respect to the last actual. Furthermore, the probability of getting the direction of change wrong did not seem to be factored into the forecast. A DSS incorporating this decomposition and using a graphical presentation with mouse based pointing has been shown to improve estimation when compared to a purely judgemental alternative and to be significantly better than the naive alternative. This test was performed using a database of M-Competition monthly series. The reason for the improvement is the reduction in the typical forecasting anchor and adjustment biases (which operate in forecasting in the opposite direction than in other fields).

International Capital Flows

Chair: ***Angelos A. Antzoulatos***
International Macroeconomics Function Research Department, Federal Reserve Bank of New York, 33 Liberty Street, New York, N.Y. 10045, USA

Real exchange rates - The real interest differential and the terms of trade: The Turkish case

Haluk Erlat
Güzin Erlat
Department of Economics, Middle East Technical University, Ankara, Turkey

Turkey embarked on a policy of export oriented economic growth from the beginning of 1980 onwards, which involved financial liberalization on several fronts. These consisted of the deregulation of interest rates, the introduction of flexible exchange rates and the liberalization of the capital account. These developments indicated that one can now investigate the determination of the real exchange rate (RER) by taking monetary factors into account, the real interest differential (RDIFF) in particular. Also, Turkey, being a *small* country, would be subject to terms of trade (TOT) shocks in the post-1980 period. Thus, it became legitimate to ask if there is a long-run relationship between RER, RDIFF and TOT in the post-1980 period. We investigated such a relationship using the Johansen approach and found (a) that there was a single cointegrating relation, (b) that the long-run coefficients were economically interpretable in the sense that whenever RDIFF and TOT turned in Turkey's favor RER appreciated, and (c) the long-run coefficients were statistically significant.

Terms Of Trade Shocks And Economic Fluctuations

Ahmet N. Kipici
T.C. Merkez Bankasý, Araþtýrma Genel Müdürlüðü, 06100 Ulus, Ankara, Turkey

In this study, we examine the existence of the Harberger-Laursen Metzier hypothesis for Turkey. This hypothesis states that an improvement in the terms of trade raises a country's real income level. Since part of the increase in the real income falls on saving, the improvement in the terms of trade improves the current account. To this end, we use a general equilibrium model similar to those used in the real business cycle literature. Unlike most of the previous studies, we obtain the estimates of the intertemporal and intratemporal elasticity of substitution parameters using the Generalized Method of Moments (GMM) technique. Other parameters of the model are also based on the data instead of calibration. Using these parameters in the model we obtain first and second moments of the data obtained from the model by numerical methods and compare with those of actual data.

The Determinants of Private Capital Flows to LDCs in the 1990s

Angelos A. Antzoulatos
International Macroeconomics Function Research Department, Federal Reserve Bank of New York, 33 Liberty Street, New York, N.Y. 10045, USA

The return of private capital to LDCs in the early 1990s was widely attributed to global and country specific factors, such as, low international interest rates and policy reforms in the recipient countries, Yet, preliminary results from a panel of six L.A. countries for the period 1989:1 to 1994:4 indicate that total new bonds issued worldwide and lagged foreign exchange reserves in the recipient countries are the most significant determinants of bond flows. Moreover, both have a positive coefficient. The latter suggests that reserves may have reassured lenders about the borrowing countries' ability to repay. Overall, it appears that bond flows were primarily supply driven, which explains their resilience to the rising interest rates in the industrial world during 1994. From a forecasting point of view, lagged values of the two independent variables can explain almost 60% of the flows.

World-Class Forecasting in the Supply Chain

Chair: ***Hans Levenbach***
Delphus Inc., 103 Washington St., Suite 348, Morristown, NJ 07960, USA

The four P's of Effective Demand Forecasting Software

Hans Levenbach
Delphus Inc., 103 Washington St., Suite 348, Morristown, NJ 07960, USA

The ability to plan the functions across all organizations in the supply chain requires effective forecasting methods and information management tools. For operational forecasting, a good gauge of the future crucially depends on the integration of forecasts by Place, Product, Price and Promotion. This multidimensional view creates interesting complexities for time series modeling, forecast assessment and software implementation, which will be the focus of the presentation.

Forecasting Revenues for a Leased Service Operation: A Modeling and Software Implementation Challenge

Mike Quat
Lucent Technologies, 5 Woodhollow Road, Parsippany, NJ 07054, USA

Forecasting recurring revenues for a leased operation, such as telephone equipment, offers special challenges for designers and developers of an operational forecasting system. Firstly, item level demand history for inward and outward movements of equipment are needed by channels and product groupings and translated to reflect appropriate ratios relative to in-service quantities. Secondly, forecasted ratios of units are modeled and subject to overrides as a result of judgmental inputs by the forecaster to incorporate special marketing events and activity. The resulting revenue implications of these forecasts fulfill the business requirements for managing a leased service operation. In this talk we describe the demand forecasting process, modeling issues, and related software implementation challenges

Manufacturing Plans for Short-Life Products: Two-Stage Optimization

Lilian Shiao-Yen Wu
Betty J. Flehinger
IBM Research Division, T.J. Watson Research Center, Box 218, Yorktown Heights, NY 10598, USA

A model of volume planning for manufactured products with short life cycles and long lead times will be described. This is a 2-stage generalization of the 'Newsboy Problem'. We assume two decision points, the first prior to the start of manufacturing. At this point a preliminary commitment for the quantity to be manufactured is made. At a later time, when more information about demand has been collected, a second decision to increase or decrease the initial commitment is permitted. Additional costs are associated with such changes. At each stage, the commitments are calculated to maximize expected profit based on unit profitability and demand uncertainty.

Forecasting in Telecommunications

Chair: ***Dvora Tzvieli***
AT&T Bell Labs, Holmdel, New Jersey 07733, USA

Predicting Cell Delay Variation in an ATM Network: Bayesian Estimation of Tails of Distributions

Kostas Oikonomou
AT&T Bell Labs, Holmdel, New Jersey 07733, USA

An issue in the emerging ATM (Asynchronous Transfer Mode) networks is the prediction of the "cell delay variation" on a connection from a set of measurements. This reduces to the problem of predicting in real time extreme quantiles of the cell delay distribution, such as 0.99999 or 0.00001. We present a Bayesian approach to a general version of this problem, where the body of the distribution is arbitrary and only its tails are of interest. Our method derives posteriors for the parameters of an algebraic and of an exponential tail form, and either selects the one best supported by the data, or uses a more robust mixture of both forms. Since the tail models are conjugate, the distributions for their parameters can be updated every time a set of measurements becomes available. Besides point estimates, the Bayesian framework allows us to compute the entire probability distributions of the quantiles, which provide a much more realistic assessment of the uncertainty inherent in the results.

A Caller Retry Behavior Model for Demand Forecasting

David Trutt
AT&T Bell Labs, Murray Hill, New Jersey 07974, USA

Given countries Z1 and Z2, let T denote the total call attempts from Z1 to Z2 during a fixed time period P, typically a week or month. Then T = A + U, where A is the number of answered attempts and U the number of unanswered attempts to Z2 during P. Callers who are not answered on their first attempt may retry one or more times during a retry window W chosen for our analysis, typically a day or two. Then the demand D, or number of first-time callers, from Z1 to Z2 during time P is: D = A + L, where L = number of callers who are unable to reach their destination in Z2 during W, even after retries. A basic relationship is that L = (1-r) U, where r = retry probability of unanswered callers. The D = A + (1 - r) U. Since A and U are readily available from standard telecommunications reports, estimates of r will determine estimates of D. Call detail data is now available for all attempts from the United States to various countries Z2, so the model can be calibrated periodically with values of r for a current time period. This study compares 1995 values or r, D, and % Lost Callers = L/D for various countries Z2 in Europe, Asia, and the Mid-East, when Z1 is the United States. It is shown that % Lost Callers is a constant multiple K of the blocking rate (incomplete call attempt rate) b: L/D = Kb. The current values of r and D for each country Z2 yield baseline quantities from which forecasting models can estimate future demand. Model calibration is simplified by the continued availability of call detail data.

Automating Forecasting Methodology: Near-Real-Time Monitoring of Recording in the AT&T Network

Dvora Tzvieli
AT&T Bell Labs, Holmdel, New Jersey 07733, USA

CDRM (Call Retail Recording Monitor) uses a Box-Jenkins based algorithm to detect in near-real-time variations in recording data that may indicate failures in message recording in the entire AT&T switched network. Historically, such failures have been detected in down-stream billing systems, often after a long time has elapsed, and (at times heavy) revenue losses were incurred. The CDRM-BJ algorithm is used to monitor thousands of data-streams, mostly on an hourly basis, covering a variety of switches, services, and measurement statistics.

A number of added, fully-automated mechanisms, are built into the algorithm to provide computational and spatial efficiency; automated selection of model forms, model diagnosis and model fitting; self-adaptability to traffic pattern changes; detection and treatment of outliers, holidays, and step changes; continuous and fully automated operation. The algorithm is easily adjustable to detect persistent deviations of any given percentage. Depending on the level of granularity of monitored data, and on the type of monitored statistic, the algorithm's relative forecast errors run as low as 0.02%, and critical alarms flag deviations as low as 0.13%. This algorithm can be adapted for use in a variety of other monitoring and detection applications.

Selection Strategy for Optimal Short and Medium Term Forecasts for Demand of Mobile Telecommunication Services

Mohsen Hamoudia
France Telecom, 17, Rue des Galons, 92190 Meudon, France

Accurate short (up to one year) and medium-term (one to two years) forecast has become a most important issue for mobile telecommunication forecasting in France and Europe. In this paper, we examine time series on mobile telecommunication services (for GSM and Analogue markets) in France and compare the accuracy of forecasts generated by different forecasting methods and their combinations for various lead time. The final aim is to build a selection strategy for optimal forecasts at different lead time.

Essential Factors to Be Considered for Telecommunications Forecasting

Xin Min Liu
Sunderland Business School, St. Peter's Campus, St. Peter's Way, Sunderland, SR6 0DD, UK

Telecommunications industry has become one of the most lucrative businesses in the world since 1980s. Privatisation or deregulation and globalisation plus digitalisation are driving the industry towards fierce competitions and high quality of services. Telecommunications industry has never been so competitive as it is today in more and more countries, e.g. China and Vietnam. There will be certainly more European countries to open this market for competition after 1998.

Facing fierce competition, strategic decision making is getting harder for the executives of telecommunications businesses. Right information at the right time concerning the right would-be situation of demand and supply of telecommunications services appears more essential than before foe this decision making.

This paper is concerned with the factors/variables which need to be highly considered for forecasting the telecommunications market. Based on the authors previous research on the telecommunications industry, particularly British Telecommunications (BT) - one of the leading telecommunications operator in Europe, this paper analyses the particular characteristics of the and thereof the factors which effect tremendously the demand and supply of telecommunications services. Approaches to examine these factors in proper models of telecommunications forecasting have also been developed.

Inflation

Chair: ***Robert Lamy***
Department Finance, Economic Analysis and Forecasting Divison, Esplanade Laurier Building, 18 floor, East Tower, Ottawa, Canada K1A OG5

The Distribution of Perceptions and Expectations of Inflation in Sweden

Anna Bornefalk
Department of Statistics, Uppsala University, Box 513, 751 20 Uppsala, Sweden

To test if perceptions and expectations of inflation stems from a normal distribution, we used data from Statistics Sweden's (SCB) survey on Consumer Buying Expectations (HIP). The hypothesis of normality was clearly rejected. Adaptive kernel density estimation revealed that the nature of departure from normality is mainly that the function is located far above the normal curve in the main part of the distribution. Also, the distributions are skewed to the right. None of the distributions are skewed to the left, not even for high values of the inflation estimated by the Consumer Price Index (CPI). However, in times of high inflation rates the skewness is less pronounced. The distributions appear to be multimodal, though this was not tested. The inflation guesses cluster around the inflation when it is not high or low. The shape of the distributions changes between different time points and for different values of the inflation.

A central point in this paper is how to filter out misleading observations. According to our analyses, the SCB cut-off interval [0, 15] seems too narrow. During the period the HIP survey has been conducted, the inflation in Sweden has actually been above 15 per cent occasionally. Also, the inflation has been close to zero. To be somewhat independent of the true level of the inflation, and to include the behaviour of all respondents of interest, the cut-off interval [-15, 40] was used in the density analysis here. The densities point in the direction of a dependence between the perceptions and expectations formed at the same time. It seems that respondents expect the inflation to be almost the same as they perceive it to be, but are a little bit more cautious (higher for low perceptions and lower for high perceptions).

A VAR-Nonlinear Method to Estimate Core Inflation

Christian Andrew Johnson
Department of Economics, University of Santiago, 3363 Bdo. O'Higgins Ave., Santiago-Chile

The standard method to estimate core inflation developed by Quah y Vahey (1995) is extended in two dimensions. First, we allow for more variables in the vector autoregression system, including monetary and fiscal variables, and terms of trade shocks. Second, we extend the form of the mapping to allow for nonlinear forms in the VAR system. A nonlinear vector autoregression was estimated (NLVAR) using all the standard procedures to define the number of lags to be included. It was studied alternative decomposition methods in the estimation. The results yielded considerable insight about the nonlinear structures that generate the inflationary process.

An Indicator Model of Core Inflation for Canada

Robert Lamy
Paul Rochon
Department Finance, Economic Analysis and Forecasting Divison, Esplanade Laurier Building, 18 floor, East Tower, Ottawa, Canada K1A OG5

The paper presents an indicator model of inflation for Canada . The model was designed to forecast the year-over-year rate of inflation up to four quarters ahead. A novel feature of the model is that it includes a leading indicator of inflation, in addition to other indicators that are thought to cause inflation. The leading indicator provides advance signals of the cyclical turning points in inflation with an average lead of about 5 quarters. The leading indicator is correlated with the output gap, but has greater explanatory power. The model has much stronger predictive capacity forecasting future inflation than either a Philips Curve or an autoregressive model of inflation.

Issues in Forecasting I

Chair: ***Ossama Kettani***
Faculté des Sciences de l'administration, Université Laval, Sainte-Foy (Québec), G1K 7P4, Canada

On Nonlinearity and Limits to Forecasting in the Canadian Residential Housing Market

C. René Dominique
Francois Des Rosiers
Laszlo Kiss
Faculté des Sciences de l'administration, Université Laval, Sainte-Foy (Québec), G1K 7P4, Canada

Time series of the International Urban Housing Market, whether stationary or not, look highly irregular and yet they are often summarily fitted in linear models for forecasting purposes. This paper investigates the issue of nonlinearity by first extending the power of Range Rescaling analysis to uncover and to identify any type of nonlinearity that might be present in temporal sequences and next applies it to monthly supply and prices data (from 1949-01 to 1995-01) of the Canadian residential housing market. The market is found to display *antipersistence* on all time horizons. And that its behavior is essentially governed by a periodic attractor with a dominant frequency of 5.43×10^{-3} cycles per month, i.e., a period of 15.3 years.

A Real- Life Application of Constrained Regression in Residential Housing Market

Richard Chabot
Roche Llée Groupe-Conseil, Bays Chemis de Quatre Bourgeois, Ste-Foy, PQ, Q1W 4YD, Canada
Ossama Kettani
Faculté des Sciences de l'administration, Université Laval, Sainte-Foy (Québec), G1K 7P4, Canada

Real estate appraisal is a subject of growing interest for financial institutions, different levels of governments, real estate brokerage firms, real estate analysts and appraisers. Computerized statistical estimation tool of market value is one of the many important aspects in appraising real estate. In this presentation, we will discuss the successful experience of EVIMBEC, a division of ROCHE GROUPE CONSEIL and a leader in contemporary real estate appraisal methods, in using EsProM, a mathematical programming based software for real estate estimation in residential housing market.

Statistical Estimation via Goal Programming Model Tools

Belaïd Aouni
Ossama Kettani
Jean-Marc Martel
Faculté des Sciences de l'administration, Université Laval, Sainte-Foy (Québec), G1K 7P4, Canada

The recent studies suggest that mathematical programming could be a better alternative to statistical analysis. One advantage of mathematical programming models is that it necessitates, compared to statistical models, not only smaller data base but also provides a much clearer data processing. This is more so in the case of multicriterion analysis, for mathematical programming provides, when formulated properly, a platform where the experience of decision makers can be an integral part of parameter estimation. This feature of mathematical programming is especially useful when some imprecision is associated with the goals of decision makers. This paper suggests a goal programming model which is instrumental in explicitly integrating the preferences of decision makers regarding their imprecise goals.

Multiechelon Distribution Systems

Irina Ioachim
Alain Martel
André Gascon
Faculté des sciences de l'administration, Université Laval, Sainte- Foy (Québec), G1K 7P4, Canada

The problem addressed in this presentation is finding a coordinated procurement policy for a multiechelon distribution system. The nodes considered in the distribution system are either warehouses or sales points operating under deterministic time varying demand.

We formulate the problem as a non-linear program and discuss a heuristic and an optimal solution approach. We explore next the implications of a stochastic demand process.

Combining Forecasts I

Chair: ***Shevy Gunter***
TEKNIX Inc., and Boðaziçi University, 3 N. Columbus Blvd., Suite 316, Philadelphia, PA 19106, USA

Assessing the Predictive Distribution for Combined Time Series Forecasts

James W. Taylor
Derek W. Bunn
London Business School, Sussex Place, Regent's Park, London NW1 4SA, U.K.

Despite a considerable literature on the combination of forecasts, there is little guidance regarding the assessment of forecast uncertainty. Since combining methods do not involve a formal procedure for identifying the underlying data generating model, theoretical variance expressions are not easily derived. This paper considers the estimation of the complete predictive distribution for several of the most popular combining procedures. After offering critical appraisal of various theoretical contributions, a new nonparametric approach is presented. The method is a hybrid of empirical and theoretical methods in that it applies quantile regression to empirical fit errors to produce forecast error quantile models which are functions of the leadtime, as suggested by theoretical variance expressions for various simple data generating processes. The results of a simulation study investigating the new approach are reported.

A Comparative Evaluation of Combination Forecasting Models

Helman I. Stern
Alan Chun On Yang
Paul Rech
San Francisco State University, School of Business, 1600 Holloway Avenue, San Francisco, CA 94132, USA

The purpose of this study is to evaluate six combination forecasting models. The six models combined various institutional forecasts and were used to forecast three economic indicator timeseries (EMP-U.S. Unemployment Rate, HSE-U.S. Private Housing Starts, and FED-U.S. Federal Funds Rate). One of the six models is the Simple Average; three are models that minimize squared errors (Normal Method, Regression With A Constant, and Regression Without Constant); and the other two are Linear Programming models (Constrained, and Unconstrained). Sensitivity analysis was performed on a number of parameters, such as the best damping values in the Linear Programming Models, the examination of different moving window lengths, the comparison of the sample size for the Simple Average Method, and the investigation of different forecasting horizons. The best model found in this study is the Constrained Linear Programming Model (with a time damping factor of 0.99, and a moving window size of from 8 to 12). This model exhibited forecasting errors of 3.4% for EMP, 6.2% for HSE, and 10.6% for FED. This is compared to the individual institutional forecaster errors of 4.5% to 6.3% for EMP, 7.3% to 12.4% for HSE, and 12.7% to 14.6% for FED.

A Combinative Forecasting for the Population in Shenzhen, China

Fulin Zhang
Shenzhen Municipal Health Bureau, No. 5, Tianbei 1st Road, Shenzhen 518020, P.R. of China

Population is of great importance in making various social-economic plans. Shenzhen is a new developed city in south of China. About 3 quarters of the total population are visiting people who may stay in Shenzhen for a period of 6 month to several years. It is very difficult to obtain the accurate number of people in a certain time. This paper is trying to predict the population by statistical way. The annual statistical report numbers of people from 1979 to 1994 are fitted by 15 types of curve, of which quadratic model gives one of the 'best' fitting. Meanwhile linear regression, ARMA, and Grey model are applied to fit the same data. All of the 4 predicts are statistically significant. Linear combination of the 4 forecasts is also applied to fit such data. Here the weighs of the 4 forecasts are estimated by simplex method of Linear Programming. The sum of square of error for quadratic curve, linear regression, ARMA, grey model, and their combination are 13.01, 61.79, 18.20, 20.72, and 7.31. It seems that the combination model is one of the 'optimal' forecast. The advantages & disadvantages of these forecasts in application are discussed.

Improving Forecasting Accuracy Using Technical Analysis

Chair: ***Roy Batchelor***
Department of Banking and Finance, City University Business School, Frobischer Crescent, Barbican Centre, London EC2Y-8HB, UK

Benchmarking Candlesticks

Roy Batchelor
Department of Banking and Finance, City University Business School, Frobischer Crescent, Barbican Centre, London EC2Y-8HB, UK

Japanese candlestick charts have become popular in the financial markets in recent years. This paper reviews the elements of candlestick charts, and tests the power of the best known reversal patterns on a large data set of 101 financial time series. The results are not encouraging.

A Technical Analysis Approach to Calendar Effects: The UK Experience

Michael J. Edwards
Ronald L. Giles
Area of Accounting, Finance and Law, South Bank University, 103 Borough Road, London SE1 0AA, UK

The weakness of the Efficient Market Hypothesis as a method of financial forecasting has been exposed by its rejection. Assuming that all information is in the price, this hypothesis repudiates such notions as trends, cycles and rhythms markets, whereas a technical analysis approach embraces these, postulating that markets have memory. Research on annual rise and falls over six decades in the UK FT30 Index has demonstrated a clear repetitive pattern, which can be described as a calendar effect; in particular the "January effect" has received much attention in the literature. This paper suggests an alternative interpretation of the traditional calendar effect which yields significantly superior results, with potentially wider implications and applications.

Predicting Company Solvency Using a Technical Analysis Approach: The UK Experience

Ronald L. Giles
Michael J. Edwards
Area of Accounting, Finance and Law, South Bank University, 103 Borough Road, London SE1 OAA, UK

The combining of financial ratios to predict company failure has received much attention in the literature. However, the methodology suffers from inherent weaknesses. This paper challenges the conclusion that new advances in predicting company failure are likely to be application rather than methodologically driven. Market technicians are able to study the effect of all factors without restriction. Charts and fundamentals are often in conflict with each other and usually at the beginning and end of important market change. One major criticism of technical analysis is that chart patterns are almost completely subjective. However, we show that by considering Taffler's (1995) selection of companies at risk, for selected technical methods, it is possible to consistently discriminate between future failed and non failed companies. In addition we demonstrate that the market price can act as a leading indicator of fundamental change.

Macroeconomic Forecasting I

Chair: ***Tran Van Hoa***
Department of Economics, Wollongong University, Wollongong, NSW 2500, Australia

The Role of Financial Spreads in Macroeconomic Forecasting: A BVAR Approach

Nicholas Sarantis
London Guildhall University, Centre for International Capital Markets, Faculty of Business, 84 Moorgate, London
EC2M 6SQ, UK

In this paper, we seek to assess the informational content of financial spreads by looking at the out-of-sample forecasting performance of a macroeconomic model for the UK. We develop a BVAR (Bayesian Vector Autoregressive) model over the period 1971q1-1989q4, which is used to generate 1-step ahead, 2-step ahead, up to 12-step ahead (quarters) forecasts for GDP, prices, exchange rate, interest rate and other aggregate variables. The forecasts are generated through sequential re-estimation using the Kalman filter. Extensive experimentation is undertaken (using different priors, level and difference forms, alternative monetary indicators, etc). in order to obtain a model with satisfactory forecasting performance. Subsequently, we add four financial spreads (i.e., yield curve, default risk, reverse yield curve, foreign interest rate differential) to the best model and new out-of-sample forecasts are generated using the same procedure. To evaluate the sensitivity of our results, all the forecasting experiments are repeated over periods covering both a boom and a recession. Finally, the forecasts without and with financial spreads are compared.

The Logistic Framework of the Growth Rate of GNP

Vesna Jablanovic
Faculty of Agriculture, University of Belgrade, Yugoslavia

The meteorogist Lorenz discovered the lact of predictability in deterministic systems in the late fifties. The Lorenz effect, i.e., sensitive dependence on initial conditions, is the ingredient of deterministic chaos. Following Lorenz we use the logistic equation to describe the complexity of economic dynamics. Namely, business cycles are generated because the gap between potential and actual GNP widens and shrinks.

Potential output is defined as the economy's high-employment output. It represents the maximum sustainable GNP. In our model we will assume that actual GNP is restricted by potential GNP. We postulate that the growth rate of GNP should be proportional to the GNP gap. This premise leads to the logistic model, a one-dimensional, discrete-time model. For this chaotic system we cannot accurately predict its transition from the present position to the next one. It is impossible to predict the long-run behavior of chaotic system.

Fiscal Policy Forecast Errors in Finland 1980 - 1995

Jukka Lassila
Research Director, The Research Institute of the Finnish Economy (ETLA), Lonnrotinkatu 4 B, 00120 Helsinki, Finland

Indicators of fiscal policy tightness, such as full-employment budget deficit, tell little about timing of the changes in policy. More information can be obtained from forecasted deficits and forecast revisions. We analyze the relationship between forecasted and actual fiscal tightness using Finnish data. Special attention is given to the severe depression period 1990 - 1993.

A Quartely Macroeconometric Model of the Turkish Economy With Disequilibrium in Money Market

Fatih Özatay
Ankara University, Faculty of Political Sciences, Ankara, Turkey
Ahmet Çimenoðlu
Ahmet Emel
Belma Evin Fýrat
Özlem Onaran
Yapý Kredi Bank, Research Department, Yapý Kredi Plaza, 4. Levent, Istanbul, Turkey

The Turkish economy has been characterized by continuously growing budget deficits, an increasing domestic debt stock, high inflation and a volatile growth rate since the mid 1980s. In 1994, a financial crisis started which then hit the whole economy. That was the most severe one in Turkish history.

In the 1980s and 1990s, one of the main deriving forces behind the Turkish economy has been the public sector budget deficits and the way it has been financed. The chosen financing mechanism altered and continues to alter the balance sheet of the Central Bank. This means that resulting money supply from time to time deviated from its demand. This excess money affected main macroeconomic variables through its impact on exchange rate, interest rate and inflation rate.

In this paper, we provide a small quarterly macroeconometric model for the Turkish economy. The model is built to capture the effects of excess money supply on the whole economy. By making use of this model, we first aim at giving an answer to an important question: In a medium term context, to what extent should policy makers reduce budget deficits if they want to substantially decrease the inflation rate? Secondly, we investigate whether the 1994 crisis could have been forecasted, had this model been used.

Better Forecasts of FDI and Growth in Major ASEAN-Asia Pacific Developing Economies: The Foundation for Better Forward Economic Policy

Tran Van Hoa
Department of Economics, Wollongong University, Wollongong, NSW 2500, Australia

The paper (a) describes the most recent advances in the theory of estimation and forecasting, and (b) reports an application of the empirical Bayes two stage hierarchical information (2SHI) estimators (Tran Van Hoa, 1985, 1986a, 1993b, Tran Van Hoa and Chaturvedi, 1988, 1990) to forecasting FDI and growth in some major developing economies in the ASEAN and the Asia Pacific to help formulate better forward policy in economics, business, and finance. Some comparison of our forecasts with conventional forecasts routinely used in current forecasting studies is also made. All empirical findings indicate the substantial informational gain or improved accuracy of our forecasts and point to a new direction of enquiry for forecasting analysts in practical applications.

Statistical Behaviour of Financial Time Series I

Chair: ***Lars-Erik Öller***
Director of Research, National Institute of Economic Research, PO Box 3116, S-103 62 Stockholm, Sweden

The Economic Significance of Modeling Stock Market Behavior

Ben Jacobsen
Finance Group, University of Amsterdam, Roetersstraat 11, 1018 WB, Amsterdam, The Netherlands

We investigate practical implications of recent findings on the predictability of stock returns and volatility, like calendar anomalies, short and long term dependence, mean predictability from other economic variables (short term interest rates and dividend yields) and time varying volatility (GARCH)) Our analysis concerns a representative mean variance investor who in an efficient market would invest equally in a market index and a risk free asset. Using past data and these recent findings the investor evaluates whether it is useful to adjust his investment strategy. He considers transaction costs, parameter uncertainty and different investment horizons. The results show that in most cases even small transaction costs substantially reduce any potential increase in benefits whereas parameter uncertainty is relatively irrelevant.

Testing and Forecasting Volume and Return Relationships in the Stock Market

J. del Hoyo
J. Guillermo Llorente
Dpto. de Economia Cuantitativa, Facultad de C. Economicas, E-III 307, Universidad Autonoma de Madrid, 28049 Madrid, Spain

The accepted version of time varying risk premium, changes in expected return through time, and the increasing agreement about the non-linear relationships on the stock market, make it difficult to test for the general relationships among the variables in the market, such as volume and returns. Shifts in the risk aversion or information acquisition of some traders can be some of the sources in this behavior. The non-linearities present difficulties for testing all specifications of the market (LeBaron (1991)). From the empirical side we have to add the sample selection procedures and the non stationarity of the data. Given these limitations, this paper attempts to add more understanding to the issues using some techniques that deal with the problem. The reference point is the price volume relationships developed and tested in Campbell, Grossman and Wang (1993). They postulate that volume can help to "identify" the reason for a change in price. We compare their results with two alternatives: (i) time varying parameters using the same structural equation but estimating with constant sample size by means of a rectangualr window, and (ii) using a non observable components model with time varying parameters instead of using moving average techniques to get stationarity of the time series. These comparisons yield important conclusions about the best return forecasting and the identification function atributed to trading volume.

Forecasting Trends in Prices in the Brazilian Financial Market

Tara Keshar Nanda Baidya
Carlos Andre Muller Perpetuo
Departamento de Engenharia Industrial, Pontificia Universidade Catolica do Rio de Janeiro, Rua Marques de Sao Vicente 225, Gavea, CEP22453-010, Rio de Janeiro, Brazil

The objective of this study is to forecast trends in prices of the stock market index called IBOVESPA (Indice do Bolsa de Valores de Sao Paulo), the American Dollar and the gold in the Brazilian market. A linear trend model and a non-linear trend model were considered and our conclusion is that alinear trend model is a better one. The necessary parameters were estimated using the ARIMA model. Before forecasting trends in prices,the random walk hypothesis was tested and rejected using various parametric and non parametric methods.

Temporal Behavior of Financial Time Series: The Korean Case

Hui Jong Park
College of Business and Economics, Myong Ji University, Seoul 120-7228, Korea
Il King Rhee
College of Business and Economics, Myong Ji University, Seoul 120-7228, Korea

This paper examines long memory properties of the stock market return series in Korea. A wide variety of non-linear models for modeling financial time series are used to test for non-linearity of stock market return series in Korea. The null hypothesis of non-linearity cannot be rejected. Evidence can be presented that stock returns contain not only important stochastic non-linearities but also chaotic dynamics. It is also found that there is substantially more correlation between absolute returns than returns themselves. The power transformation of the absolute return has high autocorrelation for long lags. This power transformation can be interpreted as the characterization of long memory. Thus the Korean stock market exhibits long-range dependence.

Asset Allocation

Chair: ***Ernest Jordan***
Macquarie Graduate School of Management, Macquarie University, NSW 2109, Australia

Beating The S&P 500: A Dynamic Application of Marginal Conditional Stochastic Dominance

Haim Shalit
Depatment of Economics and Finance, Monaster Center for Economic Research, Ben Gurion University of the Negev, Beer-Sheva, Israel

Marginal Conditional Stochastic Dominance (MCSD) is used to construct a portfolio that improves the performance of the market portfolio or any given benchmark portfolio. MCSD states the probabilistic conditions under which all risk-averse investors, holding a given portfolio, prefer to increase the share of one asset over that of another. Since MCSD are expressed in terms of conditional distributions, empirical applications using assets returns are easily performed. In particular, this paper forecasts an alternative portfolio produced by increasing the shares of dominating securities on account of the dominated ones. Improved portfolios are constructed following the necessary and sufficient conditions for MCSD, that are based on concentration curves obtained from returns distributions. As empirical distributions are not necessarily exact, an alternative statistical approach based on the mean-Gini necessary conditions for MCSD has been developed. Given a benchmark portfolio, the procedure established the set of statistically significant dominant (MCSD) securities. The model is tested using CRSP data for three distinct time periods. The set of dominating and dominated securities is obtained, given the that investors hold S&P 500 portfolios. The shares of dominant securities are increased by shorting the dominated ones to show the superior performance of an alternative S&P 500 portfolio. Maximizing the mean less the Gini of the tracking error of the new portfolio relative to the benchmark allow to determine a stochastic dominant alternative portfolio.

The Term Structure of Volatility and Fractal Structure in the Turkish Foreign Exchange: Implications for Asset Pricing and Corporate Finance Decisions

Cem Aysoy
Ercan Balaban
Research Department, The Central Bank of the Republic of Turkey, Ulus 06100 Ankara, Turkey

This paper is a first effort to describe the term structure of volatility in foreign exchange market of a developing country, namely Turkey. Realized volatility and implied volatility under random walk theory are compared by employing the daily observations of the U.S. dollar and German mark against Turkish lira for the period July 2, 1981 to December 29, 1995. The paper also employs rescaled range (R/S) analysis for both currencies. The results suggest that volatility is mean-reverting and persistent for different holding periods. Possible implications of the empirical results for asset pricing, particularly for option pricing, and corporate finance decisions are also discussed.

Data Analysis and Parameter Estimation for Evaluating Investment Alternatives in the Turkish Capital Market

Altan Küçükçýnar
Sibel Güven
Industrial Engineering Department, Middle East Technical University, 06531 Ankara, Turkey

In In this paper, the distribution of total savings among the investment alternatives in the Turkish Capital Market and the overall expansion of the savings are analyzed.

Historical data covering last 9 years (108 months) are taken as the basis for the analysis. Investment alternatives chosen are; basic foreign currencies ($, DM), government bonds, treasury bills, gold, common stock for which Istanbul Stock Exchange index is taken as a proxy, time deposits of varying maturities, and mutual funds.

The empirical results indicate the changes in the allocation of the savings in the Turkish Capital Market and form the data basis for estimating mean and variance of returns of investment alternatives to be used as parameters in the construction and management of an optimal portfolio model.

An Analysis of the Impact of Forecasting Methods in Asset Allocation Models

Ernest Jordan
Bruce Murtagh
Macquarie Graduate School of Management, Macquarie University, NSW 2109, Australia

The asset allocation problem is investigated in the case of the Australian financial market. The requirement is posed in terms of the need to allocate a large fund across seventeen accumulation indices which represent the major sectors of the Australian stock, commodity and bond markets. Interrelationships between the component indices are of concern as they represent related risk exposures. The allocation problem is formulated as a risk minimization problem, specifically of downside risk, while maintaining a required rate of return.

In the first stage, historical data is used to develop the risk relationships between the sectors. The second stage is to forecast the returns in each sector. This stage is kept separate so that independent research at the macro- or micro-economic level may be used to generate the forecast. In place of such external forecasts, we evaluate the impact of three classes of forecast methods on the allocations and the portfolio returns.

Estimation of Market Model Parameters

Chair: ***P.A.V.B. Swamy***
Office of the Controller of the Currency, Federal Reserve Board, Washington, D.C. 20551, USA

Measuring Risk in the Presence of Long Term Memory

Jonas Andersson
Dept. of Statistics, University of Uppsala, P.O. Box 513, S-751 20 Uppsala, Sweden

Measuring systematic risk in asset returns is usually done with the beta value. This measure does not take long term memory into account. I discuss the consequences of using the original beta value in the presence of long term memory. Is it approprate to compare the risk of two assets with different long term memory parameters, using the original beta value? Can the beta value be corrected for long term memory? Those questions are discussed and suggested answers to them are presented.

Characteristics of Betas in Istanbul Stock Exchange

Atilla Odabaþý
Boðaziçi University, Bebek, Ýstanbul 80815, Turkey

Since beta is the risk index of each individual security, the accuracy of beta estimates is quite important for investors. The empirical evidence reveals that beta for most securities is quite unstable. In particular, beta varies with "bull" and "bear" markets. Furthermore, some claim that stocks with beta greater than one tend to decrease toward 1 over time while securities with betas smaller than 1 tend to increase toward 1. Research leading to above mentioned results have been conducted with data from well established markets such as NYSE. This paper examines the characteristics of betas of securities traded in an emerging market, namely Istanbul Stock Exchange.

Reports of Beta's Death Are Premature: Evidence from the UK

A.D. Clare
The ISMA Centre, Department of Economics, University of Reading, PO Box 218, Reading, RG6 2AA, UK
R. Priestley
S.H. Thomas
EBMS, University College of Wales, Swansea, SA2 UPP, UK

A number of authors have found that firm size and book-to-market-value capture the cross sectional variation in average stock returns. More importantly, these variables have been shown to out-perform the CAPM's β coefficient in explaining the cross-section of US stock returns. However, these studies all employ variants of the two-step estimator due to Fama and MacBeth (1973). In this paper we use a one-step estimator due to McElroy, Burmeister and Wall (1985) and find a highly significant role for β risk in the UK stock market.

A Consistent Method of Testing the Capital Asset Pricing Model

P.A.V.B. Swamy
Office of the Controller of the Currency, Federal Reserve Board, Washington, D.C. 20551, USA
John Leusner
Graduate School of Business, The University of Chicago, Chicaco, IL 60637, USA
Jalal D. Akhavein
Stern School of Management, New York University, New York, NY 10003, USA

This paper considers Roll's (1977) criticisms of previous tests of the capital asset pricing model (CAPM) and Fama and French's (1992) empirical results undermining this model to be quite serious. Indeed, to avoid these criticisms and reassess the validity of the CAPM, it is extended and then tested using a consistent method. The extended CAPM takes into account the differences between observable and expected returns for risky assets and for the market portfolio of all traded assets. Furthermore, a variety of nonlinearities and the effects of all excluded variables are taken into account with the testing

procedure employed. This is important because, among other reasons, the relation between asset returns and asset-market returns is nonlinear even if an expected return on an asset is linearly related to an expected return on the market portfolio.

Prediction Intervals

Chair: ***Fred Collopy***
The Weatherhead School of Management, Case Western Reserve University Cleveland, Ohio 44106, USA

So Why are Prediction Intervals (Almost) Always Too Narrow?

P. Geoffrey Allen
Bernard J. Morzuch
Department of Resource Economics, University of Massachusetts, Amherst, MA 01003, USA

Prediction intervals constructed around point forecasts are frequently too narrow. Likely causes are incorrect model specification and structural change. Ultimately, the data generating process is not well-approximated by the forecasting model selected. Even if a model passes misspecification tests and the series appears well-behaved within-sample, a specification tends to break down as the forecast horizon lengthens. There is little the modeler can do here. Series that are not well-behaved within-sample are frequently encountered. Then it should be less of a surprise when post-sample prediction intervals are too narrow. However, appropriate tests are not widely performed. We sample from the 1001 series used in the Makridakis competition to show how results from within-sample misspecification tests determine the adequacy of post-sample prediction intervals.

Approximate Confidence Intervals for Aggregates of Lognormal Variables

José L. Gallego
Victor M. Gonzalo
Arthur B. Treadway
Departamento de Economia Cuantitativa, Facultad de Ciencias Economicas y Empresariales, Universidad Complutense de Madrid, Campus de Somosaguas, 28223 - Madrid, Spain

Economic magnitudes can usually be forecasted by using an identity relating a set of lognormal variables whose logarithms receive a multivariate VARMA specification. The theoretical confidence interval (CI) for the aggregate could be hard to calculate, and higher or lower levels of aggregation invalidate the theoretical formulae obtained. This work develops approximate easy-to-calculate formulae for CI of this kind of aggregate forecasts. We also give approximate formulae for linear and non linear transformations of the aggregate. Statistical properties of most economic aggregates justify our approximation, but some clues to detect deterioration of the approximation are also given. Notwithstanding this, we check the validity of approximate CI in two ways: 1) comparing them with those obtained using an univariate ARIMA model for the aggregate, and 2) comparing them with CI based on a sample of forecast made for the aggregate Both comparisons are made for a wide range of forecasting horizons.

Prediction Intervals in Extrapolation: Asymmetry, Error Measures, and Contrary Trends

J. Scott Armstrong
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104, USA
Fred Collopy
The Weatherhead School of Management, Case Western Reserve University Cleveland, Ohio 44106, USA

Extrapolation forecasts for economic and demographic time series data fall outside of estimated prediction intervals more often than would be expected on the basis of statistical theory. One reason is that while prediction intervals are generally assumed to be symmetric, the forecast errors are often asymmetric. This problem arises in part because of the error measure used to construct the intervals. We show that, for annual economic data, the errors are more symmetric when the forecast and actual values are converted to logs. Thus, we recommend that the prediction intervals be estimated as symmetric in the logs, which yields asymmetric intervals in the original units. However, a series can be expected to have asymmetric log errors when extrapolation methods predict a trend that is opposite to expectations (which we call "contrary trends"). Directional asymmetry occurred for 81 percent of 671 forecasts from 20 contrary trends. We were able to reduce this problem of asymmetry, but not eliminate it, by using forecasting methods that were more consistent with the causal forces.

Technical Issues in Forecasting

Chair: ***Muhittin Oral***
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

Structural Sensitivity as Tool for Marker Analysis in Transportation System Predictive Diagnostics

Petr Moos
Mirko Novák
Karel Kulle
Pavel Pribyl
Faculty of Transportation of the Czech Technical University, Prague 1, Konviktská 20, Czech Republic

One of the most significant criterion of the quality and applicability of all transportation systems and its fundamental components (e.g. railroad or airplane engines etc.) is their operation reliability and life-time. Complex predictive diagnostics based on the prediction of shape of the time-trajectory of characteristic point representing the system behavior in the multidimensional space of its parameters allows to estimate the probability of the system eventual failure or of limitation of its functionality. It allows also to determine the moment of the system prevention correction or to optimize its-post-failure restoration. However, the investigation of the system properties taking into account all its parameters brings serious numerical problems because the number N of its all parameters is usually very high. Therefore one needs to find some its subset with M significant parameters (so called markers) when M<< N, approximating in acceptable manner the considered system fundamental properties. Analysis of the marker set is usually a considerably complicated task. One of most powerful approaches to its solution is based on the analysis of system structural and mutual sensitivities. In this paper we shall discuss some possible approaches to the marker analysis based on the sensitivities criterion and demonstrate their real applicability.

On How to Use Forecasts of a Regressor When Making Prediction with a Regression Model

Bo Jonsson
Statistiska Institutionen/Department of Statistics, Uppsala University, Box 513, S-751 20 Uppsala, Sweden

This paper discusses the usefulness of forecasts as inputs to regression models used for forecasting purposes under two different model specifications, the errors in variables and the "optimal forecast" approach. The distinction between the two models is underlined. The paper mainly treats the one regressor case, but a multiple regression model is also considered. Earlier results concerning adjustments towards the mean are extended from the unconditional to the conditional case. Comparisons with some other methods of adjusting forecasts are made and they are all found to be basically the same.

Interval Arithmetic Methods Applied to Time Series Forecast

Claudio M. Rocco
Facultad de Ingenieria, Universidad Central de Venezuela, Caracas, Venezuela and
(6571), c/o POBA International No. 100, PO Box 02-5255, Miami, FL 33102-5255, USA
J. Montiel
Facultad de Ingenieria, Universidad Central de Venezuela, Caracas, Venezuela

Many real time series are characterized by the fact that observations are obtained by directly applying a measuring instrument and cannot be absolutely accurate (e.g., daily SOx emissions). Classical forecasting methods assume that these errors can be modeled by normal distribution. However, in many cases, the only information about the errors are the lower and upper bounds. In these cases, the observations that form the time series under analysis can be considered as an "interval" with extreme values [Xt-, Xt+]. Interval Arithmetic takes into consideration the uncertainty associated with the observations, treating them as interval numbers whose ranges contain the uncertainties in those observations.

This paper shows the use of Interval Arithmetic applied to some classical forecasting methods (Moving Averages, Exponential Smoothing). We present general interval equations and considerations to be taken into account for obtaining optimal smoothing parameters. The resulting computations, calculated using Interval Arithmetic carry the uncertainties associated with the data throughout the analysis.

Statistical Properties of a Test to Measure Complexity of Time Series

M.A. Kaboudan
Penn State University - Allentown, 8390 Mohr Lane, Fogelsville, PA 18051, USA

This paper presents a test which measures the complexity of time series and the test's statistical properties. The test measures complexity by computing the ratio of two correlation dimension estimates. (The correlation dimension measure was introduced during the 1980s to detect chaotic behavior in time series.) The first dimesnion estimate is computed for an observed time series. The second is computed for the same obseved series after shuffling its sequence. The test is based on the notion that if the observed data is random (i.e., it is generated by a random process or highly complex), the ratio will be approximately one. This i because shuffling random data has no effect on the correlation dimension estimate. The ratio will be between zero and one if the dat is not random. The less complex the series (or the data generating process of the series), the closer to zero will the ratio be.

The statistical properties are derived by applying the test to well known chaotic maps. The minimum sample size the test applies to is determined according to the results from testing these maps. The test is then used to determine the complexity of four stocks traded on the NYSE.

Policy Issues

Chair: ***Reinhold Bergström***
Uppsala University, Deptartment of Statistics, P.O. Box 513, S-751 20 Uppsala, Sweden

Analysis of the EC as an International Organization and Predicting its Implications

Maria Coletta
Via Monte Sirrente No.30, Francavilla al Mare(CH), 66023, Italy

The paper will walk through an analysis of the pros and cons of the EC in various sectors. It will study the effects of interest rates, exchange rates and other economic factors. Implications of the EC will be studied by predicting the effects on regional labor markets, European unemployment rates, tax harmonisation and production efficiency, transport infrastructure and region building, and trade effects of economic integration. The EC climate policy will be evaluated by arriving at institutional problem solving capacities. Finally, emerging markets will be analysed, where Turkey is considered as a potential contributor.

Population Aging and Long-Term Prospects for the Andalusian Labour Market

José M. Otero
Jesus Sanchez
Fernando Isla
Facultad de Ciencias Economicas, Departamento de Estaditica y Econometria, Universidad de Malaga, El Ejido S/N 29013, Malaga, Spain

In this paper long-term population forecasts (1991-2041) for Andalusia have been computed and their implications for the labour market analyzed. Results show three main conclusions. First, that in spite of the drop in fertility, which began in 1980, the population will continue to increase until 2015, when it will start a slow decline until 2041. Second, the population aging process will be progressive if fertility patterns do not change drastically. Third, the labour force will continue to increase at a higher rate than the total population (mainly because of the raising of female participation rates) and, after reaching the upper limit by 2016, in 2041 it will still be higher than in 1991, although older. Two main recommendations for policy formulation follows from these results, taking into account that the present unemployment rates in Andalusia are the highest in the OECD regions.

How the Systemic Study if Major Crises can Contribute to the Better Forecast of Complex Policy Issues. A Case Example

Thierry C. Pauchant
University of Montréal, École des Hautes Études Commerciales, 5255, avenue Decelles, Montréal, Québec, H3T 1V6, Canada

Despite many other methodological considerations, forecasts have been strongly criticized for their lack of transparence about basic assumptions and about the pragmatic purpose pursued by social actors (Coates et al., 1994). In this paper, we propose that the systemic study of major crises can bring some powerful rebutals to these criticisms as crises have been shown to have a strong revealing effect on both basic assumptions and actions (Pauchant and Mitroff, 1992). In this paper, we conduct a systemic analysis of a crisis (a 1988 major oil spill in Canada) and draw some conclusions on potential future changes in the oil industry.

Consumer Confidence and Consumption in Sweden

Lennart Berg
Reinhold Bergström
Uppsala University, Deptartment of Statistics, P.O. Box 513, S-751 20 Uppsala, Sweden

The role of confidence indices in explaining consumption growth in Sweden during the period 1975-90 is analysed in this paper. We first analysed which variables influence the levels of the confidence indices. Two important such factors are found to be changes in real interest rates and changes in the inflation rate. Of the two forward-looking indices considered, the one regarding the personal financial situation is found to be more closely related to changes in consumption than the index regarding the general economic situation. The latter has no additional information; content in the presence of the former. In a crude analysis the personal financial situation index explains about 37 % of the variance in the growth rate of consumption. The index has an important significant effect even in the presence of other variables in the two types of consumption models that are considered, an Euler equation and a solved-out consumption model. In the latter model, the confidence index increases the explained part of the variance in consumption. growth from about 0.69 to 0.76. The real after-tax interest rate and the change in the inflation rate are important determinants of consumption. Financial wealth is more important than housing wealth and changes in debt also influence consumption. The solved-out consumption model is able to reflect the Swedish boom-to-bust cycle in consumption remarkably well.

Forecasting, Accounting, and Technology Interface

Chair: ***Pekin Ogan***
Department of Accounting & Information Systems, School of Business, Indiana University, Bloomington, IN 47405, USA

Analyzing Capital-Gains Tax-Induced Earnings Management Using Multivariate Models

Thomas M. Porcano
Department of Accountancy, Richard T. Farmer School of Business Administration, Miami University, Oxford, Ohio 45056, USA

Capital Gains generally have been taxed differently than have other sources of taxable income. Since 1974, there have been four tax law changes which directly affected the corporate tax rate on capital gains (two increase and two decreases). These changes provide firms an incentive to manage their capital gains taking, thereby affecting taxable and financial accounting income, after tax cash flows and other contracting costs. Prior research on intertemporal tax-induced earnings management generally has examined firm behavior around one tax law change, and most of this has centered around the Tax Reform Act of 1986. Using multivariate models, this study analyzes firm response to several tax law changes to determine if firms' responses to the 1986 Act were atypical (because the Act was so significant) . Results indicate that large firms consistently have responded to tax law changes, but that the reaction to the 1986 Act was greater than usual.

The Predictive Ability of Normalized Accounting Rates of Return Derived Endogenously from Price-to-Book Differentials

Yaw M. Mensah
School of Business, Rutgers University, New Brunswick, NJ 08903, USA
Catherine C. Chiang
Bernard M. Baruch College, City University of New York, New York, NY 01106, USA

An emerging interest by accounting researchers in identifying exactly how accounting variables are used and contribute to the determination of both levels of stock prices as well as changes in those levels has led to increasing emphasis in capital markets research in theoretical stock valuation models. Among these, one that has aroused the greatest interest since the cumulative abnormal returns studies initiated by Ball and Brown (1966) is a model first proposed in Edwards and Bell (1961) and recently formally redrived by Ohlson (1991,1994). Using a slight modification of this valuation model together with simplifying assumptions, we have derived a normalized accounting rate of return which can be regarded as the "flow" counterpart to the "stock" price-to-book value ratio. The measure is found to be more highly associated with future accounting rates of return and future stock returns than realized accounting rates of return and earnings-to-price ratios, and to possess similar predictive ability as the price-to-book value ratio. Preliminary results also show the model to outperform both market beta and market size with respect to association with future risk-adjusted returns.

One possible use of this normalized accounting rate of return is explored: the evaluation of how effectively investors impound accounting information around earnings release dates. The changes in the normalized accounting rates of return are shown to be positively associated with both one quarter ahead realized rates of returns and future realized stock returns adjusted for future risk. These results lead to two inferences. The first is that investors are able to draw the correct inference from earnings announcements regarding future profitability. The second inference offers support for the findings from Bernard and Thomas (1990) and Mendenhall (1991) that the stock market appears to underweight earnings-related information at earnings announcement dates.

Forecasting for Technological Change is Ideologically Laden

Christine L. Ogan
School of Journalism, Indiana University, Bloomington, IN 47405, USA

Westerners, and particularly Americans, look to the future to solve all of the problems of the present day. This is especially true when it comes to anticipating the potential of technology to address a difficult situation--be it an educational outcome or a concern for increasing business productivity. When we aren't expressing optimism for the technological promise of an invention, we tend to express the opposite view--that technology will bring nothing but terrible consequences. Our children will be morally corrupted by the content on the Internet; our employees will be displaced from their jobs when computers can do it all; and newspapers will die in the next century when all information is delivered electronically, they say. The truth about what changes come about as a result of the introduction of a new technology in society is at neither extreme. This presentation will develop through specific examples the argument that technologies are not value-free and instead are a part of the societal infrastructure and cultural context where they are introduced. They can neither solve all our problems nor signal only gloom and doom for our future. Forecasters need to look to history to understand potential effects of a developing technology.

The Accounting and Legal Implications of Predicting Cost Behavior: Examples From the Real World

Lester E. Heitger
Pekin Ogan
Department of Accounting & Information Systems, School of Business, Indiana University, Bloomington, IN 47405, USA

In this paper, we discuss many different definitions of cost behavior. Frequently, managers use terms like fixed costs and variable costs when they mean something entirely different. The result may be misunderstandings between managers, inappropriate evaluations of decision alternatives, and poor strategic cost planning and controls. Accounting practices and procedures also add to the confusion by using concepts such as fully-loaded manufacturing costs, fully-loaded total costs, variable operating costs, and variable total costs. It may appear that costs are internal to organizations and that it really does not matter what cost definition or accounting convention the organization uses. The courts disagree. Many cases have been litigated when a company accuses another of using predatory pricing in an effort to gain market share in a new territory. The defendants find themselves arguing that they really do not know which costs are relevant for their pricing. Not knowing their relevant costs, the courts have ruled, is not a legally acceptable defense. We conclude the paper by citing examples of such litigation and their outcomes.

Multivariate Models I

Chair: ***Celal Aksu***
Graduate School of Business, Koç University, Çayýr Cad., 80860 Ýstinye, Ýstanbul, Turkey

The Effect of Model Misspecification on Short Term Forecasting from Transfer Function Models

Mohd Salihin Ngadiman
Faculty of Computer Science and Information System, University of Technology Malaysia, Locked Bag 791, 80990 Johor Bahru, Johor, Malaysia
Alan J. Watkins
Statistics & Operational Research Group, EBMS, University of Wales, Singleton Park, Swansea SA2 8PP, UK

Multivariate or transfer function models in time series analysis utilise more information and therefore offer the potential for better forecasts, when compared to univariate counterparts. Such forecasts, however, are subject to model identification, with misspecified models leading to incorrect forecasts. In this paper, we consider the effects of model misspecification on short-term forecasts. This topic is usually approached in terms of "under-fitting" models, but, as we have argued elsewhere, more general approaches, in which the fitted and true model belong to the very different classes, are possible. Here, we work within the general framework, and use extensive simulation studies to consider the effect of model misspecification on the mean square error (MSE) of forecasts. We start by considering data which follows an MA model, but where the forecasts are based on fitting various AR processes. We then consider the modelling and forecasting the output series of data from a transfer function, using univariate methods.

Using Vector Autoregressive Model to Examine the Effects of the 'Liberalization' Reforms in Turkey

Noyan Dereli
Jason Laws
Business School, Liverpool John Moores University, 98 Mount Pleasant, Liverpool L3 5UZ, UK

In 1980s through applying a set of 'liberalization reforms', the main thrust of general economic strategy for the Turkish economy has been changed from an inward looking policy to a more market driven outward looking strategy. The aim of this article is to evaluate the effects of this strategy change on the main macroeconomic variables in the economy using the VAR modelling methodology. There are three main eras distinguished: The 'inward looking planned era' up to 1980 or earlier when an inward looking growth strategy was pursued. A 'transition era' in early 1980s when there was the transformation from this inward looking strategy to a more market driven outward looking strategy. The final 'outward looking liberalization era' of late 1980s and 1990s when this new strategy is applied. Our approach is to apply to each of these eras a VAR model with yearly macroeconomic variables. Various goodness-of-fit analyses are conducted and these were especially used to obtain a 'good' set of boundary points for the eras. Block exogeneity tests are conducted to determine proper lagging structures. Finally, the variance decompositions and the impulse response functions for different eras are generated and compared.

Prediction of Aggregate Variables with Application

Dario Focarelli
Bank of Italy, Research Department, Via Nazionale 91, 00184 Roma, Italy
G. C. Tiao
Graduate School of Business, University of Chicago, Chicago, IL 60637, USA

The forecast of a time series obtained from temporal and/or contemporaneous aggregation of a number of variables has been extensively discussed in the statistical literature, particularly when the function linking the series to the component variables as well as their generating models are known. However, when neither the models of the components nor the transformation that links the disaggregates to the aggregate are known, few results are available. This paper proposes modeling procedures to obtain the best prediction when the aggregation function is not precisely known. A single equation transfer approach and a vector ARMA modeling approach to link the variables are discussed. Applications to time series of Italian banks' deposits are presented.

Seasonality

Chair: ***Estelle Bee Dagum***
Faculty of Statistical Sciences, University of Bologna, Via delle Belle Arti 41, 40126 Bologna, Italy

Predicting Strike Action: The Relationship between Business Cycles, Seasonality, Real Wages Shifts and Industrial Conflict

Geoffrey Wood
Rhodes University, Department of Sociology and Industrial Sociology, 6140 Grahamstown PO Box 94, South Africa

This paper proposes a model for understanding and predicting strike action in relationship to a number of causal variables, particularly shifts in the business cycle, seasonality, union membership, and real wages, based on the South African experience from 1950-1995. Regular strike action has become a central characteristic of the South African industrial relations system. Whilst in the 1950s strikes were mostly isolated outbursts of relatively short duration, strikes in the 1980s were challenges of unprecedented duration and intensity. It is argued that despite this dramatic change, reflecting a series of discontinuities in both the political and economic arenas, strike action in South Africa does follow distinct patterns, and can be ascribed to a combination of identifiable causes, an explanation which has a broader applicability beyond the South African context. In addition to these principal causal factors, a number of contingent factors play a "shaping" role. These include the prevailing political climate, industrial relations legislation, the amount of information opposing sides possess of their adversaries' intentions as well as spatial issues, such as the internal dynamics of individual communities. It is hoped that the constructs developed will shed light on a widely prevalent form of conflict, assist in the analysis of future outbreaks, and enable the forecasting of those situations where a high propensity to engage in strike action may exist.

The Log Transformation and Models for Seasonality: A Case Study of Their Impact on Forecasting

Miguel A. Arino
IESE, Avda Pearson 21, 08034 Barcelona, Spain
Philip Hans Franses
Econometric Institute, Erasmus University, Rotterdam, P.O. Box 1738, NL-3000 DR Rotterdam, The Netherlands

It is standard practice in forecasting seasonal time series to consider the so-called "airline model" (Box and Jenkins, 1970) for a log transformed time series, where the airline model assumes that the seasonal fluctuations are generated by seasonal stochastic trends. In this paper we document for two monthly USA time series that these two decisions can have a major impact on forecasting. In fact, for our example series we find that models for untransformed data, where seasonality is incorporated as deterministic seasonal dummies, yield superior forecasting performance, both for one-step ahead and multi-step ahead. We also find that insample diagnostics (as unit root tests) are helpful to point at the seasonal dummy models, suggesting that these can usefully be applied for selecting a forecasting model. Based on our findings, we recommend that thoroughly evaluates the various models on in-sample data, prior to forecasting out-of-sample.

A General Family of Seasonal Stochastic Processes

Jose Luis Gallego Gomez
Departamento de Economia, Facultad de Ciencias Economicas, Universidad de Cantabria, Avda. los Castros s/n, 39005 Santander, Spain

This paper presents a new approach to the treatment of seasonal time series that is based on a new and precise definition of seasonal statistical model. According to this definition, seasonality is a nonstationary phenomenon that can be either deterministic, stochastic or mixed deterministic-stochastic. A new general mathematical representation that contains these three forms of seasonality as particular cases is formulated. Finally, a practical method for elaborating these seasonal models is shown and it is applied to model the airline data set.

Forecasting for Government I

Chair: ***Stuart Bretschneider***
CTIP, The Maxwell School, Syracuse University, Syracuse, NY 13244, USA

Heuristics for Forecasting Compliance Burden from Government Regulations: Lessons from Implementation of the 1990 Clean Air Act Amendments

Barry Bozeman
School of Public Policy, Georgia Institute of Technology, Atlanta, GA 30332, USA

Increasingly, politicians and public managers find it necessary to have some prior assessment of the amount of administrative burden required by the implementation of rules, regulations and procedures. Indeed, the most recent Congress proposed legislation to mandate cost-benefit analyses of regulations. But as policymakers delve more deeply into the question of assessing compliance burden and impacts, they find that straightforward approaches, such as cost-benefit analysis, are not quite so straightforward as they appear. There is a critical need for methods for ex ante determination of compliance burden, but precise, valid methods are not now available. In this paper we argue that the inability to forecast compliance burden is in large measure due to the inadequacies of theories about administrative processes and the impacts of rules and regulations. Drawing from experiences with the implementation of Title V permitting from the 1990 Clean Air Act Amendments, we suggest some heuristics for making regulatory compliance burden forecasts. These guidelines are submitted to test on data recently collected regarding costs of Title V implementation.

Organizational Determinants to Forecasting Methods in US Federal Agencies

Stuart Bretschneider
CTIP, The Maxwell School, Syracuse University, Syracuse, NY 13244, USA
Wilpen Gorr
Public Policy and Management Information Systems, School of Urban and Public Affairs, Carnegie Mellon University, Pittsburgh, PA 15213-3890, USA

Various organizational and personal factors help to explain which specific forecasting methods are used by an organization. While much of the research in forecasting method selection is based on attempts to maximize forecast accuracy, the true situation is significantly more complex. For example, some organizations use forecasting to evaluate alternative policy actions, many of which (because they are not selected) can never be tested for accuracy. In other situations, organizational history and culture help to explain which methods are in use. This paper first postulates a theoretical explanation for observed usage of forecasting methods and tests it against survey data. The results suggest that organizational factors such as mission, size, and function, along with culture explain forecast methods in use.

Simulating the Economic and Fiscal Impact of Policy Interventions Using Regional Econometric Models

William Duncombe
Bernard Jump
The Maxwell School, Syracuse University, Syracuse, NY 13244, USA

The last decade has been a time of fiscal decentralization in the United States. The federal government has off loaded responsibility for financing most public infrastructure to state and local governments. Despite the rising role of sub-national governments in the United States, the capacity to forecast the impact of policy changes on their economies and finances remains limited. The objective of this paper is to examine the use of regional econometric models, which have gained in popularity, in the forecasting of local economies particularly with major policy changes. Despite the growing use of such models, their utility for policy analysis and forecasting accuracy has not been carefully examined.

We will illustrate the use of one of these regional models, developed by Regional Economic Models, Inc. (REMI), to forecast economic and fiscal impacts of a large infrastructure project in a medium size county in New York State. Besides simulating the economic changes from such a project, we will build a multiple regression-based fiscal forecasting model which will use the economic variables forecast in REMI. We will compare the forecasting accuracy of this approach with a naive forecast and several univariate time-series methods.

Cointegration in Financial Series I

Chair: ***Daniel Pena***
Departemento de Estadistica y Econometria, Universidad Carlos III de Madrid, Madrid, 126, 28903, Getafe, Spain

Forecast for Stock Market Price Index: Cointegration Analysis in the U.S. and Japan

Carmen Ansotegui
ESADE, Escuala Superior de Administracion y Direccion de Empresas, Av. de Pedralbes 60-62, E-08034 Barcelona, Spain

It is recognized that the stock market price index does not follow a random walk. If elements of predictability exist in stock prices, they should be related to the fundamentals which drive their formation. But, with respect to their fundamentals, stock prices are too volatile in the short run. The questions that we address are: Are there long-run relations between stock market prices and fundamentals which do not necessarily hold in the short run? Can we find these long-run relations? If the relationship do exist, do they help to forecast stock market prices in the short run?

In the empirical analysis of the stock market the relevant variable was stock returns. The non-stationarity of stock market prices, on the other hand, has prevented from being used in empirical analysis. This shortcoming can be overcome through the application of cointegration techniques which allow the inclusion of non-stationary variables. In this paper, we develop an empirical analysis studying the existence of cointegration, which is interpreted as long-run equilibrium relationships between the Stock Market and Real Activity.

Cointegration and Forecasting Analysis of Chinese Stocks

Haiyan Song
Peter Romilly
Xiaming Liu
Division of Economics, School of Social Sciences, University of Abertay Dundee, Bell Street, Dundee DD1 1HG, United Kingdom

Established in December 1990 and July 1991 respectively, the Shanghai and Shen-Zhen Stock Exchanges are the only two official stock exchanges in China. This paper aims to test for randomness and forecastability for both stock exchanges and to examine the relationship between the stock exchange indexes. Statistical evidence shows that both Shanghai and Shen-Zhen indexes can be best characterized as random walk processes so that share returns are not predictable using their own histories. However, cointegration analysis suggests a long-run equilibrium relationship between the Shen-Zhen and Shanghai share prices and the Granger causality test shows that movements of the Shen-Zhen stock index may be used to predict the Shanghai Stock index. The relationship between the Shanghai B-Share index and the Hong-Kong Heng-Sheng index is also examined using the cointegration technique.

Cointegration Analysis of Official and Free Market Exchange Rates in an Emerging Market: The Turkish Case

Aybe Yüce
Can Simga-Mugan
Bilkent University, Department of Management, 06533 Ankara, Turkey

In this paper, we will examine the long run and short run dynamics of the official and free market exchange rates (US dollar and Deutschemark) in an emerging market, Turkey, through cointegration analysis and Granger causality tests. If markets are found to be cointegrated, then we will exploit an error correction model. Using this model we will forecast of one the series using the past data of the other series.

Our preliminary results show that all markets are found to be nonstationary and integrated of order 1, I(1). The results of the cointegration tests indicate that the official series are not cointegrated with each other. Similarly free market series are not cointegrated with each other either. On the other hand, free and official rates of the same currency are cointegrated indicating

long run equilibrium. Feedback relationship in the Granger sense is observed between all the series involved. However, stronger results are obtained from regressing official rates on free market rates.

Interest Rates

Chair: ***Ronald Bewley***
University of New South Wales, Sydney 2006, Australia

Forecasting with a Continuous Time Interest Rate Model: A Comparison Between Continuous and Discrete Time Methods

Burak Saltoðlu
Dept. of Economics, University of Essex, Colchester, CO4 3SQ, UK

The primary objective of this paper is to compare the forecasting performance of a continuous time interest rate model estimated by exact and approximate methods, with alternative discrete time techniques. The financial model, which derives the relationship between the long and the short rates of interests, is estimated with Canadian monthly data between 1964-1992. The forecasting performace of the model is measured by root mean square, mean absolute error and mean error. The forecasting performance of the model estimated with the continuous time estimation technique is shown to outperform the alternative discrete time techniques used in the paper.

A Three-Factor Model of The Term Struture of Interest Rates

Lin Chen
Federal Reserve Board, Mail Stop 31, 20th and Constitution Avenue,Washington, DC 20551, USA

A three-factor model of the term structure of interest rates is presented in this monograph. In the model the future short rate depends on 1) the current short rate, 2) the short-term mean of the short rate, and 3) the current volatility of the short rate. Furthermore, the model has incorporated the empirical realism in assuming that both the short mean and volatility are stochastic. By specification our model has nested many models of the term structure in the existing literature.

The model consists of both special interest rate dynamics and general interest rate dynamics. The Green's function method is employed to evaluate derivatives under the special interest rate dynamics. The functional iteration method is employed to deal with the general interest rate dynamics. Closed form solutions for values of discount bonds and bond options are derived under special interest rate dynamics. The Green's function for the fundamental valuation PDE is given. A general formula for valuing interest rate derivatives under the general interest rate dynamics is presented. The effects of the three factors and model parameters on the term structure of interest rates are discussed. The computation of the expected future short rate is performed.

On the Herding Instinct of Interest Rate Forecasters

Ronald Bewley
Denzil G. Fiebig
University of New South Wales, Sydney 2006, Australia

It is not uncommon to observe the published forecasts of economic commentators closely bunched together over long periods of time. In our case, the phenomenon is observed for eight national panels of economists and their three-month-ahead forecasts of three month interest rates. While the actual forecasting methods used by individuals are unknown to us, we have been able to successfully specify and estimate a regression model that adequately describes the month-to-month revisions in forecasts for each national panel. The model conveniently nests within it several simple, yet sensible forecasting rules and allows us to explore possible explanations of the clustering phenomenon. One possible explanation is the existence of incentives to report forecasts not too far from the expected range of the remainder of the panel. There is a fear of being along, or more precisely, alone and wrong. We find strong evidence that the behavior of the majority, but not all of the individual forecasters is consistent with an attempt to cluster around the consensus mean.

Forecasting Interest Rates and Yield Spreads: The Informational Content of Implied Futures Yields and Best-Fitting Forward Rate Models

Tae H. Park
Chicago Board of Trade, Chicago, Illinois, 60604, U.S.A.
Lorne N. Switzer
Finance Department, Faculty of Commerce and Administration, Concordia University, 1455 De Maisonneuve Blvd. W., Montreal, Quebec, Canada H3G 1M8.

The growth of derivatives markets coupled with the development of complex theories of the term structure of interest rates have provided forecasters with a rich array of variables for predicting interest rates and yield spreads. This paper extends previous work on forecasting future interest rates and yield spreads using market data for T-bills, T-Notes, and Treasury Bond spot and futures contracts. The information conveyed in best-fitting models of forward rates (using the fourth-order maximum smoothness model) and in implied yields and yield spreads derived from futures prices is assessed. The results show some evidence of market segmentation, with more arbitrage evident for nearby maturities. Market participants appear to show a greater degree of consensus on short term interest rates than on longer term interest rates. There is some indication that forecasts from the futures markets are marginally better than those provided by forward rates, consistent with the informational advantages of futures markets owing to lower transactions costs. Finally, futures and forward market forecasts are shown to outperform those of the random walk model.

Nonlinear Models

Chair: ***Winfried Stier***
University of St.Gallen, Varnbuelstrasse 14, CH-9000 St.Gallen, Switzerland

Forecasting Non-Linear Time Series with Feedforeward Connectionist Approach

Chokri Slim
Université de Tunis III, Institut Supérieur de Gestion de Tunis 41, Av. de la liberté, 2000 le Bardo, Tunisia

This paper presents a neural networks approach to handle non-linearity, outliers and many other characteristics in time series modeling. Feedforeward connectionist networks with one hidden layer of Gaussian unit based on Kalman filter for state space models is considered. Our results show that the neural networks approach is centered with the traditional statistical forecasting methods. Several financial applications are taken as examples.

A New Forecasting Methodology, Combining Dynamic Regression and Radial Basis Function Models

Antonio J. Rodrigues
DEIO-FCUL, Faculdade de Ciencias, Universidade de Lisbon, Edificio C2, Campo Grande, 1700 Lisboa, Portugal

We describe a new methodology for nonstationary time series modelling and forecasting which combines two different approaches: linear dynamic harmonic regression models and radial basis function networks. The latter are convenient linear-in-the-parameters nonlinear models that are used in cooperation with the former in two ways. Firstly, they are used to support automatic model identification and quasi-optimization of metaparameters, based on the analysis of spectral features in the data. Secondly, they are used to improve forecasts by seeking to model the innovations or the residuals of the linear dynamic model. We describe and illustrate the application of the methodology with some economic and financial time series.

The Use of SETAR-Models in Forecasting

Winfried Stier
University of St.Gallen, Varnbuelstrasse 14, CH-9000 St.Gallen, Switzerland

SETAR-time series models are special non-linear models which allow modeling changing regimes of a process. In this paper it is demonstrated that for forecasting they can be considered to be interesting alternatives to linear models. Examples of both simulated and practical time series are discussed.

Manpower Forecasting

Chair: ***Martin L. Puterman***
Faculty of Commerce, University of British Columbia, Vancouver, BC V6T 1Z2, Canada

Forecasting the Labour Demand by Occupational Class in the Netherlands

Lex Borghans
Wendy Smits
Research Centre for Education and the Labour Market (ROA), University of Limburg, The Netherlands

To grasp the developments in Netherlands labour market, a model has been developed explaining the labour demand by occupational class at a low level of aggregation. To compromise between the need for detailed information and lower quality of the data at this aggregation level, the forecasts of the changes in the occupational structure of a sector are made by means of a so called random coefficient model. Due to its conservative character the model has a satisfactory forecast performance. Since the available time-series are becoming longer the constant trend, assumed by the model, becomes less realistic, however. Because of the noise in the data it is however not trivial to include an autoregressive trend in the model. In this paper we will investigate the problems with the forecast of trends in this context and propose an alternative version of the model.

The Role and Use of Forecasting in Manpower Control and Planning

Marcus Blosch
Business School, University of Portsmouth, Milton Site, Locksway Road, Portsmouth PO4 8JF, UK

This paper provides a case study of how the British Navy use forecasting in order to decide recruitment levels, assist in manpower allocation decisions, and evaluate alternative strategic policies. A variety of simulation models, decision support systems and econometric models are used. Based on current research, the paper aims to firstly highlight the role played by forecasting models within the overall management structure and to what extent the different models meet the needs of the organisation. Secondly the paper discusses the comman problems encountered by management in the interpretation and use of these forecasting models and goes on to suggest ways in which these problems may be overcome. The paper aims to provide a practical look at how the use of forecasts and how they may be more successfully located within the management process.

Stochastic Forecasts and the United States Social Security Program

Shripad Tuljapurkar
Mountain View Research, 2576 Westford Way, Mountain View, CA 94040, USA
Ronald Lee
University of California, Berkeley, CA, USA

Declining mortality and falling birth rates have combined to raise questions about the future of the U.S. Social Security system (officially known as the Old Age Survivors Insurance and Disability Insurance program). We have developed stochastic demographic projections that captures the major sources of uncertainty in future population composition (Lee and Tuljapurkar 1994). In this paper we use these stochastic forecasts to project and analyze uncertainty in the future dynamics of the U.S. OASDI Trust Fund. We believe that our quantitative assessment of uncertainty leads to new and informative policy perspectives on the Fund's future. Even more usefully, the analysis given here provides a probabilistic metric for the analysis and comparison of alternative policy responses.

Forecasting Workers' Compensation Claims

Brian A. Kapalka
Martin L. Puterman
Faculty of Commerce, University of British Columbia, Vancouver, BC V6T 1Z2, Canada

We report our experience developing monthly forecasts of claims for the Workers' Compensation Board of BC (WCB) broken down by injury type, industry and reporting office. We compare Holt-Winters, sequential autoregression, ARIMA

and hybrid methods with the aim of developing a software package for use by non-expert WCB staff. We also discuss an optimization model to ensure that forecasts of subcategories agree with aggregate forecasts.

Forecasting and Marketing

Chair: ***Ercan Týrtýroðlu***
Faculty of Business Administration, Boðaziçi University, 80815 Bebek, Ýstanbul, Turkey

Testing the Stationarity of Attitude Questions in Repeated Samples

James B. Wiley
Hong Kong University of Science and Technology, Department of Marketing, Clear Water Bay, Kowloon, Hong Kong

Many companies and organizations do periodic surveys to monitor the effects of their actions and detect changes in environmental factors, such as consumer confidence. Typically, several questions are asked and an index is created from response category averages. No use is made of the fact that the same questions have been asked in previous surveys. Furthermore, both the measured construct (i.e., the attitude) and the subjective meaning of the questions and categories can change over time. In previous papers, the author has proposed a model and estimation procedure that decomposes responses into separate parameters for constructs and questions. As a result, prior information about the question parameters may be incorporated into current estimates. However, the approach is predicated on the assumption that the series for the question parameters is stationary. The present paper develops a test of stationarity.

Competitive Analysis of the Bicycle Industry

Aini Aman
Accounting Department, Business Administration Faculty, National University of Malaysia, Bangi, 43600, Malaysia
Jothimani K. Muniandy
National Institute of Public Management, Center for Economics, Finance and Business Administration, Bukit Kiara, Jalan Damansara, Kuala Lumpur 50480, Malaysia

The study focuses on four main players in the bicycle industry; Raleigh Industries Ltd., Cycleurope UK., Casket Plc., and Universals Cycles Ltd. the analysis of the external environment of the industry, the internal structure of the companies, and the current strategies of the companies were based on Porter's 5 forces. Among the four companies, this paper concentrates on Casket Plc. to determine its future strategies. A comparative financial analysis of the four companies showed that Casket has had the best performance both in terms of profitability and sales. In addition,Casket apparently has a sound strategy & is consistently working on improving the quality of its products. In addition to SWOT analysis, the future trend of the bicycle industry was assessed and the possible future strategies of the other players were analysed. It was concluded that Casket should continue to pursue the current strategies, whilst emphasising on further improving its quality and price effectiveness. Casket should also in the long term move towards establishing a brand image, not only in the niche sector but also in the other sectors as the best value for the money.

Forecasting Cross-Category Demand: Theory, Tests and Applications

Subir Bandyopadhyay
Faculty of Management, McGill University, 1001 Sherbrooke St. West Montreal, Canada H3A 1G5

Recent studies in marketing use scanner data to diagnose how a change in a brand's marketing mix including price, advertising, and promotion, influence market shares of other brands competing in the same category. However, to date few studies use scanner data to model inter-category effects between substitutes e.g., tea and coffee, or between complements e.g., tea and sugar.

We present a model that shows how different products in the market basket of a typical consumer influence each other's demand. The model is flexible enough to operate at the store, region or market level. Empirical tests of the model use single source data containing market level data for ice-cream and some of its substitute and complement categories over a two year period. To check the predictive validity of our model, model parameters using first twenty three month data are used to predict the last month behavior.

Exhibitor Session I

Chair: ***Vedat Akgiray***
Faculty of Business Administration, Boðaziçi University, 80815 Bebek, Ýstanbul, Turkey

AUTOBOX 4.0: Bridging the Gap Between Regression and ARIMA

David Reilly
AFS - Automatic Forecasting Systems, P.O. Box 563, Hatboro, PA 19040, USA

Statistical forecasting is like a three-legged stool. Its formulation can use: 1) History of the series of interest, 2) Information (both lead and lags) in causal series, and 3) Pulse, seasonal pulse, level shifts and time trends. Why settle for anything less than the best ? AFS is proud to unveil it's AUTOBOX 4.0 FOR WINDOWS and to demonstrate the power of models combining all three of these components. We will illustrate the ease of use of AUTOBOX 4.0 by using a few examples from our large customer base, including Anheuser-Busch, Kraft, United Dominion, Phillip Morris, Gallo, Coors ....just to name a few!. Come Join Us !

Forecast Pro: Addressing the Needs of the Business Forecaster

Eric Stelwagen
BFS - Business Forecast Systems, Inc., 68 Leonard Street, Belmont, MA 02178, USA

This exhibitor session will overview the award-winning Forecast Pro product line. Forecast Pro is an easy-to-use Windows-based forecasting package designed for a general business audience. Forecast Pro incorporates a wide variety of forecasting models (exponential smoothing, Box-Jenkins, dynamic regression, Croston's intermittent demand, event models and multiple-level models) within an expert system shell, capable of performing model selection and optimization automatically. Forecast Pro is in use at thousands of companies around the globe as well as hundreds of colleges and universities. Typical applications include forecasting product sales, revenues and demand for services. Typical users include product managers, corporate planners, market researchers, production planners -- anyone who prepares or analyzes forecasts as part of their job responsibilities. The presentation will include numerous live examples using business data supplied by Forecast Pro customers.

Judgemental Forecasting I

Chair: ***Peter Ayton***
Department of Psychology, City University, Northampton Square, London EC1V OHB, UK

Effects of Expertise on Forecasts and Confidence in Forecasts

Peter Ayton
Department of Psychology, City University, Northampton Square, London EC1V OHB, UK
Dilek Önkal
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

The overconfidence phenomenon, reported in numerous calibration studies, has often been explained as a characteristic of human information processing. However, ecological theorists claim that overconfidence is essentially an artifact due to the use of artificial experimental tasks and the non-representative sampling of stimulus materials. We studied judgmental forecasts of a set of items that were sampled representatively. We compared Turkish students with very little knowledge of the domain and British students with a lot of knowledge. They all made forecasts for all 32 English F.A. cup 3rd round football matches. They gave their confidence in these forecasts and estimated the number of forecasts that would be correct. We found very limited degrees of overconfidence and evidence for accurate forecasting with limited knowledge. These results are discussed in relation to Gigerenzers (1992) model of ecological judgement.

Social Influence in Judgmental Forecasting: Effects of Own Expertise, Other Forecasters' Expertise and Consequences of Error

Ilan Fischer
Nigel Harvey
Department of Psychology, University College London, UK

In our simulation, people were told to regard themselves as trainee agricultural inspectors who had to forecast the number of cattle that would die in disease outbreaks on the basis of the area affected and the virus type. They were told forecasts were needed so that farmers could be provided with compensation from the government before outbreaks had finished. Accurate forecasts would ensure compensation was not too low (unfair to farmers) or too high (unfair to taxpayers). Different groups of people received short, medium or long periods of training during which they were given immediate feedback about the correctness of their forecasts. After training, they completed 72 trails without feedback. On each one, they made an initial forecast, were informed of a (variable quality) forecast made by someone attributed with high, medium or low expertise, and then produced a final forecast.The degree to which they were influenced by the other person's forecast was determined by that person's putative expertise when they had received little training, but by the severity of the outbreak when they were more highly trained. These results are considered in the context of recent models of information integration,belief updating and persuasion.

The Effects of Trend and Autocorrelation on the Accuracy of Judgemental Forecasts

Fergus Bolger
City University, London, Centre for HCI Design, Department of Business Computing, School of Informatics, City University, Northampton Square, London EC1V 0HB, UK
Nigel Harvey
Department of Psychology, University College London, UK

In practice, forecasts are often made on the basis of judgment alone. Real-world time series are often trended and/or contain serial dependence. How accurate is judgmental forecasting under such conditions?

64 subjects viewed 21 45-point graphs and made forecasts for the next five time points for each graph. Feedback was given regarding the true value of the series after each forecast. The series consisted of 7 different types of lag-1 and lag-2 autocorrelation (the ideal values were: +/-.5,+/-.3; +/-.5,0; 0,0) crossed with 3 types of trend (upward, downward or none). Half the subjects saw one stimulus set the other half saw another.

The main finding was that forecast errors were moderately to strongly correlated with lag-1 and lag-2 autocorrelation depending on trend. Specifically, errors increase the further either lag-1 or lag-2 autocorrelation departs from zero. This finding, and others, is discussed in terms of the judgmental heuristics which people use when forecasting.

Decision Making Using Uncertainty Information

Michael Nelson
Michael Lawrence
Marcus O'Connor
School of Information Systems, University of New South Wales, Sydney 2052, Australia

This research investigates the circumstances under which Uncertainty Information (UI) is useful in a business decision making scenario. Although UI is normatively of value in decision making when the loss or gain function is asymmetric, research has not shown the UI to be of value in practice. One possible reason is that the UI can be learnt from the task information. An experiment has been designed and carried out to investigate this possibility. The relationship between UI utility, and task uncertainty was investigated. Results showed UI significantly improved investment performance, especially when task uncertainty was at a maximum. UI also increased consistency in investment performance.

ARIMA Models

Chair: ***Valderio A. Reisen***
DEST- Universidade Federal do Espirito Santo, Departamento de Estatistica- CCE, Vitoria- ES- Brazil

Change Point in Time Series Data Using Residual Sum of Squares via Sliding Window

Azami Zaharim
NCUK/PPP/ITM Section 6, 40000 Shah Alam, Selangor, Malaysia

Problems can arise in any statistical data analysis. In practice, data often reveal some unexpected observations which are not guaranteed to be totally dependable for the phenomena under study.

One of the related problems in time series data is that of change points, where the data changes its character abruptly, usually at an unknown time point. For example, the mean level may suddenly increase to a new level.

In this paper, a new procedure based on the residual sum of squares via a sliding window is introduced to detect a single change point in seasonal ARMA models. The proposed procedure is then applied on a real gas consumption data taken from the City of Newcastle Upon Tyne, England.

A Severity Measure Associated with the Extremes of a Univariate Max-AR(1) Process

Neþe Akkaya
Bilkent University, Faculty of Business Administration, 06533 Bilkent, Ankara, Turkey

The extremes of environmental variables such as wind, rainfall, water level or temperature have an enormous impact on the human activity and animal and plant life. It is not only the extreme events themselves which cause disruption to human, animal and plant life, but also their duration and extent. From this point of view, it is important to introduce a severity measure to analyze the aggregate excess of the environmental variable under consideration.

This talk will introduce a method for the analysis of the aggregate excess over a high threshold. The method will be applied to a univariate process which is used to model environmental data.

A Procedure for Estimating the Parameters of the ARIMA(p,d,q) Model

Valderio A. Reisen
DEST- Universidade Federal do Espirito Santo, Departamento de Estatistica- CCE, Vitoria- ES- Brazil

In our study we analyse the procedure for estimating the parameters, including the coefficients of the polynomials, of an ARIMA(p,d,q) process when d is fractional. This procedure was suggested theoretically by Hosking(1981). In the procedure, three methods of estimating the fractional parameter d are compared. The methods are: the smoothed periodogram regression (Reisen 1994), the periodogram regression (Geweke and Porter-Hudak, 1983) and the Hurst coefficient (Mcleod and Hipel, 1978).The results are obtained by simulation of time series having the property of long memory.

Forecasting for Government II

Chair: ***Herman O. Stekler***
Department of Economics, George Washington University, Washington, D.C. 20052, USA

Forecasting U.S. Exports and Imports of Services

Lois E. Stekler
William L. Helkie
Board of Governors of the Federal Reserve System, Washington, D.C. 20551, USA

Exports and imports of services play a large role role in U.S. international transactions. Despite this important role, far less attention has been focused on modeling and forecasting services trade compared to goods trade. This paper describes the model used at the Federal Reserve Board to forecast U.S. exports and imports of services and examines the model's post-sample forecast performance. It describes our method for dealing with the frequent improvements made in U.S. services trade data in the past decade, the implications of the recent shift in the U.S. national income accounts from fixed-weight to chain-type price indices, and compares estimated income and price elasticities with elasticities estimated for U.S. goods trade.

Forecasting Models and Tracking Signals Applied to Federal Budget Outlays

Peg Young
Office of Inspector General, Department of Veterans Affairs, 810 Vermont Ave., NW (54B1), Washington, D.C. 20420, USA

The political debates as to the US federal budget have brought about research for new solutions to multiple budget forecasts of key social programs. By fitting appropriate forecast models to create one step ahead forecasts, and by testing the forecast errors with tracking signals (e.g., CUSUM and smoothed tracking), quick determinations are made as to whether highly variable data are becoming too variable to be attributable simply to random variation. Budget forecasts from other sectors of the federal government are combined with the time series models in order to incorporate budget limitations. These forecasting procedures will be demonstrated on data from several federal social programs. Potential areas of further application of these procedures will also be discussed.

An Evaluation of the Forecasts of the Federal Reserve

Fred Joutz
Herman O. Stekler
Department of Economics, George Washington University, Washington, D.C. 20052, USA

This paper examines the GNP, real GNP and inflation forecasts of the staff of the Federal Reserve for the period 1965-1990. The topics include an analysis of the improvement in accuracy with a reduction in lead time, the rationality of the forecasts, the usefulness of the predictions to the users, and the forecasting record in the vicinity of turning points. The methodology utilizes the traditional error measures as well as a new statistic which permits us to test whether error differences are statistically different.

Energy Forecasting I

Chair: ***Reinaldo C. Souza***
Grupo de Sistemas, DEE, PUC/RJ, Rua Marques de Sao Vicente 225, Gavea, 22453, Rio de Janeiro, Brazil

Electric Load Forecasting 744 Hours Ahead Using Neural Networks

Ricardo Salem Zebulum
ICA: Nucleo de Inteligencia Computacional Aplicada, Departamento de Engenharia Eletrica, Pontificia Universidade Catolica do Rio de Janeiro Rio de Janeiro - Brasil
Marley Vellasco
Marco Aurelio Pacheco
ICA: Nucleo de Inteligencia Computacional Aplicada, Departamento de Engenharia Eletrica, Pontificia Universidade Catolica do Rio de Janeiro Rio de Janeiro - Brasil, and
Departamento de Sistemas de Computacao, Universidade do Estado do Rio de Janeiro, Rio de Janeiro - Brasil

This work investigates the performance of a Neural-Network based hourly load forecasting system. Tests are made varying the forecasting leading time from 1 to 744 hours ahead. Forecasting electric load for long periods ahead (i.e., over 24 hours) requires the Neural Network to feed itself with predicted load values (multi-step prediction) in order to forecast the next period. The results obtained in these tests are very good when compared with single-step prediction, which uses only the actual load values available for the next prediction. This feature is a key result to power systems operation since it allows accurate prediction with large leading times. In the experiments we use real load data from the Electric State Company of Minas Gerais (CEMIG) and predict load for a whole year (from March/1993 to February/1994). The results are evaluated using three metrics: MAPE, RMSE and Theil's U. In many cases results exhibit a MAPE below 2% and Theil's U around 0.5.

The Effects of Modelling, Structural-Breaks and Heteroskedasticity on Forecasting: The Case of Energy Demand for a Small Group of Selected European Union Countries

I.D. McAvinchey
A. Yannopoulos
Department of Economics, University of Aberdeen, Dunbar Street, Old Aberdeen, AB9 2TY, UK

The energy demands (oil, gas, coal, electricity) for manufacturing industry are derived from a Translog-Cost function for each country. The demand for each fuel is generated by a dynamic equation, non-singular system, estimated using quarterly data. The structural type model, is estimated as a multivariate cointegrated system in an equilibrium correction framework (ECM) and subjected to cointegrating and economic restrictions. Utilizing this general dynamic model Benchmark forecasts for fuel demands are generated for the selected countries. The model is then tested to discriminate between possible structural breaks and apparent heteroskedasticity. The latter may be present in the data or may be generated by data transformations to accommodate structural breaks. Subsequently the system is adjusted to incorporate the effects identified by the tests, and new forecasts are derived. These various forecasts (for fuels, and between countries) are compared on a number of criteria.

The Three Gap Model as a Source for Electrical Energy Demand Forecasts

Monica Barros
Reinaldo Castro Souza
Grupo de Sistemas, DEE, PUC/RJ, Rua Marques de Sao Vicente 225, Gavea, 22453, Rio de Janeiro, Brazil

The objective of this paper is to show how an an economic model, known as the three gap model, can be used to generate forecasts for explanatory variables to be used in a dynamic regression setting to generate medium range electrical energy demand forecasts. The proposed methodology was used to generate yearly forecasts for 1996-2000 of Gross Domestic Product and other macroeconomic variables which, in turn, serve as inputs in a model to forecast electrical energy demand in Rio de Janeiro, Brazil. Comparisons with current methodology are also shown.

Forecasting Using ARIMA and Fractional ARIMA Models

Chair: ***M. Shelton Peiris***
School of Mathematics and Statistics, University of Sydney, Sydney, N.S.W. 2006, Australia

Specification, Estimation, and Forecasting Using Fractional ARIMA Models for Consumer Price Inflation

Marius Ooms
Econometric Institute, Erasmus University Rotterdam, Postbus 1738, NL-3000 DR Rotterdam, The Netherlands
Jurgen Doornik
Nuffield College, Oxford OX1 3UL, UK

In this paper we discuss specification, estimation and forecasting using fractional ARIMA models. In the specification stage we discuss tests for stationarity and unit roots and tests for orders of Autoregressive and Moving average part. In the estimation stage we compare approximate frequency domain maximum likelihood, nonlinear least squares methods and exact maximum likelihood methods. In the forecasting stage we compare naive methods with optimal methods explicitly based on finite sample information assets.

In the empirical part we apply the different methods on a comparatively wide array of monthly and quarterly time series of inflation in consumer prices for the US and the UK. Some of these inflation series show clear signs of long memory. We discuss some elements of the computational aspects of the estimation problem. We also examine the relative advantages of the different methods in the estimation stage and forecasting stage in a small Monte Carlo study.

Recursive Forecasting for Models with Infinite Variance

Nasser Ordoukhani
11300 N.E. 2nd Ave., Deparment of Math. & Computer Science, Barry University, Miami Shores, FL 33161, USA
A. Thavaneswaran
Department of Statistics, University of Manitoba, Winnipeg, Manitoba R3T 2N2, Canada

Recently a criterion for filtering has been studied in Thavaneswaran and Thompson (1988) for stochastic processes with finite variance. the aim of this paper is to describe a computationally efficient procedure for a state-space system driven by processes with infinite variance. A characteristic function technique is used to obtain a recursive form for the forecasts for a linear state-space system generated by systematic stable random variables.

It is also shown that the Kalman-Bucy prediction with normal errors is a special case of the proposed algorithm. Estimation of missing oservations with models having stable errors is also dicussed in some detail.

Predictors for Seasonal and Nonseasonal Fractionally Integrated ARIMA Models

M. Shelton Peiris
School of Mathematics and Statistics, University of Sydney, Sydney, N.S.W. 2006, Australia
Nihal Singh
Department of Mathematics, Monash University, Clayton, Victoria 3168, Australia

This paper derives easy-to-calculate predictors for seasonal and nonseasonal fractionally integrated autoregressive-moving average (ARIMA (p, d, q) x (P, D, Q)s) models with both differencing parameters d and D assuming values on the real line. It is shown that these predictors are optimum. Special attention is given to the one-step-ahead predictors as they are constantly in demand in almost every practical situation.

Issues in Forecasting II

Chair: ***Yusuf Uðraþ***
Department of Accounting, School of Business, LeSalle University, Philadelphia, PA 19141, USA

Sense and Nonsense of Forecasting

Mirko Novák
Emil Pelikán
Ladislav Pecen
Milan Paluš
Institute of Computer Science, Academy of Sciences of the Czech Republic, 18207 Prague 8, Pod vodárenskou vezi
2, Czech Republic

All the real processes in the Universe proceed in time, which is the only one absolute independent variable. When dealing with any of them, we are interested not only in its present stage and history, but mainly also on its future. The respective time-series representing various important processes are therefore subjects of forecasting. Since process without noise does not exist in real world, one could not never expect 100% correct prediction. The noise in the process can have different nature - observational or dynamical noise. In real world at least a small percentage of both kinds of noises are present in any process. The most important practical question is, whether the eventual forecasting procedure has some sense or whether it is senseless.

In this paper, the most significant aspects of forecasting sense analysis are discussed. These are: the complexity of the respective process and dimensionability of time-series, the quality of historical data, dependencies on other processes, the length of required forecasting horizon, requirements on forecasting accuracy and reliability, and the area, where the forecast is used. Before starting any practical forecasting procedure the carefully forecasting sense analysis has to be done. Some approaches how to realize it, both theoretical and practical, will be discussed.

Forecasting Perceptions in Manufacturing Firms

Scott O'Leary-Kelly
Benito E. Flores
College of Business Administration, Texas A&M University, College Station, TX 77840, USA

This paper focuses on the way forecasts, specifically the accuracy of the forecasts, influence the decision maker's perceptions. Four important perceptual factors were chosen. The first factor, is the decision makers perceived forecasting capability of the company. Another one is the time horizon for which the firm can accurately forecast. The decision maker perceived adequacy of firm's forecasts and the satisfaction they feel in relation to the decisions they make is analyzed. The last one is perceived demand uncertainty. Perceived uncertainty regarding product demand can cause decision paralysis and lead to decreased organizational performance. Results from a survey were used to test the perceptions from the perspective of two different levels of management: the Chief Executive Officer and the Marketing Manager of manufacturing firms. Results show that there are no significant differences in the perception of the two officers.

Toward a Better Measure of the Economic, Social and Ecological Accountability of Firms. A Major Concern for Forecasting the Legitimacy of Firms in Future Markets.

Estelle M. Morin
Psychology Department, University of Montréal, HEC, 5255, Avenue Decelles, Montréal, Québec, H3T 1V6 Canada

The trend toward a greater social and ecological accountability of organizations is a major factor that will influence the legitimacy of firms located in industrialized countries in the future. At present, if the economic and financial accountability of firms has been efficiently routinized by the accounting profession, the evaluation of their social and ecological responsibilities has not yet been systematized. In this paper, we propose a set of performance indicators in the economic, social and ecological spheres which can be operationalized by the accounting profession. We argue that the routinization of such indicators by a profession known for the quality of its professional evaluations will be essential for assuring the legitimacy of firms and will be instrumental in forecasting their future legitimacy in changing markets and societies.

Management in Emerging Markets

Chair: ***Asým Þen***
St. John's Fisher College, Rochester, New York 14618, USA

Technology Transfer Practices from Developed Countries to Developing Ones: The Case of Turkey

Hüseyin Ateþ
Mustafa Atilla
Middle East Technical University, Ankara, Turkey
Asým Þen
St. John's Fisher College, Rochester, New York 14618, USA

After joining European Customs Union at the beginning of 1996, the Turkish firms face a great challenge from their European counterparts. It is predicted that small and medium sized firms will suffer a lot compared to well prepared big ones. In order to survive even in the domestic market, small and medium sized Turkish firms have to find the means and ways of effective competition. One way of surviving in a highly competitive market is to transfer advance technology. However, compared to large corporation, small and medium sized companies, lacking the knowledge of licensing process will face serious problems and difficulties to confront this challenge. Some of the potential problems that a prospective license may encounter in the licensing process will emerge during drafting a licensing agreement. Therefore, the purpose of this study is to analyze the restrictions and requirements found in licensing agreements signed by Turkish licensees between the period of January 1990 and January 1995. In addition to the analysis of restrictive covenants, the study provides detailed information on correlation among and between restrictive covenants and other provisions related to royalty fees, arbitration. The study highlights the weakness of small and medium sized Turkish companies in the process of technology transfers. A prediction and/or forecast will be made if the recipients of advance technologies do not follow the standard contractual format. The findings of this study may help licensees, as well as Department of Foreign Investment of Undersecrateriat of Treasury which has a sole authority to approve/disapprove the technology transfer agreements.

Managing Crisis in Emerging Markets

Merouanne Lakehal-Ayat
St. John's Fisher College, Rochester, New York 14618, USA

The increase in capital flows to emerging markets from 1990 to 1994 was a welcome global financial development. It helped recipient countries finance their current account deficits, and it provided diversification opportunities to industrial country investors. However, the growing scale and speed of international capitol flows to and from emerging markets presents new challenges that financial authorities around the world will have to meet in this new period of rapidly evolving global capital markets. The management of the risks associated with such situations is considered to be of major importance in relation to movement in capital inflows. We will briefly review the sources of capital flows to emerging markets and the development that led to some global crisis. Our objective will focus, first, on the challenges faced by emerging market countries in managing the risks that are part of capital inflows, and second, on the desirable policy guidelines to adequately respond to such crisis. Then we will try to predict potential outcomes which may provide policy guidelines for the decision makers.

Management in the 21st Century

Asým Þen
St. John's Fisher College, Rochester, New York 14618, USA

Many organizations and nations throughout the world have been trying to change their management practices in order to increase their productivity and competitiveness in the global market. However, they often do not know what, how and where to change. This paper attempts to predict the viable management practices in the 21st century. Technological, economical, social and political factors contribute to the major factors for the transformation process. These factors together and interdependently provide the environment for the development of human knowledge, skill and values that shape the nature and the future of the management. Our analysis supports the arguments that democratic management is not only the most viable but also inevitable management practice for the 21st century. Those organizations and governments looking for high productivity and competitiveness in the global market should transfer their current management practices into the democratic management. This study may provide some useful guidelines for that purpose.

Forecasting in Tourism Industry

Chair: ***N. Kulendran***
Department of Applied Economics, Faculty of Business, Victoria University,8001,Melbourne Victoria, Australia

The Tourism Industry Forecasting - A Case Study of 'Taiwan'

S. C. Sharon Liu
K. Lawler
Business School, University of Sunderland, St. Peter's Campus, St. Peter's Way, Sunderland, Tyne & Wear, SR6 0DD, UK

Tourism is one of the leading categories of international trade, alongside oil and motor vehicles. In addition to the contribution of gaining foreign exchange and creating jobs, tourism is a modern tool developing a national image and raising international status. It is found that an accurate forecast in demand has important economic consequences because governments and private sector must plan for expected tourism demand and provide tourism investment goods and infrastructure (Wander and Van Erden, 1980)

Due to the perishable nature of the product, it is particularly necessary for accuracy in tourism demand forecasting. However, the characteristics of tourism industry is very complex to carry out an accurate forecast. To the end of this paper will (I) evaluate existing forecasting techniques for tourism industry; (ii) apply forecasting techniques to a selected case study - Taiwan; and (iii) suggest the most appropriate forecasting technique for tourism industry.

Forecasting Tourism Demand: A Model for Competing Destinations

Ioannis Linardopoulos
Vassilis Assimakopoulos
National Technical University of Athens, Department of Electrical and Computer Engineering, 10682, Athens, Greece

The paper presents a model for forecasting inbound tourism flows from a particular origin country to competing destinations. After using a classical econometric model to forecast outbound tourism from the origin country, it employs a heuristic approach to estimate their market shares. The ideas is to simulate consumer's decision making process while evaluating the competitive advantages of each available destination. The analytical and statistical tools employed as well as the relevant judgmental assumptions are discussed in the context of a case study concerning outbound flows from Great Britain.

Forecasting International Quarterly Tourist Flows to Australia Using the Error-Correction Model and Time-Series Models

N. Kulendran
Department of Applied Economics, Faculty of Business, Victoria University,8001 Melbourne Victoria, Australia
Maxwell L. King
Department of Econometrics, Monash University, Victoria, Australia.

The purpose of this paper is to compare the forecasting performance of the error-correction model (ECM) with time-series models within the tourism context. The demand function approach is considered to estimate the long-run relationship between quarterly tourist flows to Australia from the major tourist markets of the USA, Japan, the UK and New Zealand and the factors that influence arrivals. The forecasting performance of EM is compared to a range of time-series models including the autoregressive integrated moving average model (ARIMA), the basic structural model (BSM) and autogressive model (AR). The forecasting performance of the models varies between countries of origin. For Japan the ECM performs better than time-series models. For the USA, UK and New Zealand the time-series models perform better than the ECM. To achieve stationarity, operators (1-B) with seasonal dummy, (1-B4) and (1-B) (1-B4) were considered in time series modelling. For better short-term forecasts operators (1-B) with seasonal dummy and (1-B) (1-B4) should be considered. The operator (1-B4) seasonal differencing is worth to considering for long-term forecasts.

Regional Forecasting

Chair: ***Philip D. Adams***
Centre of Policy Studies, Monash University, Clayton Vic 3168, Australia

A Synthetic Quarterly Indicator for Andalucian, a Region of Spain

Francisco Trujillo Aranda
M. Dolores Benitez Marquez
Pilar Lopez Delgado
Dept. Statistics and Econometrics, Faculty of Business and Economy, University of Malaga, Apartado Oficial Suc4, 29071 Malaga, Spain

This work presents the methodology and initial results of a synthetic quarterly indicator for Andalucia, a region of Spain, which is capable of representing the evolution of its global economic activity, excepting its agricultural activity. This global indicator is based on simple indicators, from which the signal trends were obtained. These signal trends were treated with principal component analysis. Furthermore, the Annual Non Agricultural Gross Added Value (NAGAV) has been divided into quarterly figures. Finally, a regression analysis relates the quarterly NAGAV to the principal components. The result of this regression generates the synthetic indicator.

Generating Detailed Regional Forecasts from a Computable General Equilibrium Model

Philip D. Adams
Peter B. Dixon
Centre of Policy Studies, Monash University, Clayton Vic 3168, Australia

The largest computable general equilibrium (CGE) models currently in operation produce economy-wide forecasts for about 100 commodities. Such forecasts are generally adequate from a macro economists' point of view, but are often inadequate for regional planning. For example, a national forecast for agriculture in a country such as Australia where agriculture is dominated by wool, meat and cereal grains, is often inadequate for planning educational programs in small regions specialising in intensive-farming products.

As a step towards generating information for regional planners, this paper describes a tops-down method for disaggregating CGE forecasts for the national economy down to a regional level. An application is reported in which forecasts from a 114-commodity CGE model of Australia are disaggregated into forecasts for 114 commodities in 56 separate regions.

Economic Implications of Accounting Forecasts

Chair: ***Gerald J. Lobo***
School of Management, Syracuse University, Syracuse, NY 13244, USA

Relation between Predisclosure Information Asymmetry and Trading Volume Reaction Around Quarterly Earnings Announcements

Gerald J. Lobo
School of Management, Syracuse University, Syracuse, NY 13244, USA
Samuel S. Tung
School of Business, University of Hong Kong, Pokfulam Road, Hong Kong

This study investigates the effects of differences in predisclosure information asymmetry on trading volume reaction during quarterly earnings announcements. It employs the dispersion and range in security analysts' earnings forecasts in the month prior to the announcements as the operational measures of predisclosure information asymmetry. The empirical analyses show that trading volume reaction to quarterly earnings announcements is positively related to the level of predisclosure information asymmetry and to the magnitude of the price reaction to the announcements. These results are consistent with Kim and Verrecchia's (1991a) theoretical trading volume proposition and to Atiase and Bamber's (1994) empirical tests of the proposition based on annual earnings announcements. This study also provides evidence on the relation of predisclosure information asymmetry and trading volume before and after quarterly earnings announcements.

Determinants of Time-Series Properties of Earnings and Cash Flow

Badr Ismail
School of Management, Syracuse University, Syracuse, NY 13244, USA
Kwan Choi
School of Business, Sung Kyun Kwan University, Chongro-Ku, 3-ga, Seoul, Korea

This paper examines the relative ability of some economic factors in explaining systematic differences in the time-series properties of earnings vs. cash flows. The factors used are: firm size, inventory level, capital intensity, degree of competition, and product type (durable - nondurable). The results confirm that these factors explain firms' cash flow properties better than earnings properties. Specifically, tests of the differences in the coefficients of variation and autocorrelation coefficients of the earnings series suggest size and product-type effect. Cash flows, in contrast, indicate an effect with respect to all variables. These findings contribute to our understanding of how the structural forms of the processes generating earnings and cash flows are fundamentally different. The strength of the relationship between economic factors and cash flow properties is potentially relevant to some research efforts directed at cash flow prediction.

The Behavior of Stock Returns in the Presence of Predictable Events: Case of Earnings Announcements in Istanbul Stock Exchange

Atilla Odabaþý
Boðaziçi University, Bebek, Istanbul 80815, Turkey

The empirical evidence indicates that the mean excess returns during predictable event periods (e.g., earning announcements) are higher than otherwise in various established stock exchanges. The magnitude of the mean excess returns over the event period is larger than round-trip transaction costs for the traders.

This paper examines the effects of earnings announcements on security returns in Istanbul Stock Exchange. For this purpose, the returns of 92 firms over the period from June 1992 to June 1995 are analyzed to verify if any economic gain is possible by trading around the earnings announcements.

Cointegration Applications

Chair: ***Peter Romilly***
Division of Economics, School of Social Sciences, University of Abertay Dundee, Bell Street, Dundee DD1 1HG, Scotland

Forecasting the Discount on UK Investment Trusts

Laurence Copeland
Cardiff Business School, Cardiff CF1 3EU, Wales

The well-known fact that investment trusts (closed-end mutual funds in the USA) trade at a discount means that the return to an investor depends not only on the change in net asset value (NAV), but also on changes in the discount over the holding-period. Using daily data, we model the relationship between UK investment trust prices and NAV's using cointegration methodology, then show that the forecasts based on the error correction mechanism (ECM) compare poorly with those from vector autoregressions. We then ncorporate a number of modifications to the ECM in an attempt to improve the forecasts. In particular, we model volatility persistence and allow for asymmetric responses in the ECM.

Money Demand Behavior in an Economy with Cash and Credit Goods: A Canonical Cointegrating Regression Approach

Christian Andrew Johnson
Department of Economics, University of Santiago, 3363 Bdo. O'Higgins Ave., Santiago-Chile

The traditional cash in advance macroeconomic models present the feature that the velocity of money is constant. Based on the Lucas and Stokey cash and credit goods model, this paper study the behavior of money demand for the US, simulating a real business cycle model. The results of the simulation are compared with the actual data using the Impulse-response VAR approach, and the Canonical Cointegrating Regression approach (CCR). Also the standard errors were evaluated by block-Wald testing procedures. As conclusion, and based on these three metrics, the model is not rejected in its ability to capture a high percentage of the volatility and relationship of the actual US data.

Modeling and Forecasting Car Ownership in Britain: Cointegration and the General to Specific Approach

Peter Romilly
Haiyan Song
Xiaming Liu
Division of Economics, School of Social Sciences, University of Abertay Dundee, Bell Street, Dundee DD1 1HG, Scotland

The National Road Traffic Forecasts (NRTF) for car ownerships in Britain are based on a number of approaches. Cross-section and time series data are used, together with qualitative judgments. This paper develops a single alternative model of car ownership within a clearly articulated economic methodology, namely the general to specific approach. In particular, the model takes account of the stationary properties of the time series data. Regressions between non-stationary variables may produce spurious relationships unless those variables are cointegrated. This paper uses the Engle-Granger two stage and Johansen cointegration tests to establish a long run equilibrium relationship for car ownership in Britain for the period 1953 to 1994, and specifies the short run dynamics of the data generating process in terms of an error correction mechanism. The model provides very good estimation results, and produces forecasts which are generally superior to those of the NRTF abd associated extrapolatory models.

ECU-Denominated Government Eurobond Markets: A Cointegration Analysis

Nikolaos Mylonidis
Michael Bowe
Manchester School of Management, UMIST, P.O. Box 88, Manchester M60 1QD, United Kingdom

The achievement of a high degree of monetary policy convergence among the member-states of the European Union (EU) is crucial if a common monetary policy is to be initiated. The aim of this study is to apply modern econometric techniques to ascertain the degree to which the ECU-denominated Government Eurobond markets of seven European countries move together in the long run: in economic terms, the degree to which they are *cointegrated*. The results of the empirical analysis indicate that (i) all yield series demonstrate first order integration and (ii) there are several common stochastic trends when the whole spectrum of yield series is analysed. These findings suggest that some countries' monetary policies are set independently, at least in the long run. The latter is likely due to the private ECU/Basket exchange rate divergence and issue specific factors, such as maturity, issue size and liquidity.

Bayesian Forecasting

Chair: ***Wilpen Gorr***
Heinz School, Carnegie Mellon University, Pittsburgh, PA 15101, USA

Do Leading Indexes Really Influence the Probability of U.S. Business Cycle Phase Changes

Allan Layton
School of Economics and Finance, Faculty of Business, QUT, GPO Box 2434, Brisbane QLD 4001, Australia

In earlier work Layton (1995) examined the usefulness of Hamilton's (1991) quasi-bayesian, markov (constant transition probability parameters), regime-switching model in dating and anticipating U.S. business cycle turning points. Relatedly, using Australian GDP and unemployment data, Bodman (1995) followed Durland and McCurdy (1993) and allowed the markov transition probabilities to be duration dependent. In this paper, the CIBCR coincident index is employed as the summative measure of the U.S. Business Cycle and the markov transition probability parameters are allowed to vary. In particular, the CIBCR leading and long leading indexes are used as putative determinants of these transition probabilities to test whether, in this framework, these indexes systematically influence the probability of phase changes in the business cycle.

Can Univariate Models Forecast Turning Points in Seasonal Economic Time Series?

Antonio Garcia-Ferrer
Ricardo Queralt
Departamento de Analisis Economico, Universidad Autonoma de Madrid, 28049 Madrid, Spain

When discriminating among competing models, comparisons of forecast accuracy are typically carried out only on the one step ahead predictions. Most of the extant accuracy tests are only a reflection of the previous approach since correlation of forecast errors across space and time, as well as other complications, makes formal comparison of model accuracy difficult. More recently, however, new directions of change have been stressed by Diebold and Mariano (1995) by proposing a wide variety of accuracy measures which allow for multistep forecast comparisons when comparing competing turning point anticipation models. Based on a particular class of recently developed unobserved component (UC) models using time varying parameters, we propose an alternative measure of underlying growth base on our estimated trend derivative without needing any further transformations. Also, using the information embedded on the trend derivative, we provide a simple, easy to use, method for improving quantitative point forecasts obtained in the vecinity of turning points.

Using Leading Indicators to Forecast Turning Points in Economic Cycles

Phil Smith
Corporate Analysis, The Boots Company, 1 Thane Road, Nottingham, NG2 3AA, England

This paper describes a practical method for predicting the likelihood of turning points occurring in economic time series. It is based on the Neftci probabilistic forecasting technique and by using leading indicators as the independent variables, short run forecasts can be made. The algorithm used is a Bayesian Probability Model (Discriminant Analysis) so the output from the procedure is a probability. This allows the results to be actively used in decision making processes.

Selection of Univariate Time Series for Cross-Sectional Pooling

George T. Duncan
Wilpen L. Gorr
Janusz Szczypula
Heinz School, Carnegie Mellon University, Pittsburgh, PA 15101, USA

Recent advances in cross-sectional pooling of time series have shown that "borrowing strength from neighbors" significantly improves forecast accuracy and accelerates accurate adjustment to time series pattern changes. The collections of time series pooled in past studies have simply been all series collected or ad hoc samples. This paper develops co-movement correlational methods for determining the optimal size and set of univariate time series to pool. The result is a completely

automatic procedure that promises to dominate single univariate time series forecasting methods under both stable and dynamic conditions.

Issues in Forecasting III

Chair: ***Kajal Lahiri***
Department of Economics, SUNY-Albany, Albany, NY 12222, USA

Database Implementation of Stochastic Multistate Forecasts

Juha M. Alho
University of Joensuu, Department of Statistics, P.O. Box 111, 80101 Joensuu, Finland

The users of population forecasts are primarily interested in knowing the most likely size of future population by age, sex, and "region", such as geographic region, marital status, employment status, or state of disability.Such forecasts are currently produced by combining statistical analysis of past trends of the relevant transition rates with expert judgment concerning their future course.Experience has shown that despite the considerable expertise going into the forecasting work, the forecasts are often widely off the mark. This has prompted the development of statistical models that would give the users a realistic indication of the (ex ante) uncertainty of a forecast being made.

We will briefly describe a set of computer programs (written in C language) that produces a predictive distribution of the future population based on the specifications given by the forecaster. The program uses simulation to produce a database from which the forecaster may produce customized summaries for each user. The summaries may range from histograms of predictive distributions for population aggregates of the user's choice to statistical discription of such distributions (mean, median, quartiles, standard deviation etc.). New numerical methods of producing multistate population forecasts will be discussed. We will also discuss some simple statistical models that can be used to approximate error structures of fertility, mortality, and migration.

Socioeconomic Causal Model and Forecasting

Camilo Dagum
University of Bologna, Via Belle Arti, 41, 40126 Bologna, Italy

In dealing with causal model it is often assumed a symmetry between explanatory (goodness of fit) and forecasting performance. Explanation is understood as prediction in retrospect and forecasting as prospective explanation. This symmetry holds only under the assumption of structural stability as defined in experimental sciences. However, most social and economic phenomena are often subject to abrupt structural changes or rapid structural evolution where the symmetry property break down. In order to provide forecasts that incorporate structural changes, further assumptions are required. The two main assumptions to be discussed are: (i) anticipate structural evolution; and (ii) unanticipated structural evolution. The corresponding consequences for forecasting are analyzed.

Do Data Revisions Make Multi-Period Survey Forecasts Unusable for Rationality Tests?

Anthony Davies
Kajal Lahiri
Department of Economics, SUNY-Albany, Albany, NY 12222, USA

We have developed an econometric framework for using panel data on multi-period forecasts, see Davies and Lahiri (J.Econometrics 1995). To test for the validity of the Rational Expectations hypothesis (REH) Keane and Runkle (AER 1990) used only one quarter forecasts from the ASA-NBER surveys arguing that when data revisions occur between the time a forecast is made and the time actual is realized, the forecast will falsely reject REH. We argue that July revisions are nothing more than aggregate shocks which occur in every July; any systematic component should be exploited by rational forecasters. Since ASA-NBER surveys give forecasts for multiple targets at each horizon, we can estimate a-th (anticipated change h periods prior to the end of period t) and u-t (quarterly aggregate shock for period t) to test if forecasters do anticipate systematic data revisions, which should show up as a component of only third quarter a-th. Our results show that July revisions affect only the third quarter shocks in levels; they do not affect u-t and a-th when forecasts are evaluated in terms of inflation rates. Thus, the data revision problem raised by Keane and Runkle manifests itself only when REH is tested using price levels and not inflation rates. Using multi-period inflation forecasts over 1968:IV - 1991:IV our GMM tests decisively reject the Unbiasedness and Martingale properties of REH. The covariance matrix of forecast errors is expressed in terms of the few fundamental parameters of the process, which allows GMM estimation efficiently with less restrictions.

Corporate Financial Forecasting Models

Chair: ***Hans Levenbach***
Delphus Inc., 103 Washington St., Suite 348, Morristown, NJ 07960 USA

Predicting Credit Risk for Corporate Debt Ratings

Hans Levenbach
Delphus Inc., 103 Washington St., Suite 348, Morristown, NJ 07960 USA

The rating methodologies of major rating agencies of corporate debt include a quantitative analysis of various historical financial measures as part of an overall business risk evaluation. In this talk we present a ratings modeling approach based on key financial ratios for use in predicting the credit quality of US corporations. Modeling and software implementation issues are discussed in the context of market segmentation, time factors and statistical considerations.

A Study on the Effectiveness of the Financial Ratios to Control Size Differences Across Firms

Noradiva Hamzah
Accounting Department, Universiti Kebangsaan Malaysia, Bangi 43600, Malaysia
Amizawati Mohd Amir
Accounting Department, National University Of Malaysia, Bangi, 43600 Selangor, Malaysia.

Financial Statement Analysis concerns with evaluations of the financial statements of companies either at one point in time or over a time period. And financial ratios are commonly used to analyse financial positions of companies. One motivation for examining data in ratio form is to control for size differences across firms or over time. This study examines the effectiveness of financial ratios for controlling size differences across firms. The ratios studied are current assets ratio, inventory turnover ratio and profitability ratio. To investigate the effectiveness of the ratio as a size control measure, regression analysis is done on the ratio against the denominator. This is to test on the assumption of strict proportionality between the ratio and the denominator. Strict proportionality between the numerator and the denominator of a ratio is a necessary condition for the ratio to be an effective size control measure.

Cross-industry analysis of uncertainty

Can Simga-Mugan
Bilkent University, Faculty of Business Administration, Department of Management, 06533, Bilkent, Ankara, Turkey
Hasan Pirkul
University of Texas at Dallas

In this study, we explore the amount of uncertainty in various industries in the U.S.A. based on the entropy measure of uncertainty where the financial ratios are the firm attributes. We also determine the financial ratios which reduce the uncertainty in each sector. Hence, in forecasting the financial performance of firms in different sectors, financial analysts could place more emphasis on the components of these ratios, and obtain more accurate estimates. Our results show that industries operate at different uncertainty levels. Food industry demonstrates the lowest level of uncertainty whereas chemical, rubber and oil industry displays the highest level of uncertainty over the years. The ratios which convey more information differ among the industries. However, cash to sales, cash to current liabilities, cash flow from operations to interest payments, and cash to total asset ratios provide information to reduce the uncertainty in all sectors considered.

Nonlinear Dynamics and Forecasting in Foreign Exchange Markets and on Monetary Policy

Chair: ***Aydýn Çeçen***
CITER, Central Michigan University, Sloan 301, Mt-Pleasant, Michigan 48859, USA

Predictability and Low-Dimensional Chaos in Foreign Exchange Rate Returns: Further Evidence

Aydýn Çeçen
CITER, Central Michigan University, Sloan 301, Mt-Pleasant, Michigan 48859, USA
Cahit Erkal
Oklahoma School of Science and Mathematics and Oklahoma University, Physics, 1141 N. Lincoln Blvd, Oklahoma City, OK 73003, USA

The paper examines the nonlinear dynamic properties of exchange rate returns in order to differentiate between low-dimensional chaos and stochastic behavior. Based on conditional probabilities and GP correlation integrals, a predictability index is constructed. The estimation results reveal little evidence in favor of a low-dimensional attractor in hourly exchange rate returns.

Who is Going to Fail? Determinants of Failure of Small Scale Textile Firms in Turkey

Mine Çýnar
Loyola University, Department of Economics, Water Tower Campus, 820 North Michigan Avenue, Chicago IL 60611-2196, USA

This study analyzes factors critical to the survival of small scale textile firms. The numerical evaluations are based on artificial neural networks that provide non-linear, non-parametric modelling and pattern classification. The empirical results demonstrates that neural networks generate better forecast results than the traditional logit model.

Budget Deficit, Money Supply and Inflation: A Vector Error Correction Model for Turkey

C. Akçay
Emre Alper
Süleymen Özmucur
Boðaziçi University, Department of Economics, 80815 Bebek, Istanbul, Turkey

In developing countries where financial markets are thin, sustained budget deficits are predominantly financed through seigniorage. This in turn leads to high rates of inflation. We use post-1980 high frequency data to forecast major economic variables by applying a vector error correction model.

New Trends in Competetiveness Strategies

Chair: ***Ossama Kettani***
Faculté des Sciences de l'administration, Université Laval, Ste-Foy, Québec (PQ) G1K 7P4, Canada

Business Networking: Typology, Evaluation Criteria and a Method for Network Optimal Configuration

Ossama Kettani
Diane Poulin
Muhittin Oral
Faculté des Sciences de l'administration, Université Laval, Ste-Foy, Québec (PQ) G1K 7P4, Canada

In the present international competitiveness and market globalisation, firms are continually seeking new strategies to better succeed in the challenges they are facing. Business networking appears to be a promising strategy for the coming years. In this paper, we will present (I) a typology of business networking, (II) Evaluation Criteria of how good is a particular business network and, (III) a multiobjective model (and a solution procedure) to optimally configure a business network taking in account criteria such as market shares, profitability and cost superiority. A numerical example will be used to illustrate the suggested method.

The Networking Enterprise Logic

Diane Poulin
Zhan Zu
Ossama Kettani
Faculté des Sciences de l'administration, Université Laval, Ste-Foy, Québec (PQ) G1K 7P4, Canada

The network enterprise will be the most important mode of organization in the coming years. However, this organization puts into question the traditional management principles that are generally accepted today. Therefore, in this paper, we will present the new strategy logic we must use for designing the organization of future and will use some cases to illustrate new trends in competitiveness strategies.

Human Implication of Networking

Charles-Henri Amherdt
Faculté de l'education, Université de Sherbrooke, Sherbrooke, PQ, Canada
Zhan Zu
Diane Poulin
Faculté des Sciences de l'administration, Université Laval, Ste-Foy, Québec (PQ) G1K 7P4, Canada

Given that the organizational structure of the network enterprise is lean and agile, the policies of the enterprise in terms of human resources development must be reconsidered in order to, on one hand, motivate the personnel, and on the other hand, satisfy the new organizational requirements of the network enterprise. In this paper, we will propose solutions to the following questions: How to conciliate people's career development with the mobility and the flexibility that is demanded by the network enterprise? What are the new mechanisms human resources management adapted to this type of organization?

Scenario Analysis and Strategic Planning

Chair: ***Bartolomeo Sapio***
Fondazione Ugo Bordoni, Via Baldassarre Castiglione 59, 00142 Roma, Italy

Customizing Telecommunications Services: A Planning Methodology

Isabella Maria Palombini
Bartolomeo Sapio
Fondazione Ugo Bordoni, Via Baldassarre Castiglione 59, 00142 Roma, Italy

This paper presents the description of a methodology finalized at characterizing the demand of telecommunications services and the definition of users' classes. The methodology analyzes the behaviour of telecommunications services consumers and classifies their willingness to pay for each distinct service attribute, according to a rational criterion. The aims of the work belong to the more general framework of scenario analysis, geared at singling out helpful tools for strategic planning in the field of telecommunications. In this case we concentrate upon the customization of telecommunications services for the efficient management of resources allocated to their production and marketing. These aspects are becoming more urgent due to the recent advent of global and multimedia offer of services, whereas the individuation of market niches and strategic guidelines remains relevant.

A Scenario Approach to Strategic Planning: The Future of Distance Learning in Higher Education

Ron Roberts
University of the West of England, Faculty of Computer Studies and Mathematics, Frenchay Campus, Coldharbour Lane, Bristol BS16 1QY, UK
Bartolomeo Sapio
Fondazione Ugo Bordoni, Via Baldassarre Castiglione 59, 00142 Roma, Italy

New communication platforms and technologies are offering the world of Education much greater choice of where, when and how students study and are taught. As a result, the impact of Distance Learning within Higher Education will be extensive. However, alongside technology, a range of financial, environmental and regulatory factors will also play their role in determining the extent to which the impact of Distance Education will be significant in any particular country. This paper examines the issues involved in preparing to apply the Weighted Impact Structured Evaluation (WISE) scenario analysis approach in order to assess and forecast the overall affect a range of factors will have on the impact of Distance Education. The method endevours to assess the extent to which each factor's influence determines or is determined by the other factors having a role to play in shaping the future of Distance Education.

SIMULAB (Scenario-Engineering Interactive Multimedia Laboratory): An Integrated Environment to Forecast and Plan for Possible Futures

Enrico Nicolé
Bartolomeo Sapio
Fondazione Ugo Bordoni, Via Baldassarre Castiglione 59, 00142 Roma, Italy

Scenario Engineering is a corpus of methods and techniques of scenario analysis for strategic planning, aimed at interpreting, forecasting and building possible futures. This paper introduces the fundamentals of SIMULAB (Scenario-engineering Interactive MUltimedia LABoratory), a research environment to be systemically used in the field of Scenario Engineering, allowing an integrated treatment of information and adopting multimedia interfaces, in order to build, analyze and present complex evolutionary scenarios. Interactive applications of SIMULAB can exploit the global telecommunications network.

Predicting Corporate Performance

Chair: ***Muhittin Oral***
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

The Comparison of Turkey and Italy with Respect to Multivariate Financial Failure Models

Ramazan Aktaþ
KHO Turkish Army Academy, Harbiye, Istanbul, Turkey

In this study, the financial failure was defined as bankruptcy and incurring losses for at least 3 consecutive years. Successful companies were defined as those operating profitably. The sample companies were selected among the companies registered to the Turkish and Italian Stock Exchanges. 25 failed and 35 successful companies were sampled from the Turkish Stock Exchange for the analysis. 19 failed and 31 successful companies were selected as the Italian sample by using the same financial failure criteria. 21 financial ratios were used as independent variables to develop the financial failure models using Logit analysis. The model developed for Italy showed better performance than the one for Turkey. This finding was tied to the fact that the predictive power of financial ratios increases in stable economies. The model developed for Italy was not as good as the Turkish model at predicting the financial failure of the Turkish sample. The same conclusion was reached for the reverse situation. These results provide strong support for the view that a difrerent financial failure model is necessary for each country due to the differences in their economies. Finally, different financial ratios were found to be important in measuring the financial failure risk for Turkey and Italy.

Cash Flow Statements for Forecasting Failure: The Case of Hooker Corporation

Sam Makmur
Ratnam Alagiah
Syme Department of Accounting, Monash University, Caulfield East, Victoria 3145, Australia

The problems that brought Hooker Corporation into bankruptcy did not develop overnight. But were there any forewarnings of the impending problems? Whilst conventional funds statements would not have revealed the existence of the firm's financial problems, careful analysis of the firm's cash flow would have indicated such problems. This paper discusses the demise of the funds statement with reference to relevant accounting standards. The argument against the funds statement is also reviewed. Finally, the importance of cash flow information is considered. This study was prepared from publicly available information. The objective is to examine carefully the operating cash flow information and in particular its ability to provide an early warning signal of financial problems for Hooker Corporation. It is found that cash flow statements contain more information than funds statements (and net profit) in the sense that they are able to reveal corporate financial distress. It is also found that an analysis of cash flow provides users of financial reports with stronger indicators for prediction of corporate failure than traditional ratio analysis and Atlman's multivariate model.

Predicting Multinational Corporate Performance: An Empirical Inquiry

Refik Çulpan
Chin C. Kuo
School of Business Administration, Penn State University at Harrisburg, Middletown, PA 17057, USA

Researchers on and managers of multinational corporations (MNCs) have been interested in knowing firm performance and its determinants. Our paper will report the findings of an empirical research on the prediction of the performance of multinational firms by considering firms' product and international diversity and their relationship with the financial results of firms. Regression models consisting of firm performance (return on sales) as dependent variable and product diversity, globalization (multinationality and country scope), firm size, firm leverage, and industry growth as independent variables will be used to predict the relationship. We expect to find that limited level of diversity, whether product and global, would be related to higher levels of performance. We also expect that the performance effects of product diversity would interact with or be moderated by the level of global diversity.

Aspects of Forecasting and Modelling Financial Series

Chair: ***Timo Teräsvirta***
Department of Economic Statistics, Stockholm School of Economics, Box 6501, S-113 83 Stockholm, Sweden

On ARMA and SETAR Models: Comparison Of Forecasting Performance

Paul de Bruin
Jan G. de Gooijer
Faculty of Economics and Econometrica, University of Amsterdam, Roetersstraat 11, 1018 WB Amsterdam, The Netherlands

In this paper seven monthly Indian economic time series are investigated. In Ray (1988, Sankhya, B) these time series have been shown to be nonlinear. Two types of models are fitted to the data, namely autoregressive moving average (ARMA) and self-exciting threshold autoregressive (SETAR). Exact out-of sample forecasts are computed for several steps ahead. The forecasting performances of both types of models are evaluated and compared by use of forecasting criteria. Finally, the combination of linear and nonlinear forecasts is examined.

Stylized Facts of Daily Return Series and the Hidden markov Model

Stefan Åsbrink
Timo Teräsvirta
Tobias Ryden
Department of Economic Statistics, Stockholm School of Economics, Box 6501, S-113 83 Stockholm, Sweden

In two recent papers, Granger and Ding (1995a,b) considered long return series which are first differences of logarithmed price series or price indices. They established a set of temporal and distributional properties for a stochastic model that could generate such series and suggested that the return series might be generated by a sequence of independent doubly exponential variables with ARCH-type dependence. The present paper shows that a mixture of normal variables with zero mean is another feasible possibility for the generating mechanism. In that case, the temporal higher-order dependence is described by a hidden Markov model. Such a model is estimated for a number of series. It is seen to reproduce the stylized facts of Granger and Ding quite well. The implications of these results are discussed.

Two Stylized Facts and the GARCH(1,1) Model

Timo Teräsvirta
Department of Economic Statistics, Stockholm School of Economics, Box 6501, S-113 83 Stockholm, Sweden

Many high-frequency economic or financial time series display two empirical characteristics: high kurtosis and positive autocorrelation in the centred and squared observations. The first-order autocorrelation is typically low, and the autocorrelation function decays slowly. These series are often modelled with a GARCH(1,1) model. In this paper it is shown why such a model with normal errors cannot adequately characterize these stylized facts. The same seems true for the IGARCH(1,1) model. It is also shown why one can improve the situation by replacing the normal error distribution by a leptokurtic one, although this may not provide a complete remedy.

Judgemental Forecasting II

Chair: ***Dilek Önkal***
Bilkent University, Faculty of Business Administration, Ankara 06533, Turkey

Experts Versus Novices: An Examination of Time Series Extrapolative Judgment In a Currency Forecasting Context

Mary E. Wilkie
Dept. of Consumer Studies, Glasgow Caledonian University, Park Drive, Glasgow G3 6LP, Scotland, UK
Dilek Önkal
Bilkent University, Faculty of Business Administration, Ankara 06533, Turkey
Andrew C. Pollack
Dept. of Mathematics, Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA, Scotland, UK

An experiment is reported which compares the quality of expert and novices' probabilistic time series extrapolative judgment. Subjects made forecasts over six time horizons from simulated monthly currency series based on a random walk, with zero constant and stochastic drift, at two noise levels. The difference between the Mean Absolute Probability Score of each subject and an AR(1) model was used to evaluate performance. It was hypothesized that the experts would perform best, with effects expected for differing noise leveles, horizons, and series type. The results showed that the experts performed better than the novices, although worse than the model except in the case of zero drift series. No clear expertise effects occurred over horizons, albeit subjects' relative performance improved as the horizon increased. Possible explanations are offered for these results and some suggestions for future research are outlined.

A Framework for Examining the Quality of Bank Forecasts: The Yen-DM, 1990-1993

Andrew C. Pollack
Dept. of Mathematics, Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA Scotland, UK
Mary E. Wilkie
Dept. of Consumer Studies, Glasgow Caledonian University, Park Drive, Glasgow G3 6LP Scotland, UK
Jennifer F. Pollack
Dept. of Mathematics, Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA Scotland, UK

A general framework for examining the quality of currency forecasts is described. This framework illustrates how directional, magnitude and profitability performance measures can be used to examine the variable nature of forecast performance over time. The framework is described and applied to one-week ahead Yen-DM forecasts from three major banks over a three year period between 1990 and 1993. The results illustrate considerable divergence in performance both between the banks and for each bank over time. The bank's directional accuracy and, to a lesser extent, profitability performance was better than the random walk forecaster. Magnitude of change measures, however, illustrated that the banks' forecasts were inferior to the random walk. Nevertheless, the results did illustrate that performance on most of the accuracy measures improved over the period.

Effects of Contextual Information and Feedback on Judgmental Forecasts of Stock Prices

Dilek Önkal
Serra Dirimtekin
Bilkent University, Faculty of Business Administration, Ankara 06533, Turkey

This study intends to investigate the differences in various dimensions of forecast accuracy thay may result from the differential feedback and contextual information provided to the forecasters. Participants were assigned to one of four groups: (1) outcome feedback with no contextual information; (2) outcome feedback with contextual information; (3) calibration feedback with no contextual information; (4) calibration feedback with contextual information. In each of the three experimental sessions, participants were requested to provide probabilistic forecasts for weekly changes in stock prices. The results suggest that, while the provision of contextual information appears to have no effect on probabilistic forecasting accuracy, calibration feedback is effective in improving performance.

Economic Policy and Forecasting

Chair: ***Delisle Worrell***
Central Bank of Barbados, PO Box 1016, Bridgetown, Barbados, USA

An Econometric Model of Household Income and Asset Ownership: 1987 Results Tested and Updated With 1994 Data

Zehra Kasnakoðlu
Sevil Uygur
Devlet Ýstatistik Enstitüsü, Necatibey Cad. 114, 06100 Ankara, Turkey

Obtaining accurate and reliable income estimates in household surveys is a major problem in most of the sample surveys. For various reasons the households are reluctant to report the true income level of the household or the members. The seriousness of this problem varies between different economic or social groups hence resulting in biased population estimates based on sample results. Furthermore, the income related questions in sample surveys have a negative influence on the quality and reliability of other variables survey variables. As a result researchers are reluctant to include the important income variable in their survey questionnaires to protect the rest of the information to be compiled. This on the otherhand raises the issue of estimating income magnitudes indirectly from other variables measured. The authors have developed an econometric model employing the results of the 1987 Household Income and Consumption Expenditures Survey conducted by SIS to estimate the household incomes from physical assets ownership and household composition variables. The subject of this paper is to estimate, using the econometric model developed, the incomes of households using information on their asset ownership and household composition contained in the recent Household Income and Consumption Expenditures Survey conducted by SIS for 1994. Next, the estimated and observed incomes of sampled households are compared to test and modify the model developed.

Modeling the Short-Term Capital Movements into the Turkish Economy: A Cointegration Approach

Zerrin Gürgenci
T.C. Merkez Bankasý Araþtýrma Genel Müdürlüðü, 06100 Ulus, Ankara, Turkey

This study aims at the specification of a constant parameter model for the net short term capital inflows and the net changes in the bank reserves which have a large share among the items recorded under the net foreign assets item of the balance of payments. If there is no impediments to the capital movements and domestic residents freely hold foreign exchange deposits, capital inflows have two functions: One is to finance the saving gap, and the other is to meet domestic residents' demand for foreign currency. Therefore, in the long run, the net foreign liabilities, cumulative saving gap, and the foreign exchange deposits of the domestic residents are not expected to move too far apart from each other. Cointegration tests over 1990-1994 period, by using monthly data, indicated significant long run relations among the net short-term liabilities, foreign exchange deposits of the domestic residents, bank reserves and the cumulative cash financing deficit of the consolidated budget. Utilizing those long-run relationships, a simultaneous equation model for the net short term capital inflows and the changes in the bank reserves is searched, and compared to a parsimonious VAR derived from the unrestricted VAR formulation of the error-correction model.

Economic Policy Failure in the Caribbean: Alternative Scenarios

Delisle Worrell
Central Bank of Barbados, PO Box 1016, Bridgetown, Barbados

The principal economic difference between Caribbean island economies which have sustained economic growth in the past two decades and those that have not appears to be that the former (Aruba, The Bahamas, Barbados, Belize, the OECS countries, the Netherlands Antilles) have maintained a fixed exchange rate vis-a-vis the US Dollar. There is growing weight of international theory and evidence (Pindyck, 1991; Argy and DeGrauwe, 1990) to indicate that this is not a coincidence. Might countries which experienced economic contraction (the Dominican Republic, Guyana, Haiti, Suriname, Trinidad & Tobago) have maintained a fixed exchange rate through the use of alternative policies? We will estimate a small structural model for a sample of the latter countries and simulate the effects of alternative policies to those actually pursued in search of

a strategy that might have stabilized the exchange rate. This exercise which may be considered historical - rather than future - forecasting should help in improving future policy design.

Application of Neural Networks and Genetic Algorithms to Financial Data

Chair: ***Christian Dunis***
Head of Quantitative Research & Trading, Chase Manhattan Bank125 London Wall, London EC2Y 5AJ, UK

Use of Neural Network Mixture Models for Forecasting and Application to Portfolio Management

Darren L. Toulson
Intelligent Financial Systems Limited, 8 Orsett Terrace, London W2 6AZ, UK
Sabine P. Toulson
London School of Economics, and Intelligent Financial Systems Limited, 8 Orsett Terrace, London W2 6AZ, UK

Investment managers are increasingly concerned with the management and analysis of risk as part of their portfolio selection strategies. Markowitz analysis provides a methodology whereby portfolios may be selected so as to optimize the return of a portfolio for a quantifiable level of risk. The analysis centers on the construction of the *efficient frontier* of a set of securities. This is a quadratic programming problem assuming that estimates are available for the future returns, volatilities and correlations of the securities contained in the portfolio. The accurate estimation of these quantities is paramount for the methodology to operate effectively. Recently, there have been a number of important developments in the field of Neural networks which are of particular relevance to time series forecasting. Amongst these has been the use of neural networks and mixture models to provide estimation of full conditional probability estimates of the future level of a time. This is particularly important if the type of risk analysis described above, is to be used to manage a portfolio. In this paper we examine the use of a neural network/mixture model based approach that utilizes the Expectation Maximization (EM) algorithm. To test the practical benefit of this approach, we have simulated the management of a portfolio of 50 UK equities contained in the FTSE-100 index. The portfolio is constrained such that at any time the managed portfolio should have the same risk (estimated volatility) as the FTSE-100 index itself. For that specified level of risk, however, the most efficient portfolio weightings with regard to expected return are chosen. The management of the portfolio was simulated for five years (1/1990-12/1994), trading on a daily basis. The fund was shown to significantly outperform the return of the FTSE-100 index (assuming conservative transaction costs) yet exhibited a slightly lower volatility.

Managing a Portfolio of FX/Futures Prediction - Trading Models with Fuzzy Soft-Constraint Optimisation

Poomjai Nacaskul
Quantitative Research and Trading Group, Chase Manhattan Bank London, 125 London Wall, London EC2Y 5AJ, UK, and Imperial College of Science, Technology and Medicine

We consider the problem of optimising a portfolio of FX/Futures prediction-trading models based on each individual model's prediction-trading performance statistics. Within our context, a portfolio solution will be a discretised non-negative vector of weight variables. Our portfolio optimisation/decision model seeks to **maximize** on the portfolio-weighted sum of risk-adjusted returns, which we consider to be our primary criterion, while additionally imposing a number of secondary *goal-satisficing* criteria and *soft-bounds* on the portfolio weight variables. These additional criteria, in turn, are modelled as *fuzzy soft-constraint relations*, whence our portfolio solutions are evaluated on the basis of how well they perform with respect to the primary criterion as well as the extent to which each fuzzy soft-constraint relation is satisfied or violated. This leads to our formulation of a discrete nonlinear optimisation problem. For practical and theoretical considerations, this problem is to be solved via a Neuro-Evolutionary solution methodology, i.e. one which involves the use of a mapping Neural Network and an Evolutionary Programming algorithm. We present results based on sample portfolios of FX/Futures prediction-trading models. In the final analysis, we note that while the proposed fuzzy soft-constraint formulation has been engineered for our particular problem environment, it can be shown to maintain a formal equivalence to Fuzzy Goal Programming . It can also be generalised for a larger class of multi-criteria optimisation/decision problems.

A New Approach to Using Time in Time Series Analysis

Hans Georg Zimmermann
Senior Research Scientist, Siemens AG, ZFE T SN4, Otto Hahn Ring 6, 81739 Munich, Germany

From Takens Theorem we know that we can characterize the autonomous part of a dynamical system by a sequence of observations. If we want to force a neural net to learn this dynamics, we can use a sequence of time horizons as outputs. But in normal network structures these different outputs are learned nearly indendently. By a new net architecture we allow additional information flows between the different outputs and as a consequence we get a better representation of the underlying dynamical system. This technique allows the usage of large hidden layers and therefore the possibility to analyse highly nonlinear systems.

Rule Based Forecasting

Chair: ***Scott Armstrong***
Department of Marketing, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104-6371, USA

Development of Non-Linear Smoothing Techniques

Panagiotis Mourgos
Vassilis Assimakopoulos
National Technical University of Athens, Department of Electrical and Computer Engineering, Athens, 10682, Greece

This paper introduces a genetic algorithm for non-linear regression smoothing techniques. A specific technique, generated from this algorithm, has been applied to simulated data sets with quite complicated mean functions. A comparative analysis with linear smoothing techniques (as Kernel regression smoothing and Spline smoothing) has also been conducted and the relative advantages are discussed. A specialized software has been developed providing graphic facilities for monitoring the intermediate steps of the smoothing process. It should be hereby pointed out that the technique presented could be used for the identification of time-series features and be embodied in rule-based forecasting models.

Automatic Identification of Features for Use in Rule-Based Forecasting

Fred Collopy
Monica Adya
Miles Kennedy
Weatherhead School of Management, Case Western Reserve University, Cleveland, OH, USA

The idea of selecting or combining forecasting methods based upon features of the series shows promise. In Collopy and Armstrong (1992), 18 features were used to combine levels and trends from four forecasting methods. Ten of these features were identified by the analyst. In the current paper we consider procedures for automating the identification of eight of these. We compare the resulting classifications with those in the original paper and also compare the forecasts in cases where the classifications differ. Automatic identification should permit the features to be identified more reliably, reduce the level of expertise required, and reduce the costs associated with using rule-based forecasting.

Neural Network in Forecasting I

Chair: ***Jeffrey L. Callen***
Accounting Department, Stern School of Business, New York University, 40 West 4th Street, Suite 400, New York, NY 10012-1118, USA

Neural Network Forecasting Performance Using Commodity Futures Prices

Chrispin Ntungo
Milton S. Boyd
Department of Agricultural Economics and Farm Management, The University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2
Raquel Christie
Market Analyst, Agriculutre Canada, Winnipeg, Canada

The objective of this paper is to determine whether neural network models can outperform traditional ARIMA models for forecasting commodity futures prices. Specifically, a feedforward neural network will be used to forecast a number of commodity futures prices over a number of years, including a generous out of sample range. Since neural networks are nonlinear universal mapping structures that can approximate any arbitrary function (Cybenko; Hecht-Nielsen; Hornik et al.), they may be superior for forecasting prices if prices are nonlinear, as recent research shows.

As well, neural networks have the advantage that they are less sensitive to violations of tradtional regression error term assumptions. The neural network and ARIMA forecasts will be compared using error term measures such as mean absolute percentage error, turning point (direction measures), and Theil U statistic. Since rather limited price forecasting research using large sample sizes has taken place, this paper will be one on the first to rigorously test the forecasting performance of neural networks.

Neural Network Forecasting of Mutual Fund Returns

Mark M. Carhart
Finance and Business Economics Dept., School of Business Administration, University of Southern California, Los Angeles, CA 90089-1421, USA
Orhan Karaali
Speech Research Laboratory, Motorola, Inc.

This paper explores the predictability in equity mutual fund returns using neural networks and linear forecasting methods over the 1962 to 1995 period. We fit parsimonious feedforward neural networks and linear forecasting models to the 1962-1970, 1971-1980 and 1981-1990 periods, then test the models' predictions over subsequent five-year periods. As independent variables, we use mutual fund past returns and characteristics, including fund objective, inflow, expense and turnover information, as well as macroeconomic instrumental variables that have been found to predict stock returns. In our results, we compare the forecasting accuracy of the neural networks to linear methods and demonstrate some diagnostics for infering the internal workings of the neural network.

A Comparative Study of Logistic Regression and Neuro-Network in Estimating Debt Service Capacity

Weiping Liu
Department of Economics and Finance, College of Business Administration, The University of Texas-Pan American 1201 West University Drive, Edingburg, TX 78539-2999, USA
A.M. Parhizgari
Department of Finance, College of Business Administration, Florida International University

Two methods, one traditional (logistic regression analysis) and the other more contemporary (Neuro Networks) are employed to develop models to predict debt service capacity (DSC) of the borrowing countries.

Ten measures (indices) are constructed as determinants of DSC. To keep the comparison simple, empirical applications of the two models are controlled by employing the same data sample and the same holdout and estimation groups in both models. A few drawbacks of the traditional approaches (the presence of multicollinearity, the robustness of the estimated models and the selection of cut-off points) are discussed.

The two models are compared with each other under a controlled environment by a number of tests and sensitivity studies. It can be seen that each of the models has its own advantages and disadvantages. This demonstrates that the Neuro Networks method could be a potential viable alternative to the traditional method.

Neural Network Forecasting of Quarterly Accounting Earnings

Jeffrey L. Callen
Accounting Department, Stern School of Business, New York University, 40 West 4th Street, Suite 400, New York, NY 10012-1118, USA

The study uses an artificial neural network model to forecast quarterly accounting earnings for a sample of 296 corporations trading on New York stock Exchange. The resulting forecast errors are shown to be significantly larger (smaller) than those generated by the parsimonious Brown-Rozeff and Griffin-Watts (Foster) linear time series models, bringing into question the potential usefulness of neural network models in forecasting quarterly accounting earnings. This study confirms the conjecture by Chatt-field (1993) and Hill et al (1994a) that neural network models are context sensitive. In particular, this study shows that neural network models are not necessarily superior to linear time series models even when the data are financial, seasonal and nonlinear.

Forecasting Accuracy of Time Series Methods

Chair: ***Spyros Makridakis***
INSEAD, Boulevard de Constance, 77375 Fontainebleau Cedex, FRANCE

Forecasting Accuracy-A Standard Method of Calculation Proposed for Forecasts of Multiple Parameters

D. Howard Phillips
Rafic Z. Makki
Electrical Engineering Department, The University of North Carolina at Charlotte, Charlotte, NC 28223, USA

When forecasts are being reported for a group of parameters, it is possible to report forecasting accuracy (FA) in a way that is easy to understand, relates to the "now and recent past" performance of the forecasting method, and gives the user an excellent measure for how much reliance should be placed in the forecasts. As adaptive forecasting methods have improved, it has recently become possible to forecast price direction with high accuracy even over the short term of a few days. High forecasting accuracy (85% +/- 15%) requires an even more demanding standard for measurement reporting.

No standard currently exists for measuring and reporting forecasting accuracy, and this paper proposes a standard method for determining forecasting accuracy (FA). Alternate forecasting accuracy (AFA) calculations, described in this paper, are not recommended because AFAs can be misleading to a trader at precisely the time when forecasts are usually more valuable. This paper covers three topics: (1) Explanation of the counterintuitive difference between FA and AFA calculations, (2) Recommendation for the use of forecasting accuracy using the FA method of calculation and (3) Mathematical rationale for NOT using the AFA method of calculation of forecasting accuracy.

Prediction Performance Comparisons Between Time-Varying and Smooth Transition Auto-regressive Models

Bruno Eklund
Department of Economic Statistics, Stockholm School of Economics PO Box 6501, 113 83 Stockholm, Sweden

When making a prediction out of a given time series with unknown properties, we may ask how the prediction depends on the chosen model. In this paper both linear and nonlinear data with cyclical fluctuations are simulated. We then compare the prediction performance between a time-varying parameter model and a family of nonlinear models, the smooth transition autoregressive models.

Does Feedback Improve the Accuracy of Judgmental Forecasts?

William Remus
College of Business Administration, Department of Decision Sciences, University of Hawaii, 2404 Maile Way, Honolulu, Hawaii 96822, USA
Marcus O'Connor
School of Information Systems, University of New South Wales, Sydney, New South Wales 2052, Australia
Kenneth Griggs
College of Business Administration, Department of Decision Sciences, University of Hawaii, 2404 Maile Way, Honolulu, Hawaii 96822, USA

Feedback has been shown to be a useful tool improving decision making (Balzer et al., 1992) and might also be a useful tool in improving the accuracy of judgmental forecasts. The objective of this study was to examine the impact of feedback on accuracy when forecasting time series with structural instabilities. We found cognitive information feedback (prompting on desirable forecasting behaviors) and task information feedback (prompting on the underlying structure of the time series) gave significantly better forecasting performance than performance outcome feedback (prompting with graphical indicators of forecasting accuracy or prompting words expressing levels of forecasting accuracy). Cognitive and task information feedback, but not performance outcome feedback, were superior to the baseline of providing simple outcome feedback (following each forecast with the actual value of the time series).

Forecasting Volatility

Chair: ***Anne B. Koehler***
Dept. of Decision Sciences and Management Information Systems, Miami University, Oxford, OH 45056, USA

A Comparative Study on the Predictability of the U.S. Market Volatility Based on Information Spillovers from International Markets

Mark T. Leung
Seow-Eng Ong
Graduate School of Business, Indiana University, Bloomington, Indiana 47405, USA

Previous studies on information transmission have shown that the volatility of U.S. stock returns is influenced by information from foreign markets. With this notion, the prices of options viz the implied volatilities can be expressed as a function of foreign market innovations. In particular, the impact of this information spillover is most critical during the opening of the U.S. option market. This paper examines how innovations from the Japanese and other international equity markets can be applied to forecast the option-implied market volatilities (VIX) at both the opening and closing of the U.S. market. Two sets of parametric models, simple Autoregressive (AR) and asymmetric Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models, are used to predict the implied market volatilities. The quality of the predictions is then compared to that of the forecasts found by a nonparametric connectionist approach, namely, Generalized Regression Neural Network (GRNN). Conducted empirical study shows that the connectionist models are capable of generating promising forecasts on the market volatilities.

Stock Market Volatility and the Business Cycle

Hany Shawky
Selçuk Caner
Finance Department, School of Business, SUNY at Albany, Albany, NY 12222, USA

This paper extends the consumption-based capital asset pricing model to allow for the endowment to follow a Markov process. Applying the nonlinear Markov switching method of Hamilton (1989), we find evidence for the presence of two distinct market regimes. The first regime represents recessionary economic periods and is characterized by high return volatility while the second regime represents non-recessionary time periods and is characterized by lower levels of volatility. Decomposing volatility into its predictable and unpredictable components, we show that during non-recessionary periods, there is a positive and statistically significant relationship between excess returns and ex-ante market volatility. In addition, we find a strong negative relationship between excess returns and the unpredictable component of volatility which holds for both the recessionary and non-recessionary time periods. These relationships are robust under various time periods, alternative estimation models and different regime characterization schemes.

Multiplicative Holt-Winters Method and Nonconstant Variance

Anne B. Koehler
Dept. of Decision Sciences & Management Information Systems, Miami University, Oxford, OH 45056, USA
J. Keith Ord
Department of Management Science and Information Systems, Penn State University, 303 Beam Business Administration Bldg., University Park, PA 16802, USA
Ralph D. Snyder
Department of Econometrics, Monash University, Clayton, Victoria 3168, Australia

For many years users of the Holt-Winters method for multiplicative seasonality, like ARIMA modellers, assumed that the disturbance terms in the underlying model had constant variance. Several researchers have independently given evidence that the multiplicative Holt-Winters method does not intrinsically assume constant variance. In fact nonconstant variance seems to be a better assumption for the multiplicative Holt-Winters method. While the Holt-Winters methods are hueristic methods that do not rely on statistical models, there are some new models that have been shown to underlie time series for which the multiplicative Holt-Winters method is appropriate. The purpose of this paper is to propose a procedure for choosing between the models which have different types of nonconstant variance for the disturbance terms.

Cointegration in Financial Series II

Chair: ***Kývýlcým Metin***
Bilkent University, Department of Economics, 06533 Bilkent, Ankara, Turkey

Forecasting Exchange Rates in Cointegrated VAR Systems

Fatma Taþkýn
Department of Economics, Bilkent University, 06533 Bilkent, Ankara, Turkey

The objective of the study is to compare the forecasting performance of structural models of exchange rate determination with that of cointegrated VAR systems. One structural model of exchange rate determination is the monetary model of exchange rate determination where asset market equilibrium conditions are the determining factor of exchange rates. Meese and Rogoff (1983) is the first study to conclude that structural models failed to outperform the random walk models even in the ex-post forecasts. Since then, an extensive body of literature was developed in the comparison of out-of-sample forecasts of exchange rate models. The studies either attempted to improve the forecasting performance of the structural models or accepted the dominance of the pure time series models where economic variables have little use in explaining the exchange rate movements. This study focuses on the comparison of the forecasting performance of the structural monetary model of exchange rate with the exchange rate forecasts obtained through cointegrated VAR systems composed of economic variables. The cointegrated VAR systems and the predictive power of these cointegrated systems are compared with the forecasts obtained from the structural models. The paper focuses on the US dollar ($)/Deutsche Mark (DM), $/British Pound and $/French Franc (FF) rates for the period 1973-1995, during which countries followed a flexible exchange rates regimes.

Offshore Funds and Domestic Interest Rates: A Cointegration Analysis

Guy Ta
School of Finance & Economics, University of Technology, Sydney, Broadway 2003, Sydney, Australia

Ever since major currency countries deregulated their financial systems in the 1970's, the development and growth of offshore financial markets have theoretically lent to further discussions and testing of the interest rate parity hypothesis. Whether empirically this has been true has been the subject of many studies. This paper attempts to use up-to-date cointegration techniques to test a simple linkage between domestic interest rates and offshore funds interest rates of the Eurodollar nature over some major currency countries (in Western as well as in Asia-Pacific major offshore funds centers) for the past 20 years or so. The empirical results derived from this study may enable us to generalize on the competition between internal and external credit markets, on the risk differences between domestic and external money markets as well as on the competition for funds between different offshore funds markets.

The International Transmission of Information in Corn Futures

G. Geoffrey Booth
Çetin Ciner
Department of Finance, Louisiana State University, Baton Rouge, LA 70803, USA

The purpose of this study is to investigate the transmission of information between the Chicago Board of Trade (CBOT) and Tokyo Grain Exchange (TGE) corn futures contracts. Almost identical contracts are traded on these two exchanges without overlapping trading hours. Dynamic relations and information spillovers between these two markets will be examined by employing a cointegration analysis. Early investigations suggest that the TGE contract can not be classified as a traditional agriculture futures contract and market participants may be different in two markets. This hypothesis and its implications for forecasting in this dynamic environment will be further analyzed. The findings of this paper will show the relative contribution of each market to innovations and, also, will identify the direction of causality. Thus, the results should be beneficial to farmers, grain trading houses, speculators and exchanges.

Combining Forecasts II

Chair: ***Celal Aksu***
Graduate School of Business, Koç University, Çayýr Cad., 80860 Ýstinye, Ýstanbul, Turkey

On the Benchmarking Approach to Forecast Combination

Abdelwahed Trabelsi
Université de Tunis III, Institut Supérieur de Gestion de Tunis 41, Av. de la liberté, 2000 le Bardo, Tunisia

Previous work by Trabelsi & Hillmer (1989) relates the combination of forecasts from different sources at different frequencies to the general signal extraction approach to Benchmarking survey data. Emphasis has been on the combination of forecasts generated from econometric and linear ARIMA models. In this paper, this approach is extended to handle non-linearity and many other commonly occurring characteristics in econometric and time series modeling. An optimal combination scheme based on Kalman filter for state space models is derived. Measures of forecast accuracy are developed. Properties of the proposed scheme are discussed in the light of some examples from the Bureau of the Census database.

Combining Forecast Quantiles Using Quantile Regression: Investigating the Derived Weights, Estimator Bias and Imposing Constraints

James W. Taylor
London Business School, Sussex Place, Regent's Park, London NW1 4SA, UK
Derek W. Bunn
London Business School, Sussex Place, Regent's Park, London NW1 4SA, UK

Although there exists a considerable literature on the combination of forecast probability distributions, a completely satisfactory technique has not yet been found. This paper considers a recent proposal which is to use quantile regression to combine quantile estimates. We examine the validity and usefulness of the linear combining weights that are derived. There is strong intuitive appeal for imposing various constraints on the quantile regression. Most notably, in view of the literature on the combination of point forecasts, if the quantile estimates are unbiased then one might use quantile regression with zero constant and weights summing to one. We show that suppressing the constant renders one of the main attractive features of quantile regression invalid. We establish necessary and sufficient conditions for unbiasedness of a quantile estimate and show that a combination with zero constant and weights summing to one is not necessarily unbiased.

Linear Combination of Information in Time Series Analysis

Victor M. Guerrero
Instituto Tecnologico Autonomo de Mexico, 01000 Mexico, D.F., Mexico
Daniel Pena
Universidad Carlos III de Madrid, 28903 Getafe, Madrid, Spain

An important tool in time series analysis is that of combining information in an optimal manner. Here we establish a basic combining rule of linear estimators and exemplify its use with several different problems faced by a time series analyst. A compatibility test statistic is also provided as a companion of the combining rule. This statistic plays a fundamental role for obtaining sensible results from the combination and for pointing out some possible new directions of analysis.

Unit Root and Long Memory Processes

Chair: ***Ngai Hang Chan***
Department of Statistics, Carnegie Mellon University, Pittsburgh, PA 15213, USA

Adding a Noise to Stabilize a Dynamical System

Gopal Basak
Dept. of Mathematics, Hong Kong University of Science & Technology, Clear Water Bay, Kowloon, Hong Kong

Unstable Dynamical systems have been of great concern to scientists for a long time. Kolmogorov observed that the flow is more viscous if a noise is added to the system. This idea has caught on recently and being used to study dynamical system which arises in many physical system. Probabilists perturb the dynamical system with a small noise and study the large deviation behavior of the perturbed dynamical system as the noise decays to zero. In this talk, however, the effect of noise on a dynamical system driven by a differential equation, or a difference equation, will be discussed. It will be further observed how much noise a stable system can absorb while remaining stable and how much noise is required to make an unstable system stable. In this way, it can be characterized the threshold level of the noise beyond which (i) a stable system would be unstable, or, (ii) an unstable system will become stable. This may very well shed light on the study of chaotic phenomena and provide important application in modelling various physical, financial and industrial systems.

Testing for Trends and Unit Roots

S.G. Pantula
H.G. Sun
Department of Statistics, North Carloina State University, Raleigh, NC 27695, USA

Forecasting economic and meteorological variables depends on whether the underlying process has a stochastic or a deterministic trend. Tests for these two types of trends will be discussed. Also, testing for the significance of a linear trend in the presence of correlated errors will be discussed. Estimated generalized least squares estimators based on different bias adjusted estimators of the correlation parameters will be considered. Standard error estimators of these estimators are affected by the bias in the correlation estimates. Also, the distribution of the pivotal statistics is affected by strong positive correlation. Different test criteria, including pretest methods that test for unit roots and test criteria based on critical values from bootstrap and other finite sample approximations will be compared. Methods will be illustrated through economic data.

Evidence of long memory in daily series of economic activity

Antonio Espasa
J.M. Revuelta
Universidad Carlos III de Madrid, Dpto. de Estadistica y Econometria, c/ Madrid 126 - Getate, 28903 Madrid, Spain

The research for evidence of long-memory in monthly or quarterly economic time series works with time spans of at least 30 or 40 years with the consequence of a high probability of structural breaks in such long intervals and with the uncertainty associated with such old registers. There is another type of economic data for which the long memory models could be a useful scheme and without some of these problems. These are daily series such as sales, electricity consumption, transport, pollution, monetary aggregates, etc. for which the main problem lies in finding a model of the conditional variance. Daily series of economic activity show big fluctuations owing to different evolving seasonalities and to calendar and meteorological effects which could distort the time dependence in the data. This paper aims to eliminate these distortions following the procedure proposed by Espasa et al. (96) and then explore the existence of long memory structure in the data. In the paper we apply the procedure to series of electricity consumption, money aggregates and pollution.

State Space Modelling of Long-Memory Processes

Ngai Hang Chan
W. Palma
Department of Statistics, Carnegie Mellon University, Pittsburgh, PA 15213, USA

Recent developments of state space modelling of long-memory dependent data is discussed in this paper. A truncated state space representation is proposed and its asymptotic properties are studied. In particular, the asymptotic efficiencies of the maximum likelihood estimates based on the truncated system are established for fractional autoregressive moving average processes.

Forecasting In Investment Management

Chair: ***Yves Bentz***
London Business School, Sussex Place - Regent's Park, London NW1 4SA, UK

Forecasting the Price Changes of Mortgage Backed Securities via Treasury Based Derivatives

Kurtay Ögünç
Department of ISDS, College of Business Administration, Lousiana State University, Baton Rouge, LA 70803, USA

The dynamic structure of mortgage-backed securities requires efficient modeling schemes to further institutional investors' understanding of this growing derivative fixed-income market. This paper employs the theory of cointegratrion and error-correction mechanisms to model the relationship between the mortgage-backed and the Treasury derivatives market. The objective of this study is to forecast price changes of mortgage backed securities using available forecasting procedures.

Three types of generic pass-through mortgage backed securities, namely 30 year GNMA, FNMA and FHLMC securities with a coupon of 10%, and two types of T-Note futures and options on T-Note features have been analyzed via unit-root and cointegration tests. Then error-correction models have been developed among cointegrated variables. Their forecasting performances have been compared against vector autoregressive (VAR) and ARIMA models.

Evaluating Forecasting Abilities of Portfolio Managers

Auke Plantinga
University of Groningen, Faculty of Economics, P.O. Box 800, 9700 Av. Ggoningen, The Netherlands

Performance evaluation of Investment portfolios is an important issue in many areas. For example techniques for evaluating investment performance have been applied in order to quantify the efficiency of capital markets, to control and manage the risk of investment portfolios, and to determine the fees paid to portfolio managers. The main purpose in this application is to identify the forecasting abilities of portfolio managers.

In this paper, we study a number of performance evaluation techniques. Specifically, we are interested in the ability of these techniques to identify forecasting skills. Evidence from Dybvig & Ross (1985) and Jagannathan & Korajczyck (1986) suggests that some popular techniques are inadequate in identifying forecasting skills. In a simulation study, we use a securities market model with two types of investors: with and without forecasting skills. Next, the performance of these investors will be evaluated with the different evaluation techniques.

The study confirms the results of Dybvig & Ross as well as Jagannathan & Korajczyck. Furthermore, conditions are identified for justifying the use of specific evaluation techniques.

Portfolio Managers' Forecasts of Risk and Return: Are There Predictable Forecast Errors?

Gülnur Muradoðlu
Bilkent University, Faculty of Business Administration, 06533 Bilkent, Ankara, Turkey

This study aims to investigate individual behavior that underlies the overreaction hypothesis (De Bondt and Thaler, 1985; 1990) by conducting a controlled experiment. The purpose is to explore return expectations and risk perceptions of portfolio managers as well as financially unsophisticated investors by using point and interval forecasts provided for different forecast horizons at bull and bear markets. Contributions stem from three sources: (1) the use of financially sophisticated versus unsophisticated subjects that controls for the level of expertise, (2) the use of different forecast horizons that controls for the effect of forecast period, (3) the use of the same subject groups for real time and unknown calendar time stock price forecasts that controls for biases due to environmental factors. Discussions will be given as to the expert versus naive investors' interpolating asset prices from past trends and hedging behavior due to their caution in projections of ranges for future prices.

Kalman Filter Approach for Better Sensitivity Prediction in Investment Management

Yves Bentz
London Business School, Sussex Place - Regent's Park, London NW1 4SA, UK
Laurence Boone
Merrill Lynch Global Asset Management, London, UK
Jerome T. Connor
Advanced Decision Sciences Center, London Business School, Sussex Place, Regent's Park, London, NW1-4SA, UK

Sensitivity analysis plays a central role in modern investment management. Closely related to factor modelling, sensitivities are widely used in portfolio construction, style investment, performance measurement and risk management. Yet, little research has stressed the importance of estimating these sensitivities optimally. OLS estimation, used in nearly all instances, assumes that the true sensitivities are stable over time. However, there are strong reasons to believe [Rosenberg & Guy 76, Bos & Newbold 84] that this is not the case and that stochastic coefficient models should be used to predict future sensitivities. Kalman filtering, because it can deal with varying unobservable states, provides an efficient framework to model these non-stationary exposures.

A controlled simulation experiment is used to introduce the issues involved and to present the proposed approach. The pertinence of this method is evaluated in two real world examples. In the first example, we investigate the stationarity of stock return exposures to interest and exchange rate and evaluate the pertinence of a Kalman filter in a risk management context. In the second example, we show how styles of asset portfolios (which can be interpreted in terms of sensitivities) evolve through time. Kalman filtering provides estimates of the current effective style rather than a historical average.

Issues in Macroeconomic Forecasting

Chair: ***Emre Alper***
Faculty of Business Administration, Boðaziçi University, 80815 Bebek, Ýstanbul, Turkey

Predictive Quality Evaluation Criteria: The Case of Inflation Monetary Models for Poland in Transition

Wladyslaw Milo
Piotr Wdowinski
Aneta Zglinska
University of Lodz, Department of Econometrics, 41, Rewolucji, 1905 r. St. 90-214 Lodz, Poland

The paper is intended to provide an analysis of predictive quality evaluation criteria (PQEC). The PQEC consists of three measures: 1. predictive quality of combined forecasts; 2. turning point analysis; 3. stability and sensitivity analysis.

The analysis is carried out for a number of dynamic behavioral inflation monetary models. The study aims at analysing the interrelations of money supply and exchange rates to determine the price level. Two types of price indices are taken into account: consumer price index (CPI) and producer price index (PPI). The survey is based on a monthly sample January 1991 - April 1996 that covers the transition period in Poland. The period allows for a comparative study of exchange rate influence on inflation within different exchange rate regimes: fixed and flexible.

Seasonality in Exchange Rate of Turkish Lira

Noyan Dereli
The Business School, Liverpool John Moores University, Liverpool L3 5UZ, UK
Doðan Dereli
Degere International Trading A.Þ., Istanbul, Turkey

The main aim of this article is to examine the seasonality of the monthly foreign exchange rate for the Turkish Lira. It can be argued that since the Turkish Lira is not a main international currency, its rate should be closely affected by the developments involving balance of payments items for the Turkish economy. The most important of these are the monthly trade balance (imports and exports of real commodities), tourism expenditures and workers remittances from abroad. In all these we can observe highly seasonal movements. The exchange rate may also be affected by the monetary and fiscal policies of the Turkish government. Even these show highly seasonal pattern. This article uses the frequency domain tools of spectral analysis and bivariate cross spectral analysis to examine the seasonal effects in each of the variables taken on their own and taken with the exchange rate as a pair at a time. In examining the seasonality various different types of trend elimination techniques are tried and various different types of windows are looked at. The hypotheses that is being tested is that efficient market hypothesis applies and that there is seasonality in the foreign exchange rate of the Turkish Lira, which is anticipated by the arbitrage. This seasonality is explained by the movements of the variables that relate to use of foreign currency and the movements policy variables.

An Index of Leading Indicators for the Turkish Economy

Suat Küçükçiftçi
Ümit Þenesen
Ýstanbul Technical University, Department of Management, 80680 Maçka, Istanbul, Turkey

This paper proposes an index of leading indicators for the Turkish economy. For this purpose the industrial production index was used as the reference series as in most OECD countries. 84 different series published monthly were considered to construct a leading indicator index. They are evaluated on the basis of six criteria: economic significance, statistical adequacy, timing, cyclical conformity, smoothness and prompt availability. The final index was composed of number of job applications, number of building permits issued for industrial buildings and real money supply (M2). It was found that the composite index of leading indicators leads the reference index by about 7.4 - 9.3 months.

A Fuzzy Design of the Willingness to Invest in Sweden

Robert Bielik
Tomas Lindström
Department of Economics, Uppsala University, Box 513, S-751 20 Uppsala, Sweden

This paper models investors as 'rules of thumb' agents and deals explicitly with imprecisions of macroeconomic data. By using the theory of fuzzy logic, the links between the real interest rate and aggregate investment in Sweden 1950-1990 are explored. The economic environment is characterized by multivalued logic, and an index for the investment climate in the economy is derived strictly from the interest rate. It turns out that this index highly correlates with total investments (the correlation coefficient is approximately 0.7), and hence we conclude that the interest rate may explain a surprisingly large part of aggregate investment behavior.

Forecasting Tools in Marketing

Chair: ***Scott Armstrong***
The Wharton School, University of Pennsylvania, Philadelphia, PA 19104-6371, USA

A Vajda Information Function Approach for Identifying Relationships Among Variables

Ercan Týrtýroðlu
Faculty of Business Administration, Boðaziçi University, 80815 Bebek, Istanbul, Turkey, and
College of Business & Indus., University of Massachusetts-Dartmouth, N. Dartmouth, MA 02747, USA
Doðan Týrtýroðlu
School of Business, Salisbury State University, Salisbury, MD 21801, USA

Identification of relationships among variables is an important task in behavioral research. This study attempts to compare the results obtained by Shannon and Vajda information functions. The data set we use is from an earlier study (Golden, Brockett and Zimmer 1990), illustrating a market application.

Understanding and forecasting the diffusion of technological products with micro-level models

Christos J. Emmanouilides
Centre for Applied Statistics, Fylde College, Bailrigg Campus, Lancaster University, Lancaster LAI 4YF, UK

In this paper we analyse the diffusion of eight consumer durables in the UK employing data from a large annual survey. Micro-level econometric models are used to assess the effects of socio-economic factors on the development of the process. The presence of consumer heterogeneity is tested and its effects are examined. Particular emphasis is put on uncovering the social network elements of diffusion operating at the local spatial level; there is strong empirical evidence of non-linear effects. This fýnding may have important implications in forecasting the penetration path with macro models. We develop a method for aggregating the estimated micro-level models and for using aggregate system descriptors to predict the process. Several marketing policy implications of the models arise as simulations under various scenarios are performed.

Long term forecasts for retail locations

Sam Porter
The Boots Company PLC, Head Office, Nottingham NG2 3AA, UK

This paper describes a method of ranking retail locations in the UK on the basis of their long term retail growth prospects. The long term is defined as up to 25 years. The method is essentially qualitative and judgmental due to the length of the time horizon and the deficiency of local level data, particularly time series data. The theoretical background to the methodology is discussed and supported by reference to historical trends in local unemployment and retail floorspace.

Stock Market Efficiency

Chair: ***Kürþat Aydoðan***
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

Statistical Learning in an Emerging Market

Yarkýn Cebeci
Garanti Investment Bank and Boðaziçi University, 80815 Bebek, Istanbul, Turkey

As an infant stock market matures, both the trading volume and the number of participants enumerate and a number of inefficiencies get arbitraged away with the knowledge of their existence. This study aims to determine the extent of this learning process in the ISE data. The results show that in the very first years, return generating process is far from being a random walk. In time, starting in the 1990's, return distribution approaches normality, volatility; autocorrelation vanishes; stationarity is achieved; and the return generating process gets linear. Thus, we are getting closer and closer to the point where the optimal forecast for a stock price one period ahead is the present price. The only exception here is the year 1994, when the ISE was deeply affected by a severe economic crisis.

Privatisation and Stock Market Efficiency: The British Experience

Aydýn Hayri
Department of Economics, University of Warwick, Coventry, CV4 7AL, UK
Kamil Yýlmaz
Koç University, Graduate School of Business, Çayýr Caddesi, 80860 Istinye, Istanbul, Turkey

We present evidence that with its emphasis on wide-share-ownership, the British privatisation programme created heavy involvement of small investors in privatised stocks. Using standard market efficiency tests and maximum likelihood estimates of stationary fractional ARIMA models, we show that the pricing of privatised stocks in the London Stock Exchange was indeed inefficient, unlike the rest of the market. Together, these two pieces of evidence suggest that small investors, behaving like noise-traders, may be generating this inefficiency.

Stock Market Efficiency in a Developing Economy: Evidence from Turkey

Ercan Balaban
H. Baturalp Candemir
Kürþat Kunter
Research Department, The Central Bank of the Republic of Turkey, Istiklal Cad. No 10, Ulus 06100 Ankara, Turkey

This paper primarily aims to test informational efficiency of the Turkish stock market with respect to daily changes in such variables as overnight interest rates, foreign exchange rates and some monetary aggregates. Semi-strong form efficiency is tested by using structural models in which each information variable is decomposed into its anticipated and unanticipated components by employing higher-order autoregressive integrated moving average (ARIMA) models. The paper reports significant deviations from efficient market hypothesis in the Turkish stock market for the period January 1989 to July 1995. The results have two major implications. First, domestic investors as well as foreign investors who hold approximately 25% of total tradable shares in Turkey may benefit from the empirical results of the paper to develop profitable trading strategies since all information variables are low-cost and readily accessible. This is of particular importance to the investors of the European Community (EC) due to the Customs Union Agreement, which has been effective on 1 January 1996, between Turkey and the EC. Second, resources in Turkey do not seem to be devoted into their best alternatives; i.e., allocative efficiency appears to remain unachieved.

Heteroscedasticity

Chair: ***Asad Zaman***
Economics Department, Bilkent University, 06533 Bilkent, Ankara, Turkey

Expected Returns, Conditional Volatility in the Spanish Foreign Spot Exchange Market

Jorge Pérez
Department of Econometrics, University of Barcelona, Avda Diagonal 640, 08004 Barcelona, Spain

Marc Saez
Department of Economics, University of Girona, Lluis Santalo s/n, 17071 Girona, Spain

We analyze time variation in conditional means and variances of daily excess peseta returns on dollar investment in the spot market, from 1/87 to 5/95, to investigate if the changes in the conditional variance of the peseta-dollar exchange rate may be associated with increases in the risk premia of some currencies of the European Monetary System.

We use a vector autoregression (VAR) with daily data on exchange-rate changes of various currencies. We combine the dynamics of this VAR with a multivariate model of heteroscedasticity in order to obtain estimates of the conditional variances. We assumed a multivariate GARCH model and GARCH-in-mean, allowing the volatilities of currencies to be determined by their means. The peseta/dollar exchange rate is a linear function of its conditional variance and this representation is sufficient to capture the nature of the variance of the exchange market. Furthermore, the model allows us to examine how changes in the conditional variances and covariances of future exchange rates affects the level of current exchange rates. It is expected that daily returns will show patterns of heteroscedastic volatility and the existence of possible persistence that could mean comovements in variance.

Volatility of Telebras: A Comparison between ARCH and Stochastic Volatility Approaches

Julio Ferreira *(Banco Safra)*
Mauricio Herencia *(Dept. Statistics UNICAMP)*
Luiz Hotta *(Dept. Statistics UNICAMP)*
Marcelo Mecchi *(Banco Safra)*

Pedro Valls Pereira
Dept. of Statistics, U.S.P., Caixa Postal 66.281 - Ag. Cidade de Sao Paulo, 05389-970, Sao Paulo, S.P. Brazil

The aim of this paper is to provide evidence that the volatility of return should be modelled by non-linear models. The following models are used to estimate the volatility of the return of TELEBRAS: GACH(1,1). IGARCH(1,1) and the stochastic Volatility Model proposed by Harvey and a comparison of the one step forecast is made in order to compare the models. A criterion for this comparison is proposed, which is based in the condicional distribution of returns and the main results are: GARCH models are preferable if the series is well behave but the SV models are better if there are outliers or inliers in the series.

Heteroskedasticity Tests and Corrections: New Results

Asad Zaman
Economics Department, Bilkent University, 06533 Bilkent, Ankara, Turkey

We characterize the implicit alternative of the Breusch-Pagan test, and show that it is effective only against a linear alternatives. The apparent generality of the test is an illusion -- the test is inconsistent for general alternatives. The Eicker-White heteroskedasticity test is a special case of the Breusch-Pagan. We show it is effective exactly on the types of heteroskedasticity generated by random coefficients. The set of alternatives for the Eicker-White test is equivalent to the set of alternatives for a direct LR test for random coefficients. We show that the direct LR test is substantially more powerful. The Eicker-White HCCE (heteroskedasticity corrected covariance estimate) is valid ONLY when there are random coefficients. However, in the case of random coefficients, it is a superior strategy to directly estimate a random coefficient model, rather than adjusting` OLS covariances. Monte-Carlo results demonstrating the superiority of this strategy will be presented.

Analysts' Forecasts of Earnings I

Chair: ***Robert S. Hansen***
Finance Dept., R.B. Pamplin College of Business, 1016 Pamplin Hall, Blacksburg, Virginia 24061-0221, USA

Relative Accuracy of P/E Multiple Based Stock Price Forecast Models in Emerging Markets: An Anomaly

Mohamed Ariff
Dept. of Finance and Banking, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511, Republic of Singapore; and RMIT University of Technology
S.M. Khalid Nainar
School of Business, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4M4, Canada
Anthony Ngerng
Dept. of Finance and Banking, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511, Republic of Singapore

This paper develops and tests two stock price forecasting models using P/E multiples. One model using historical multiples generates reliable price forecasts compared to forecasts from a structural model using fundamental factors. The results are anomalous and contrary to efficient market hypothesis. *Historical* multiples appear to capture expected capital gains growth more than fundamental-factor-based multiples in this emerging Asian market where capital gains constitute 75% of the average market return of 16% per annum. Returns from share price predictability are explained as rewards to informed investors who may use P/E multiples as priors for their price discovery.

The Formation of Unexpected Earnings: The Use of the IBES Actual EPS

Y. Woody Wu
School of Accountancy, Chinese University of Hong Kong, Shatin, Hong Kong

This study examines the use of Institutional Business Estimate System (IBES) actual earnings in forming unexpected earnings. In this study, we first present evidence of the prevailing inconsistency between COMPUSTAT-actual and the corresponding IBES-actual. For a sample of 30,395 firm-quarter observations during the 1984-90 period, more than half (15,646) COMPUSTAT-actuals differ from the corresponding IBES actuals. We then show that, consistent with Philbrick and Ricks [1991], the IBES-actual results in a smaller forecast error than the COMPUSTAT-actual but its association with the abnormal returns is not significantly higher than that of COMPUSTAT-actual. We find that this may be attributed to the IBES-adjustment, defined as the difference between the COMPUSTAT-actual and the IBES-actual. For a sample of 14,018 firm-quarter observations whose COMPUSTAT-actuals differ from the corresponding IBES actuals, the IBES-adjustment has incremental information content over the COMPUSTAT-actual based unexpected earnings, but not over the IBESactual based ones. Thus, we identify a potential misspecification problem in pairing up the COMPUSTAT-actual with the IBES-forecast.

The Sufficiency of Analysts' Earnings Forecasts in Equity Valuation

Theodore Sougiannis
Elisabeth Oltheten
Takashi Yaekura
Walter A. Haas School of Business, Berkeley, California 94720-1900, USA

This study examines how many multiple-year earnings forecasts are required to value various portfolios of stocks. We incorporate the forecasts into an equity valuation model to calculate intrinsic prices. Then we calculate ex-ante valuation errors by comparing actual and intrinsic prices. An earnings forecast is defined as sufficient when the ex-ante errors are statistically not different from zero. We use unconditional analyses to determine the required forecast horizon for the market portfolio and for random portfolios of stocks, and conditional analyses to determine the forecast horizon over conditions under which one expects forecasting horizons to vary. Results indicate that a one-year ahead earnings forecast is sufficient to value the market or a randomly formed portfolio. However, for portfolios formed conditional on the Book/Price ratio (for example), while a one-year ahead earnings forecast is sufficient to value high B/P portfolios, even five years of earnings forecasts are insufficient to value low B/P portfolios.

Analyst Behavior Around Seasoned Equity Offerings

Robert S. Hansen
Finance Department, R.B. Pamplin College of Business, 1016 Pamplin Hall, Blacksburg, VA 24061-0221, USA
Atulya Sarin
Department of Finance, College of Business, Santa Clara University, Santa Clara, CA, USA

We examine security analysts' behavior around SEOs for evidence of credible behavior. We find that analysts employed by lead investment banks and reputable firms do not produce abnormally favorable forecasts of earnings when firms raise new equity capital. We report evidence consistent with the view that management may manipulate earnings around the equity financing period. However, further results indicate that analysts see through these manipulations, and that their forecasts are unaffected by them. Analyst following is also found to expand significantly after the equity issues, and more so for offerings led by reputable underwriters. This is consistent with underwriters expanding investor recognition of issuing firms, and with analysts providing an important information intermediation services for investors. This also suggests that substantially greater benefits from corporate monitoring by underwriters is produced by SEOs than those previously recognized. Our findings are consistent with capital market models under imperfect information in which analysts and underwriters are important information intermediaries.

Economic Forecasting

Chair: ***Ken Holden***
The Business School, Liverpool John Moores University, Liverpool L3 5UZ, UK

Filter Rules Revisited

Jason Laws
Guy Thompson
John Thompson
The Business School, Liverpool John Moores University, Liverpool L3 5UZ, UK

Trading in the foreign exchange futures market is less costly than trading in the cash market since the currency does not have to be purchased but rather a relatively small margin paid "up front" and the settlement can be made on the basis of the gap between the purchase and selling price of the currency at the time of settlement. This suggests that the analysis of trading rules should be extended to the foreign exchange futures market and this was done by Levich and Thomas [1993]. This study examines the predictability of the foreign currency futures contracts traded in the IMM at Chicago. Simple filter and moving average rules were devised ex ante and then the profitability of the various trading strategies was examined. It should be emphasised that these rules were designed to predict the *direction* of change of the exchange rate rather than the precise level of the rate at any point in time. The precise magnitude of the change is of a second order of importance since, if the direction of the change can be predicted, then profits can be made by an appropriate buy or sell strategy.

The Predictive Power of Implied Volatilities: An Application to the Foreign Currency Options Market

Jason Laws
John Thompson
The Business School, Liverpool John Moores University, Liverpool L3 5UZ, UK

One of the most attractive features of the constant variance genre of option pricing models is that its parameters are almost all observable. The one input that must be estimated is the future volatility of the underlying asset. A common approach is to use an iterative search or Newton Raphson method to calculate the "implied volatility" from current option prices in the market by solving the pricing model for the volatility that sets the model and market prices equal. The implied volatility arrived at is then the markets expectation (or forecast) of the underlying assets volatility for the remaining life of the contract. Early studies of the informational content of implied volatilities have generally found that they contribute a statistically significant amount of information about volatility over a short term forecasting horizon. However the majority of this work concentrates on equity options and equity index options. This paper examines the informational content and predictive ability of implied volatility derived from American-style foreign currency options on the British Pound, Deutsche Mark and the Japanese Yen traded on the Philadelphia Stock Exchange. The paper also examines a number of different weighting criteria for use in combining the forecasts generated each day from each of the near money options. Unlike previous work which use closed form option pricing models, this paper uses "tree approach" models which are designed specifically for pricing American style currency options. In particular we use the Ho, Stapleton and Subrahmanyam (The Journal of Derivatives, 1994) model and the control variate binomial and trinomial models. The accuracy of the implied volatility forecasts is then tested using regression tests, statistical criteria and an encompassing test where the implied volatility forecasts are compared against alternative (GARCH, MA, historical) out of sample forecasts.

Combining Forecasts, Encompassing and the Properties of UK Macroeconomic Forecasts

Ken Holden
John Thompson
The Business School, Liverpool John Moores University, Liverpool L3 5UZ, UK

The idea of combining forecasts is of great interest to forecasters and a linear combination of different forecasts can be more accurate than any individual forecast. For model builders, forecast encompassing is a way of checking whether any extra important information is contained in forecasts from rival models. Efficient forecasts have errors which are unrelated to any information available when they are formed. Combinations of forecasts, forecast encompassing and efficiency tests can all be achieved by a restricted or unrestricted regression of outcomes on the separate forecasts. This paper links these three approaches and examines the implications for recent UK annual forecasts.

Applications

Chair: ***Anne Toppinen***
Finish Forest Research Institute, Unioninkatu 40 A, SF-00170 Helsinki, Finland

Forecasting the Risk of Diabetes Using Diet, Physiological Variables and Genetic Predisposition

Janice O'Connor
The Royal Alexandra Hospital for Children, Sydney, Australia
Louise Baur
University of Sydney, Sydney, Australia
Marcus O'Connor
University of New South Wales, Sydney, New South Wales 2052, Australia

This study reports the use of diet, physiological variables and genetic predisposition in young children to predict the future risk of developing mature onset diabetes. Diabetes results from the failure of insulin to transport glucose into the muscle where it is used to provide energy for the body. This study, by focusing on young children, seeks to eliminate many of the confounding factors that can influence an adult's predisposition to developing diabetes. Results suggest that early infant diet and genetic predisposition are important indicators of the likelihood of developing this disease.

Spatial Prediction and Kriging in Oceanography

Mine Çaðlar
Civil Engineering & OR, Eng. Quad., Princeton University, Princeton, NJ 08544, USA

Stochastic models of random phenomena evolving over time and space are of increasing interest in oceanography, geology, forestry, and astronomy. Such phenomena are often modeled as random fields over the plane with added temporal dynamics. On the other hand, the data are obtained from observations at finitely many points in time and space. The statistical problem is to predict, from the available data, the future evolution and the values of the random field on the entire plane. After reviewing methods of kriging and spatial prediction, we discuss an application in oceanography. The data come from floats that move inertly over the ocean, and the task is to make inferences about Eulerian velocity field from these Lagrangian data.

Dynamics of Salespeople's Interests During Their Career Span

Rene Darmon
Benny Rigaux-Bricmont
Pierre Balloffet
Université Laval, Faculte des Sciences de l'Administration, Québec City, Québec, G1K 7P4 Canada

To forecast the changing interests of salespeople during the career cycle, we investigate the utility functions of 420 agents selling either general or life insurance policies in the province of Quebec (Canada). By contrasting the results of the agents in four development stages of their career (exploration, establishment, maintenance and disengagement stages), differences of interests appear not only between stages but also between men and women, and, sellers of life insurance and sellers of general insurance. The results suggest that sales managers involved in the insurance business should adapt accordingly both their recruitment procedures and their training programs if they want to sustain strong motivation levels in the sales force.

Price Forecasting and Informational Efficiency of Stumpage Market in Finland

Anne Toppinen
Finish Forest Research Institute, Unioninkatu 40 A, SF-00170 Helsinki, Finland

In Finland, roundwood is mostly used as raw-material for export oriented forest industry. The roundwood market liberalization and changes in institutional environment enhance the need for price forecasting. In this paper, short run forecasting and informational efficiency of the market is studied with monthly price data for 1985-95. The long run cointegration between 6 different stumpage prices is tested by the Johansen method. Empirical results indicate that stumpage prices are non-stationary and that one common trend exists on the market. Furthermore, results are in favor of exogenous pulpwood price determination and endogenous sawlog prices. Price fluctuations are, however, so concurrent that negligible

forecasting possibilities exist over only 1-2 months. Consequently, the stumpage market in Finland can be characterized as informationally efficient.

Neural Networks in Forecasting II

Chair: ***Jochen Schwarze***
Managing Director of the Institut für Wirtschaftsinformatik der Universitat Hannover, Königsworther Platz 1, D-30167 Hannover, Germany

Neural Networks in Forecasting Business Fluctuations

Vladimir J. Simunek
Department of Economics and Finance-CBA, College of Business Adminitration, St.John's University, Jamaica, NY 11439, USA

Text of this paper analyzes the results obtained from a large-scale economic forecasting model. The model contains approximately 22 thousand variables and enables to perform quarterly forecast up to the year 2005. Forecast horizon can be extended. The model contains two subsystems. The judgmental subsystem contains variables and relationships whose values arc determined by the model builder's and/or the model user's judgemental methods. The mechanical subsystem contains the set of equations and other quantitative relationships. Neural network interconnects both subsystems. It enables to transform values of variables that determine fluctuations in the judgmental subsystem in values of selected variables in relationships of the mechanical subsystem, and vice versa.

Stock Market Prediction Using Different Neural Network Classification Architectures

Karsten Schierholt
Cihan H. Daðlý
Smart Engineering Systems Laboratory, Engineering Management Department, University of Missouri - Rolla, Rolla, MO 65409-0370, USA

In recent years, many attempts have been made to predict the behavior of bonds, currencies, stocks, or stock markets. In this paper, the Standard & Poors 500 Index is to be modeled using different neural network classification architectures.Most experiments in the past used multilayer perceptrons for stock market forecasting. In this paper, a multilayer perceptron architecture and a probabilistic neural network are used to predict the incline, decline, or steadiness of the index. The results of trading with the advice given by the network is then compared with the maximum possible performance and the performance of the index. Results show that both networks can be trained to perform better than the index, with the probabilistic neural network performing slightly better than the multi layer perceptron.

Evaluation of Neural Networks to Forecast Credit Risks

Jochen Schwarze
Managing Director of the Institut für Wirtschaftsinformatik der Universitat Hannover, Königsworther Platz 1, D-30167 Hannover, Germany

For banks and related financing services a task of essential economic importance is the forecasting of the risks of (potential) credits or credit investigation. This is usually done by conventional or statistical methods of credit investigation and evaluation of (potential) debtors. Outgoing from the weaknesses and defects of these approaches, the use of neural networks has been examinated by an empirical study, based on actual data from a German bank. It will be shown, how difficult it is, to find optimal values for the characteristics (e.g. learning rate, transfer function, topology of he network etc.) of a neural network. By a special approach of sensitivity analysis the performance and the behavior are discussed and some proposals for application of neural networks to credit and debtor investigation are given.

Bayesian Forecasting II

Chair: ***Refik Soyer***
School of Business & Public Management, George Washington University, Washington, D.C. 20052, USA

Forecasting Volatility Surfaces with Dynamic Wavelets

Andy Pole
Jefferies & Company, Analytical Trading Division, New York, NY, USA

A stochastic model is proposed for statistical estimation of the Derman-Kani binomial (stock option valuation) tree. Daily reestimation of the tree produces a multi dimensional time series. Temporal structure in the series is extracted using a wavelet decomposition subject to a noise filter. The filtered wavelet estimates are subsequently modelled in a dynamic system providing formal model based prediction. The predicted wavelets are then combined to construct forecasts of future valuations.

Efficient Global Asset Allocation: Consistent Performance Through Forecasting Refinement

Jose Mario Quintana
Bluford H. Putnam
Bankers Trust Company, One Bankers Trust Plaza, New York, NY 10006, USA

A comprehensive efficient global asset portfolio management deals not only with how best to allocate among global assets, but also with the ability to do so coherently from different currency perspectives. A typical approach is to arbitrarily choose an axis currency for developing the forecasting models, that feed optimal asset allocation processes, and use the laws of probability to derive the forecasts for the other currency perspectives. However, the critical problem of selecting the axis currency remains. We show that the latter problem can be avoided entirely by using recently developed Bayesian multiple-factor dynamic models that are invariant to changes in numeraire. The result of using these models in a mean-variance asset allocation setup is an attractive excess return performance virtually invariant to the currency perspective.

Sequential Forecasting and Stopping Rules for Software Testing

Ehsan S. Soofi
University of Wisconsin-Milwaukee
Refik Soyer
The George Washington University

In this paper we present a decision theoretic approach to adress the problem of when to stop testing during software development process. Our approach is fully Bayesian and uses utility functions based on information measures and costs. Implementation of the approach requires forecast distributions as well as evaluation of the expected utility functions at any stage of testing. We illustrate our approach by using different software reliability models and discuss computational issues.

Seasonal Adjustment of Consumer Price Indexes: A Bayesian Approach via Dynamic Models

Emanuel P. Barbosa
Wanderley Ramalho
Wallison M. de Paula
Departamento de Estatistica, UFMG, C.P. 702, CEP 30161-970, Belo Horizonte, MG, Brazil

The seasonal adjustment of economic time series; and particularly, consumer price indexes, has been usually approached using automatic methods based on moving average filters as the X11 method. Although largely used in practice, such automatic method suffers from all the drawbacks of a non model-based procedure, as far instance, the difficulty in assessing its performance.

It is proposed in this paper an alternative method for seasonal adjustment of consumer price indexes based on the dynamic linear model implemented via software BATS. Such indexes are weighted averages of relative prices calculated for each item (goods and services) of the index. It is supposed that these data follow a multiplicative model formed by, non-observable components of trend, seasonal effect, calendar effect end irregular. The key quantities involved are the seasonal factors estimated for each seasonal item and compared with the X11 estimates. The proposed methodology is applied to the consumer price index produced by the lnstitute of Economical studies of Minas Gerais, Brazil.

Combining Forecasts III

Chair: ***Shevy Gunter***
TEKNIX Inc., and Boðaziçi University, 3 N. Columbus Blvd., Suite 316, Philadelphia, PA 19106, USA

Using the Bootstrap for Improved Precision in the Combination of Forecasts

Amir D. Aczel
Nicholas C. Teebagy
Mathematical Sciences Department, Bentley College, Waltham, MA 02154, USA

The combination of forecasts is one of the most extensively researched topics in forecasting and the benefits of using forecasts from a combination of sources are well understood. Unfortunately, the widely used Granger-Bates estimator of the standard error of a combined forecast is often used in conjunction with a normal distribution in constructing forecast intervals and other measures of forecast precision.

The problem in using a normal assumption is that even when the individual forecasts are normally distributed, the combined forecast is not. The reason for this is that the weights are themselves random variables and therefore the combined forecast is a mixture of distributions. Using the usual coefficients (such as ±1.96 for a 95% forecast interval) is incorrect. Recently, Arcones and Gine (1992) proved that mixtures of distributions can be bootstrapped well. Using a bootstrap approach, as shown in this paper, leads to theoretically correct as well as more accurate bounds on forecast accuracy. The methodology is demonstrated using several sources of forecasts for the exchange rate of the Singapore dollar.

Combining Forecasts: A Bayesian Approach

K. Rao Kadiyala
Kerem Tomak
Krannert Graduate School of Management, Purdue University, West Lafayette, IN 47907, USA

There are several methods suggested for combining multiple forecasts. They usually take the form of averaging different forecasts. In addition to classical methods used to combine forecasts, there are several but small number of Bayesian methods implemented and studied. In this paper, we suggest alternative methods for combining several independent, possibly biased, forecasts. In the first part of the paper, we discuss several priors that can be used to combine multiple forecasts. We will compare these Bayes procedures by calculating mean square error of prediction and mean absolute error of prediction. We use actual data like the Blue Chip Economists Survey data and preliminary estimates of economic variables like GNP, CPI and PPI from different US government agencies in evaluating the forecast methods that are proposed.

Combining Statistical and Judgemental Information for the Selection of Forecasting Methods: A Knowledge Based Approach

Guy Melard
Université Libre de Bruxelles, Institut de Statistique, Campus Plaine ULB CP 210, Boulevard du Triomphe, B-1050 Bruxelles, Belgium
Jean-Michel Pasteels
Université Libre de Bruxelles, Departement d'economie appliquee (DULBEA) CP 140, 2, avenue Paul Heger, B-1050 Bruxelles, Belgium

This paper is an extension to the works of Amstrong & Collopy [IJOF 1992, Management Science 1993] and Weitz R. [1986] on knowledge-based forecasting. Here, we consider different data types (yearly, quarterly, monthly). We present a knowledge based system for the selection of the appropriate forecasting method(s). The information set contains both statistical (presence of trend, seasonal pattern, randomness, cycle, extreme values, ...) and judgmental information (causal factors, level discontinuities, suspicious patterns, ...). The system contains few modules: a statistical module based on robust and non-parametric tests which computes the statistical information; a knowledge base containing the expert knowledge (and preferences) and an inference engine (compiler) which relates both modules. The user can modify the expert knowledge and adapt it consequently for his own domain.

Issues in Forecasting IV

Chair: ***Sergio Koreisha***
Department of Decision Sciences, University of Oregon, Eugene, Oregon 97403 USA

The Entropy Principle, Model Misspecification and Parameter Estimation in Transfer Function Models

Mohd Salihin Ngadiman
Faculty of Computer Science and Information System, University of Technology Malaysia, Locked Bag 791, 80990 Johor Bahru, Johor, Malaysia.
Alan J. Watkins
Statistics & Operational Research Group, EBMS, University of Wales, Singleton Park, Swansea SA2 8PP, UK

Transfer function models are widely used in practical forecasting scenarios, since, when appropriate to the available data, they offer better forecasts over univariate counterparts. However, model identification is subject to error, which then affects both parameter estimation and forecasts from the fitted model. The considerable literature on model misspecification in time series analysis is largely concerned with the effect on prediction error in a univariate setting; in particular, there seems to be no general discussion for transfer function models. In this paper, we consider a more general framework, regarding the fitted likelihood function as summarising the information in the data, and thus providing, through the entropy principle, the theory behind properties of parameter estimates. We present some straightforward examples to illustrate this approach, and then consider the agreement between asymptotic theory and small sample practice, some computational issues, and the relationships between fitted and true model parameters.

Pre-Testing for Unit Root, and Bootstrapping Results in Some Swedish Macroeconomic Time Series

Thimothy Oke
Johan Lyhagen
Statistiska Institutionen/Department of Statistics, Uppsala University, P.O.Box 513, S-751 20 Uppsala, Sweden

It is often a crucial necessity to be able to identify economic time series as difference stationary (DS) or Trend stationary (TS) because of their economic implication. Statistical tests of significance have become a strong tool to establish whether a series follows a DS or a TS process. Here we investigate the consequences of pre-testing for unit root, because a DS series might well be identified as TS according to the outcome of a preliminary test of significance. We extend this idea to a resampling scheme (bootstrapping), where we use some Swedish macroeconomic time series.

Disentangling Low-Frequency versus High-Frequency Economic Relationships via Regression Paramater Stability Tests

Hui Boon Tan
Economics Dept., Fakulti Economi dan Pengurusan, Universiti Pertanian Malaysia, 43400 UPM Serdang, Selangor D. E., Malaysia
Richard A. Ashley
Economics Dept., Virginia Polytechnique Inst. & state University, Blacksburg VA 24060, U.S.A.

This paper develops and applies new tools for distinguishing and disentangling high-frequency versus low-frequency relationships among stationary economic time series. This new approach allows one to not only detect model misspecification in the frequency domain, but also provides a correctly specified model that improves the forecasting performance over the misspecified one. This is a three-step procedure; the first step transforms the regression model in the time domain to a real-valued model in the frequency domain, which is functionally identical to an ordinary regression model, the only difference being that "observations" of this model correspond to different frequencies rather than to different time periods. Consequently, in the second step, well established regression parameter stability tests are used to detect and assess the frequency dependence of relationships among the series. In the third step, the results of the parameter stability acrosss frequency tests is used to sensibly choose the best varying parameter model in the frequency domain, which is then back-transformed to a time domain model and used for forecasting.

Outlier Analysis

Chair: ***Ana Justel***
Center for Operations Research and Econometrics, Université Catholique de Louvain, 34, Voie du Roman Pays, 1348 Louvain-la-Neuve, Belgium

The Effect of Automatic Intervention Analysis on Forecasts: Empirical Findings

Guy Melard
Institut de Statistique, CP 210 Campus Plaine ULB, Boulevard du Triomphe, B-1050 Bruxelles, Belgium

Jean-Michel Pasteels
Universite Libre de Bruxelles, Departement d'economie appliquee (DULBEA) CP 140, 2, avenue Heger,B-1050 Bruxelles, Belgium

J. Ledolter (IJOF, 1989) published a theoretical paper concerning the effect of additive outliers on the forecasts from ARIMA models. He showed that an additive outlier in the series results in an increase of the forecast error provided that the outlier occurs close to the forecast origin. We investigate empirically the consequences of ignoring occasional outliers on forecasts. We use the 1001 series of the M-competition and compare the forecasts before and after adjustements for outliers. The adjustements for outliers are made by automatic ARIMA modeling with intervention analysis. The first results are rather heterogeneous and do not confirm the theoretical findings. The gain in forecast accuracy is only observable for small horizons. The results are very different accross series types (quarterly, monthly, micro, macro, demographic). This experiment shows that intervention analysis should be done manually by some domain expert rather than by an automatic program.

Distinguishment of Outlier Point and Analysis of Influence of Influential Point in Forecasting of Linearity Regression"

Chen Fuzeng
Department of Management Engineering, Harbin University of Science and Technology, Heilong Jiang 150080, China

Linear regression is the method generally used in long-term and middle-term forecasting. There are usually outliers and influential points in the dataset used. In this paper, first inspection statistic of outlier point is constructed with the model of mean shift and variance inflation. Then the outlier point in dataset can be distinguished and deleted. Second based on the concepts of Cook displacement, Welsch-Kuhn displacement and likelihood displacement, the influence of the point (Y_i , X_i^T) in dataset upon the estimation of the model parameters and the forecast can be analyzed with respect to confidence region, likelihood ratio and model fit. Then the statistical diagnostic of the forecast model of regression can be done. So that the forecasts will be more in line with the actual observations.

Robust Bayesian Forecasting for Autoregressive Processes

Ana Justel
Center for Operations Research and Econometrics, Université Catholique de Louvain, 34, Voie du Roman Pays, 1348 Louvain-la-Neuve, Belgium

We propose a robust Bayesian procedure to predict in an autoregressive time series avoiding the masking problem. The posterior distribution of a new observation is estimated by using the Adaptive Gibbs Sampling Algorithm, which modifies the initial conditions of the Gibbs sampler in each stage. The new procedure provides: (1) a method to detect the outlier positions and the magnitudes of the outlier effects; (2) a sample from the posterior distribution of the autoregressive parameters and the error variance; and (3) a sample from the posterior distribution. of the forecast values. Our proposal is illustrated with several examples.

Neural Networks in Forecasting III

Chair: ***Burhan Türkşen***
Department of Industrial Engineering, University of Toronto, Toronto, Ontario M5S 1A4, Canada

Environmental Time Series Prediction Using Neural Networks

Gerson Lachtermacher
Geraldo Pereira Simas
Depart.de Engenharia de Produçao, Universidade Federal Fluminense, Niteroi - Rio de Janeiro - Brazil

Artificial Neural Networks have been studied as an alternative to the traditional time series models. In this paper we describe the basic concepts of this alternative and briefly survey the existing bibliography. Two case studies (one using an Ozone concentration time series and the other using Water Consumption time series) are analyzed and their results compared against traditional forecasting methods. The neural network models outperform all other models in one step ahead forecasting and show similar results to the SARIMA model in multi-step forecasting. A detailed step by step description of the methodology is presented to facilitate the use of this new method as a forecasting tool.

Time Series Forecasting: Artificial Neural Networks and Structural Models

Luiz G. L. Fernandes
Marcelo S. Portugal
Philippe O. A. Navaux
Universidade Federal do Rio Grande do Sul, Felicissimo de Azevedo 568/202, 90540-110 Porto Alegre RS, Brazil

This article has a dual objective. On one hand we present the Artificial Neural Network (ANN) model from a statistical perspective. On the other hand, we also present two forecasting exercises to allow an empirical comparison between the ANN model and the structural time series model, also called unobservable components model (UCM). We use the UCM as a tool to help determining the topology of the ANN. After decomposing a time series in its unobservable components, we then use a trend, cycle and seasonal neurones to build the ANN. The results do not show a clear cut conclusion as far as one step ahead forecasts are concerned, but for longer time horizons the ANN has a better forecasting performance.

Reconfiguration Control of the High-Reliable Systems by Neural Networks

Vaclav Prenosil
Military Academy in Brno, K-303, PS 13, 612 00 Brno, Czech Republic

Technical systems have to fulfill specific requirements as to as reliability of their operation. In the synthesis of reliable systems several different approaches are used, e.g., the application of over-dimensioned system components, the improvement of component and system production technology, the use of redundant system structures. A new methodology consisting in use some forecasting methods (for example by artificial neural networks) for prediction of systems evolution is proposed in this paper. The paper covers three phases of our research: a general methology, systems analysis and an idea of predicting diagnostic. The predicting diagnostic use a special block (a predictor-arbiter) which uses predictions for control of reconfiguration and regeneration of the system. Some experiments in this area are discussed too.

A Forecasting System Based on Neural Network Integrating with Qualitative Analysis

Jian Chen
School of Economics and Management, Tsinghua University, Beijing,100084, China

The power of a neural network comes from its nonlinear relationships and its robustness to deal with noisy and incomplete data. However, owing to their complex functional form, ANN models are difficult to explain as well as other limitations. In this paper, a system framework for economic forecasting is proposed based on neural network integrated with qualitative analysis. The system works as follows: firstly, the qualitative trend is predicted, and the relevant variables and model structure are determined through causal analysis and qualitative reasoning, which would be valuable for explaining ANN models; then, a neural network model is constructed and trained with appropriate data adaptively; and finally, the forecasts

are obtained from the model. An application for predicting the GDP of third industry of a city is presented. The result is satisfactory.

Forecasting Software II

Chair: ***Valderio A. Reisen***
DEST- Universidade Federal do Espirito Santo, Departamento de Estatistica- CCE, Vitoria- ES- Brazil

The Impact Of CAL, Forecasting And The Information "Superhighway"

W.K. Annie Chu
K. Lawler
Bijan Tabatabai
Business School, University of Sunderland, St. Peter's Campus, St. Peter's Way, Sunderland, Tyne & Wear, SR6 0DD, UK

The basic objective of this paper is to measure the scope and potential impact of computer aided learning (CAL) for forecasting in academic institutions in Europe in the near future, given rapid developments on the "super highway" and the new dimensions of distance learning. To this end, the paper will:

1. analyse the most popular forecasting techniques used in the UK universities and other institutions; 2. suggest a rule-of-thumb CAL programming language or authoring package to develop a non-linear learning package in forecasting; 3. attempt to assess the future developments of CAL for forecasting package in the context of the "super highway" and technological changes which will impinge on distance learning in the next decade.

Research at Sunderland within the university and industrial sectors has shown that critical problems occur when novices are given material on forecasting techniques because very often insufficient time is available to absorb key assumptions concerning the methodologies (Makridakis 1993). This paper argues the case for development of a forecasting techniques tutorial system.

A Computer Program for Testing and Estimating the Fractional Parameter in the ARIMA(p,d,q) Model

Valderio A. Reisen
DEST- Universidade Federal do Espirito Santo, Departamento de Estatistica- CCE, Vitoria- ES- Brazil

This work presents an efficient computer program, which is written in FORTRAN, for testing and estimating the fractional parameter d in the ARIMA(p,d,q) model. The methods used for finding the estimates of d are based on the regression of the logarithm of the spectral density of the process. One method uses the periodogram function (Geweke and Porter-Hudak, 1993) and the other uses the smoothed periodogram function (Reisen, 1994). The program also gives the asymptotically and estimated variances of both estimates which can be used to obtain the confidence interval of d. With the results of the program, one can evaluate whether the series has the property of a long memory. Some examples of series where d is fractional are discussed and presented.

The Design and Use of Software for Estimation of Time Series Models

José Alberto Mauricio
Departamento de Economia Cuantitativa, Facultad de Ciencias Economicas y Empresariales, Universidad Complutense de Madrid, Campus de Somosaguas, 28223 - Madrid, Spain

It is well known that ARMA models are useful tools for forecasting purposes. In fact, it is almost always the case that new forecasting techniques are compared with traditional ARMA models in order to test their performance. Since reformulation of a fitted ARMA model depends heavily on output generated by some estimation method, the estimation stage in the model building procedure is of critical importance to guarantee a good forecasting performance of the fitted model. In this paper, some guidelines are given on designing and using computer programs for exact maximum likelihood estimation (EMLE) of time series models, including univariate and vector ARMA models and transfer-function-noise models. It is shown that a modular design can be implemented in order to write expandable and easy-to-use code for estimating an almost unlimited range of time series models. Some issues related to the practical use of EMLE algorithms in the context of a real forecast and monitor service for the Spanish economy are also considered.

Software System DYNAMICS - Tool for Computer-Aided Modelling, Simulation Graphic Mapping of Dynamic Processes

Ye.I. Somov
S.A. Butyrin
I.A. Gerasin
S.A. Gerasin
Irkutsk Computing Center, Siberian Branch, Russian Academy of Sciences, Irkutsk, Russia

We present our results on creation and emloyment of the software system (SS) DYNAMICS for research of dynamic processes in a complex continuous-discrete system for which the problems of computer-aided modelling, simulation and graphic mapping are quite actual. The SS supports that functions for control systems, as well as solving any user problems in special problem areas, which are described by differential and difference equations, also by transfer functions. The SS' basis is represented by the modelling language MATFOR, which is intended for creation and assembly of components in the vector-matrix reprezantation. Its principal difference from well-known MATLAB is that SS uses the compiling mode instead of interpreting, furthermore, the conception of assembly of models from software components is supported. The SS has been sucessfully applied in the leading Russian Academic and Applied Institutes and Universities, also for forecasting of damanges in complex systems.

Improving Forecasting Accuracies

Chair: ***Michael Geurts***
Marriott School of Management, Brigham Young University, Provo, Utah 84602, USA

Partitioning a Step Beyond Combining to Improve Forecasting Accuracy

Micheal Geurts
Marriott School of Management, Brigham Young University, Provo, Utah 84602, USA

This paper discusses partitioning a time series, forecasting the partitions, and then adding the forecast of the partitioned time series together to generate an improved forecast of the original series as a way to increase forecasting accuracy. The emphasis is on partitioning a time series into a *permanent* component and a *temporary* component.

The paper discusses statistical reasons why partitioning works, the effect of increased sample size, reduced variance, model misspecification, a test for measuring forecasting improvement from partitioning, where to partition, methodology for partitioning into permanent and temporary components, relationships to partitioning and combining, and time partitioning.

The Predictive Ability of Accounting Variables: The Life Cycle Hypothesis

Mohamed Onsi
School of Management, Syracuse University, Syracuse, NY 13244-2130, USA
Florence Kirk
Accounting, Finance, and Law department, School of Business, SUNY Oswego, Oswego, NY 13216, USA

The purpose of this research is to examine the predictive ability of three accounting measures of financial performance (net sales, free cash flow, and net income) in relation to stock returns over the different phases of a firm's life cycle. The rationale stems from economics (growth theory of the firm), marketing (product portfolios), and management (strategic planning). The life cycle hypothesis stipulates that the firm will go through different phases: rapid growth, growth, maturity, stagnation, and then a declining phase. Variables such as net sales, net income, free cash flow, plant and equipment acquisition, dividend policy and financial leverage are managed and behave differently during each phase. In an efficient market, stock returns are explained better by those significant variable(s) during the firm's phase of its life cycle. Such variable(s) can change from life cycle phase to the next.

The analysis of the regression models, using variance analysis, provide evidence that the three accounting variables do not have the same relative predictive ability of earnings during the different phases of the firm's life cycle. There is strong evidence that life cycle phases are important in differentiating between the relative predictive ability of these accounting measures. This finding has important implications for accounting policy makers studying the type of information relevant to stockholders. The new framework, in essence, has to be developed within the life cycle model.

Linear Index Models of Accounting Returns: A Structural Modeling Method to Understand and Improve Earnings Forecasts

Bernell K. Stone

This paper uses a structural model of accounting returns as basis for developing better earnings forecasts and for assessing analyst use of earnings volatility information in their forecasts.

The crux of a linear index model of accounting returns is to model an accounting return series as two components-an overall market component and a nonmarket component. These **accounting volatility models** are the analog of the linear market models of stock returns. These have been used to study accounting risk measures and to assess their relation to market risk measures. The basic idea here is recognition that a prediction of return on equity (ROE) is an implicit forecast of earnings given a value (forecast) of the common equity.

Economic Forecasting in the OECD

Chair: ***Mine Kuban Yücel***
Federal Reserve Bank of Dallas, Research Department, 2200 N. Pearl St., Dallas, TX 75201-2272, USA

Are OECD Forecasts Rational and Useful? A Directional Analysis

J.C.K. Ash
University of Reading, Dept. of Economics, Faculty of Letters & Social Sciences, PO Box 218, Whiteknights, Reading. RG6 6AA, UK
D.J. Smyth
Louisiana State University, Department of Economics, 2107 CEBA, Baton Rouge, LA 70803, USA
S.M. Heravi
University of Reading, Dept. of Economics, Faculty of Letters & Social Sciences, PO Box 218, Whiteknights, Reading. RG6 6AA, UK

Most evaluations of macroeconomic forecasts focus on quantitative errors: the forecasters' success or otherwise at predicting the direction of change has been largely ignored. Non-parametric tests on the direction of forecasts were originally developed by Merton (1981) and Henriksson and Merton (1981) in the context of whether a market-timing forecast would have value to an investor. This paper uses these methods to analyse the rationality and usefulness of semi-annual forecasts of the G7 economies made by the OECD. Changes in the main components of aggregate demand and output, inflation and the balance of payments are predicted up to three half years ahead. In total, we inspect the signs of 14,l.84 pairs of forecasts and outcomes. The results indicate that all these forecasts are rational and, looking ahead six months, generally useful. However there is no evidence that longer term forecasts- with a one year to eighteen month horizon - are valuable. With very few exceptions they are no better than a naive model that always predicted the same direction of change.

Structural Breaks in the Financial Sector Share, Savings and GDP Growth in OECD 1960-1992

Thomas Lindh
Tomas Lindstrom
Department of Economics, Uppsala University, Box 513, S-751 20 Uppsala, Sweden

Indivisibilities in extending financial markets imply level shifts in the financial cost share. Guided by a simple OLG model we search for structural breaks in the financial sector share of the seven major OECD countries and relate these to changes in GDP growth and the savings share. The even patterns of these macro series are classified by typicities. Financial structural breaks are associated with decreased savings ratios but ambiguous with respect to growth. We conjecture that most of the period studied can be characterized as a successive transition of increases in the financial sector share accompanied by lower savings and more sluggish growth.

Oil Price Shocks and Economic Growth: A Study of Eight OECD Countries

Mine Kuban Yücel
Stephen P.A. Brown
David Oppedahl
Federal Reserve Bank of Dallas, Research Department, 2200 N. Pearl St., Dallas, TX 75201-2272, USA

Oil price shocks have had major impacts on inflation and GDP growth in economies throughout the world. The correlation between oil price changes and business cycles has been well documented in the literature, although the link between increases in oil prices and recessions link has been more thoroughly studied than decreases in oil prices and their effects. While there are many estimates of the sensitivity of GDP growth and the price level to changes in oil prices, there isn't much research on how the interaction between monetary policy and oil shocks affects the economy. Using data for the United States, United Kingdom, Canada, Germany, France, Italy and Japan we study whether economies in which monetary policy did not accommodate the oil price shocks of the 1970's and 1980's performed any better than those in which monetary policy accommodated the price shocks. We employ a structural vector autoregressive model which includes oil prices, GDP, measures of money supply, interest rates, and inflation to analyze the effects of oil price shocks on the economy. One

advantage of this study is that we consider a period of time which has both rising and falling oil prices. Our results should give policymakers a better basis for conducting policy in the wake of future oil price shocks.

Multivariate Models II

Chair: ***Resat Kasap***
Dept. of Statistics, Faculty of Arts and Sciences, Gazi University, 06500 Teknikokullar, Ankara, Turkey

Large Scale Conditional Covariance Matrix Modeling, Estimation and Testing

Zhuanxin Ding
Frank Russell Company, Tacoma, WA 98401, USA
Robert F. Engle
University of California, San Diego, La Jolla, CA 92093, USA

A new representation of the diagonal Vech model is given using the Harmard product. Sufficient conditions on parameter matrices are provided to ensure the positive definiteness of covariance matrices from the new representation. Based on this, a sequence of new and simple models are proposed. A set of diagnostic test for multivariate ARCH models is proposed. The test is able to detect various model misspecifications by examing the orthogonality of the squared normalized residuals. A small Monte-Carlo study is carried out to check the small sample performance of the test. An empirical example is also given as guidance for model estimation and selection in the multivariate framework. For the specific data set considered, it is found that the simple one and two parameter models and the constant conditional correlation model perform fairly well.

Canonical Analysis of Multivariate ARMA Models

Marcia Woolf Bulach
5 Elsham Road, London W14 8HA, England

A variety of methods appear to be worth examining in order to overcome the well recognised difficulties of identification and prediction of a suitable Multivariate Time Series Model. Classical canonical analysis is implemented and applied to a realisation of a Multivariate Time Series in an original way. We partition the multivariable set into two overlapping sets or non-overlapping sets, the left set at a fixed lag 0 and the right set at a sequence of lags and we examine the subsets of the multivariable at different time lags. We try to elucidate the internal structure of the time-dependence between the component variables and to reduce dimensionality if the number of variables is large.

Usually when a Multivariate Time Series Analysis is required the researchers consider the complete set of variables. When their number is large and could with advantage be reduced to a smaller number of relations, canonical analysis is a technique that is often suggested to reduce the dimensionality and gives a simplification of the more general autocorrelation matrices that makes for easier interpretation. We did not restrict ourselves to low order models or to models based on Akaike's proposal (past/present)x(present/future).

A Vector Autoregressive Approach to the Dynamic Behavior of the Istanbul Stock Exchange Market

Nesrin Okay
Boðaziçi University, 80815 Bebek, Istanbul, Turkey

This paper suggests a vector autoregression (VAR) model to analyze the dynamic behavior of Istanbul Stock Exchange Market (ISEM). The findings show a forecasting performance of at least forty percent. A simple nine variable VAR is presented, determined by the macroeconomic fundamentals, such as spot dollar exchange rate, and risk free t-bill rate of return, as well as the Istanbul Stock Exchange Index (ISEI) and equally weighted Center for Applied Research in Finance index (CARF). The hypothesis that the stock returns do not cause each other (in the Granger sense) can be rejected at less than ten percent significance level for the majority of the nine stocks. Variance decomposition suggest that they account no less than 90 percent of their own innovations. The results support the idea that the adjusted stock returns has substantial exogenous component, that is, they are more than a forecast based on available information. In the model, addition of the CARF index as a control variable improve the results; variance decomposition suggests that CARF index accounts for between 0.29 and 7.42 percent of the innovation variance of the stocks from ISEM.

Budgeting and Forecasting

Chair: ***Badr Ismail***
School of Management, Syracuse University, Syracuse, NY 13244, USA

A Methodology for the Empirical Analysis of an Accounting System

Raquel del Rio Paramio
Departamento de Economia Cuantitativa, Facultad de CC. Economicas y Empresariales, Universidad Complutense
de, Madrid, Somosaguas, 28223, Spain

In this paper, the development of a methodology for the empirical analysis of an accounting system, by using the Box and Jenkins focus on time series (1970), is introduced. An approach to the solution given to several problems that have arisen confronting this study is offered: the analysis of flow variables, stock variables and aggregate variables. This methodological study has been applied to the accounting system corresponding to the Spanish Balance of Payments (SBP), with the aim of implementing a monitor and forecasting system for the SBP. The SBP time series corresponding to capital flows and balance variables from the different balances, show some special characteristics that other flows in economy do not show: values of variable sign and clear evidence of heterocedasticity, non-linearity and non-normality. Since theses series take positive values some months and negative values other months, it is not possible to apply Box-Cox transformation with lambda equal to zero in order to obtain good statistical properties. In this paper, some tecniques for the treatment of these series, which have been very useful in practice, are proposed.

Budgetary Accuracy and Managerial Performance

Paul Foote
P.O. Box 20, Accounting Department, College of Commerce and Economics, Sultan Qaboos University, Wilyat Al-
Seeb, Sultanate of Oman, Postal Code 123

Do managers whose budgets have high forecast accuracy have also managerial performance results better than managers with low forecast accuracy? Undergraduate business school students managed simulated firms in The Management/Accounting Simulation. They submitted monthly budgets for 64 managerial performance measures. After each month's decisions, the students received financial statements, forecast accuracy measures for the 64 managerial performance measures, and grades for the managerial performance measures. Each subsequent month, the students revised their budgets. Budgetary accuracy and managerial performance had equal weights in their grading. The results show the correlation between budgetary accuracy and managerial performance.

Forecasting and Planning in TVK Ltd.

Csaba Ilyés
Economic Consultant, Tiszai Vegyi Korribinat Ltd., H-3581 Tiszaujvaros, PF. 20, Hungary

In the last period, I could see in detail the planning system of the largest chemical company in Hungary. Hungarian companies are working at the age of changing. Some companies were collapsed. Some were closed but the most of the companies are transformed and privatised. One of the most important tasks for the companies is to change their structure and working area. During this time the managers require a lot of exact information about the company's activities, the market and the future changes. Although TVK Company will be privatised this year, the company even now tries to satisfy these requirements. Therefore a new management information system has been introduced in 1995 including planning and controlling systems. In my paper I would like to emphasize the milestones on this way; the database of forecasting and planning, computer technical supporting, methodological and practical background of forecasting and planning systems, etc.

Statistical Behaviour of Financial Time Series II

Chair: ***Gerald Lobo***
School of Management, Syracuse University, Syracuse, NY 13244, USA

Volatility Spillovers in Spot and Forward Foreign Exchange Markets

Peijie Wang
School of Management, University of Manchester, PO Box 88, Manchester M60 1QD, UK

This paper investigates the volatility spillover patterns between spot and forward foreign exchange rates. Using positive definite parameterization of bivariate GARCH, it has been found that the volatility in spot exchange rate is not only influenced by the magnitudes of the last period innovations in spot and forward exchange rates, but also by the signs in the two innovations. The volatility in spot exchange rate tends to increase when the last period innovations in spot and forward rates had opposite signs - a revelation which renders serious empirical insights.

Time Series Behavior of Foreign Exchange and Interbank Money Market Returns: Turkish Case

Cem Aysoy
Çiðdem Ýzgi Kogar
Cevriye Özcan
Research Department, The Central Bank of the Republic of Turkey, Ulus 06100 Ankara, Turkey

This paper investigates time series behavior of daily returns in foreign exchange and interbank money markets in a high inflationary developing country, namely Turkey. Daily observations of the U.S. dollar and German mark against Turkish lira and of overnight interest rates in the Turkish Interbank Money Market range between January 1988 and December 1995. Following examination of stationarity of data, stylized facts of a time series; i.e., such components as regular, trend, cycle and irregular are attempted to detect. Possible implications for modelling developments in these markets are also discussed.

Heteroskedasticity in Stock Market Prices Revisited: Unexpected Volume Versus GARCH Effects

M.F. Omran
Department of Accountancy and Finance, University of Stirling, Stirling FK9 4LA, Scotland, UK
Eddie McKenzie
Department of Statistics and Modelling Science, University of Strathclyde, Glasgow, UK

We extend the results of Lamoureux and Lastrapes (1990) to the U.K. stock market that GARCH modelling captures the serial dependence in volume of trade. We find that although the parameter estimates of the GARCH model become insignificant when volume of trade is used in the conditional variance of price changes, the autocorrelations of the squared residuals still exhibit a highly significant GARCH pattern. We argue that the serial dependence in volume of trade explains some but not all of the volatility persistence of the GARCH model. Furthermore, the uncorrelated component of volume of trade has a significant impact on the conditional variance of price changes. This can be attributed to the strong association in the timing of IOs in the price changes and unexpected volume found. Our results imply that volume of trade can help in forecasting future volatility as long as the emphasis is on prediction rather than explaining the joint dynamics of price-volume.

Time-Varying Risk-Premium Effect on Share Market Prices: A Test of Loanable Funds Predictions in Five International Share Markets

Mohamed Ariff
W. K. Wong
K. Sharma
Department of Finance and Banking, National University of Singapore, Kent Ridge, Singapore 0511, Singapore

Investors are assumed to shift their asset holdings between risky assets and cash (riskless) to maximize expected time rate of substitution between current and future consumption. If risk premium for investment in risky assets changes over time, prices of risky assets must change when risk premium is low (high) as demand for risky assets declines (rises). Tests relating different levels of time-varying risk premiums in five international share, that is risky, markets provide findings consistent with this investment behavior implicit in the Loanable Funds Theory.

Exhibitor Session II

Dilek Önkal
Faculty of Business Administration, Bilkent University, 06533 Bilkent, Ankara, Turkey

The CFA Program and Why Financial Forecasters Should Consider Becoming Chartered Financial Analysts

Edward Rosenbaum
Study Seminar for Financial Analysts, University of Windsor, Windsor, Ontario N9B 3P4

The letters "CFA" stand for Chartered Financial Analysts. This is the professional designation in the investment communities of the United States and Canada. In addition, the designation has become increasingly accepted in the worldwide investment community.

However, this acceptance is unevenly distributed. Thus, it is unquestionably accepted as "the" designation in the United States, Canada, Singapore, and Bermuda. While one out of 27,000 Americans, 17,000 Canadians, 4,500 Singapore, and 800 Bermudans are sitting for a CFA Examination each year, hardly anybody in Italy or Israel is. Evidence of the designation's acceptance is the fact that in 1995 twenty percent of the CFA Exams were written outside of the United States and Canada.

In order to receive the "CFA" designation, the principal requirements are to pass three annual examinations and to have three years experience in the field.

Why should one bother to get the CFA designation? It is an indication to the investment community that you have passed three rigorous examinations on the body of knowledge, abide by a rigorous ethical code, and are "one of us."

Reciprocal arrangements have been made with the investment analysts' societies in the United Kingdom and Japan, so that those who have the national designation of the investment community of those countries can obtain the CFA charter by passing only one CFA examination.

Advanced Statistical, Numerical and Data Visualisation Software Products and Service Solutions Offered by UYTES

Ersan Takci
UYTES, Koza Sokak 147-5, Gaziosmanpasa, Ankara 06670, Turkey

UYTES is a leading supplier of world class software products and solution systems in Turkey in statistical, numerical, data visualisation and data mining fields. This talk will include a brief description of these products and their wide use in the world as well as in Turkey.

Electricity Demand Forecasting

Chair: ***Derek W. Bunn***
London Business School, Department of Decision Sciences, Sussex Place, Regent's Park London, NW1 4SA, UK

Electricity Energy Forecasting: An Application to the Brazilian Integrated System

Reinaldo Castro Souza
Sistemas, DEE, PUC/RJ, Rua Marques de Sao Vicente 225, Gavea, 22453, Rio de Janeiro RJ, Brazil

The adoption of liberal policies in Brazil, associated with the stability of the economy, dated March 1994, has brought about the discussion on privatization of important sectors of the economy, in particular, the electrical sector. The Brazilian electrical system is still state owned and composed of some Power Generating Plants, various Power Distribution Companies (at least one for each state of the country) and a central controller company called Eletrobras. One of Eletrobras working group, GTPC (Load Forecast working group) is responsible for the generation and analysis of the monthly and weekly energy forecasts for all the Distribution Companies. In this paper we describe the ways these forecasts are produced nowadays and the main results of the forecasting system we are developing, which uses the combination of the forecasts produced by existing and new approaches.

Interactive Middle-Term Electric Load Forecasting

Emil Pelikan
P. Matejka
M. Slama
Dept. of Nonlinear Modelling, Institute of Computer Science, Pod vodarenskou vezi 2, 182 07 Prague 8, Czech Republic
K. Winkler
Czech Power Co., Jungmanova 29, 11148 Prague, Czech Republic

In our study we present a new approach to the electric load forecasting problem with prediction horizon 1-365 days ahead. This approach is based on the application of the Kohonen self-organising feature maps on the set of 24-hour load diagrams. The selected prototypes (cluster centres) form a base-forecast for a given period. This forecast can be further interactively modified using information of the expected meteorological, social or calendar events. The usefulness of the presented approach is demonstrated using data collected by the Czech Power Co. in the period 1994-1995.

Adaptive Forecasting of Electricity Load Demand in the United Kingdom

Peter Young
Diego Pedregal

Centre for Research on Environmental Systems and Statistics, Lancaster University, Lancaster LA1 4YQ, UK
The paper describes recent research concerned with electricity load demand forecasting. The methodology is based on a particular type of Unobserved Components (UC) model formulated in discrete-time state space terms. Central to the particular UC model used in this study is a Dynamic Harmonic Regression (DHR) model, in which the harm2onic regression parameters are assumed to evolve stochastically as Generalised Random Walks, so allowing for their adaption in real-time applications. The noise variance ratio (hyper) parameters in the DHR model are optimised in the frequency domain and the model is implemented within a recursive estimation framework based on Kalman filtering and Fixed Interval Smoothing (FIS) algorithms. The study is being carried out in collaboration with the UK electricity supply industry and the efficiency of the methodology is illustrated by examples using typical UK demand data.

Judgemental Forecasting III

Chair: ***Peter Ayton***
Department of Psychology, City University, Northampton Square, London EC1V OHB, UK

Scenario Planning: Pros and Cons

George Wright
Strathclyde Graduate Business School, 199 Cathedral Street, Glasgow G4 0QU, Scotland

This paper considers the advantages and limitations of scenario planning. The evaluation is informed by an analysis of the literature on scenario planning viz-a-viz the literature on judmental probability forecasting. Especial attention is paid to the role of identified heuristics and potential biases in the individual and small-group processes invoked by the requirement to make judgments under uncertainty. Issues to do with evaluating the reliability and validity of judgmental forecasting and planning are considered and discussion then focuses on evaluation of forecast accuracy and measurement of the adequacy of the invoked judgemental process.

Adjusting Judgmental Extrapolations Using Theil's Method and Discounted Weighted Regression

Paul Goodwin
Department of Mathematical Sciences, University of the West of England, Frenchay, Bristol, BS16 1QY, UK

Theil's method can applied to judgmental forecasts to remove systematic error. However, under conditions of change, the method can reduce the accuracy of forecasts by correcting for biases which no longer apply. In these circumstances it may be worth applying a local correction model based on discounted weighted regression. This paper reports on the application of Theil's original method (THEIL) and a discounted weighted regression form of Theil's method (DWR-THEIL) to the judgmental extrapolations made by 100 subjects in an experiment. Extrapolations were made for both stationary and non-stationary and low and high noise series. The results suggest that under several conditions DWR-THEIL can lead to significant improvements in accuracy over both the original judgmental and the THEIL corrected extrapolations. Moreover, while THEIL's corrections significantly reduced the accuracy of judgmental extrapolations for some series, the DWR-THEIL extrapolations were never significantly less accurate than the original judgments.

Judgemental Forecasting of Trends and Changes in Trends

Marcus O'Connor
School of Information Systems, University of New South Wales, Sydney, New South Wales 2052, Australia
William Remus
College of Business Administration, Department of Decision Sciences, University of Hawaii, 2404 Maile Way, Honolulu, Hawaii 96822, USA

Prior studies of judgemental time series forecasting have found that people have problems with downward sloping series. This laboratory based study presents a controlled experiment of series direction and it investigates the problems of changing trends. Results confirm that people have significant difficulties in dealing with downward sloping series and that behaviour is consistent with a general tendency to anticipate that downward series will reverse themselves. There is a significantly less tendency to do so for upward series. However, people tended to assume a comparative advantage over the statistical method in the periods when the time series changed direction. Implications of the way a series is described and presented will also be discussed.

Energy Forecasting II

Chair: ***Shanti Majithia***
Head of Demand Forecasting, National Grid Control Centre, The National Grid Company PLC, St Catherine's
Lodge, Bearwood Rd., Sindlesham, Nr. Wokingham RG41 5BN, UK

Short Term Forecasting of Industrial Electricity Consumption in Brazil

Emanuel Pimentel Barbosa
Dep. Estatistica - ICEx/UFMG CP 702, 30161-970, Belo Horizonte MG, Brazil
Regina Sadownik
ACE. T - FURNAS Centrais Eletricas SA, 22283-900 Rio de Janeira RJ, Brazil

This article presents short term forecasting of industrial electricity consumption for the main consuming states of Brazil (Sao Paulo, Rio de Janeiro and Minas Gerais), at the Southeast region of the country. The focus is on comparing the results obtained after applying two distinct approaches: dynamic Bayesian models and econometric models. The first one, that we propose, is based on ructural statistical models for multiple time series analysis and forecasting, involving non-observable components of locally linear trend for each individual series and a shared multiplicative seasonal component described by dynamic harmonics.

The second method, adopted by the electric power utilities in Brazil and abroad, is based an econometric models. The models are relatively simple and consist on extrapolation of the past data based on statistical relations of simple or multiple regression type. To illustrate the proposed methodology, a numerical application is considered with real data. The data is a 3-dimensional time series, representing the monthly industrial consumption of energy from the main Brazilian public power utilities (ELETROPAULO, CEMIG and LIGHT), from January 1990 to September 1994. The algorithms considered in this work were implemented via the software S-PLUS.

Technological Forecasting of Energy and Water Consumption Rates of Household Appliances

Ýffet Ýyigün
Fatih Özkadý
Merih Pasin
Arçelik A.Þ., R&D Center, Tuzla, 81719 Ýstanbul, Turkey

In recent years, both European Countries and US policy makers have taken initiatives for the reduction of energy and water consumption of home appliances. Currently, European Community Directives 94/2/EC (January 1994) and 95/12/EC (May 1995) are guiding the home appliance manufacturer's new product development projects and their market strategies. By the end of this decade, the tighter grading system expectations for consumption values including market exclusions is the main reason for accelerated R&D projects which are targeting the lower consumption values of household appliances. To be ready on time for more competitive market environment, it is very critical to select right target for those projects. The aim of this study is to use technological forecasting technique as an aid to set right target for projects aiming to lower consumption levels and to discuss the results from a manufacturer's point of view. Consumption database and technological forecasting studies have been performed for upright freezers, larder refrigerators, front loading and dishwashers which are being produced in Europe. Database covers the last ten years. The method used for technological forecasting is Growth Curve. The results show that this methodology can be used for setting right targets for consumption levels of coming products. A discussion on the applicability of the method is also included to the paper.

An Intelligent Forecasting System for Power Electric Companies

Marco Aurelio Pacheco
Marley Vellasco

ICA: Nucleo de Inteligencia Computacional Aplicada, Departamento de Engenharia Eletrica, Pontificia Universidade Catolica do Rio de Janeiro Rio de Janeiro - Brazil, and
Departamento de Sistemas de Computacao, Universidade do Estado do Rio de Janeiro, Rio de Janeiro - Brazil

Ricardo Salem Zebulum

ICA: Nucleo de Inteligencia Computacional Aplicada, Departamento de Engenharia Eletrica, Pontificia Universidade Catolica do Rio de Janeiro Rio de Janeiro - Brazil

This work presents a Neural Network based intelligent load-forecasting system applied to the Brazilian electrical system. The article adresses the case of monthly load forecasting. The results are analyzed using three different metrics: MAPE (Mean Absolute Percentage Error), RMSE (Root Mean Squared Error) and Theil's U. The portability of the forecasting system for different power companies has also been investigated. Monthly load forecasting has been performed for all power electric companies of Brazil. One month ahead load forecasting shows very promising results in most cases. We have used a one hidden layer backpropagation Neural Network in all implementations. The network inputs are typically the past load values and the forecasting period. The optimal Neural Network architecture and parameters have been achieved for each particular power company by making a large number of tests.

Electricity Demand Forecasting in the Operational Time Scale

Shanti Majithia

Head of Demand Forecasting, National Grid Control Centre, The National Grid Company PLC, St Catherine's Lodge, Bearwood Rd., Sindlesham, Nr. Wokingham RG41 5BN, UK

Electricity demand forecasting within the National Grid Company in the operational time scale is carried out using various mathematical models. These models then use comprehensive weather forecasts supplied by the UK Meteorological Office to produce demand forecasts. These demand forecasts then become the vital input to schedule plant from 15 minutes to 24 hours ahead.

The England and Wales electricity system is based largely on fossil-fired generating units: coal, oil, and nuclear. These units are regularly 2-shifts to meet the minimum demands at night and the peak demands during the daytime. A computerised scheduling program determines the optimum generator on/off times based on predicted consumer demands. Accurate demand forecasts are thus a prerequisite to secure an economic management of the power system.

Macroecenomic Forecasting II

Chair: ***Sumru Altuð***
Graduate School of Business, Koç University, Çayýr Cad., 80860 Ýstinye, Ýstanbul , Turkey

Forecasting Based on the Keynesian Market Balance

Erik A. Cerven
Krokbacksv. 11, 680 63 Likenas, Sweden

A model of forecasting is presented in which the value added is a linear function of time and investment. The market value is computed based on a market balance condition of demand and supply constituted by a multi-variable function of measurable macroeconomic factors. A round of production is sub-divided into salaried time, value added, and market value. Surplus is first set aside as savings and then as investment which, after a time lag, is added as a multiple on salaried time yielding value. The forecasted value growth including credit-free investments may be computed either as accumulated value added or market value. The computations indicate more forecasted growth of value and credit-free investments on an open market than on a closed one and a positive correlation between a strong currency and the investments.

The Impact of Public Investment on Private Capital Formation: A Study Relating to Brazil, 1965-1990

Carlos Henrique Rocha
Joanilio Rodolpho Teixeira
Catholic University of Brasilia, UCB, Department of Economics, SQSW 101 bloco K ap. 306, Brasilia - DF, 70.670-111 Brazil

The central focus of this paper is on the question: has public capital accumulation crowded out private investment in Brazil? The sample period is 1965-1990. The results obtained from an error-correction-model, ECM, show that public and private investments are substitutes.

On Forecasting Macroeconomic Aggregates: An Empirical Investigation

Sal Amirkhalkhali
Department of Economics, Saint Mary's University, Halifax, Nova Scotia B3H 3C3, Canada

This paper examines the relative forecasting performance of several methods proposed in the literature for macroeconomic aggregates within a real dynamic system using Monte Carlo experiments with anti-thetic variates. Most of the model-structures used in Monte Carlo experiments have been deliberately made economically anonymous. In this study, the specified structure within the model portrayed the Canadian economy and the parameters are chosen to be realistic dimensions. The model explains several basic macroeconomic aggregates such as consumption, investment, interest rate, inflation, unemployment rate, and income. Within this real dynamic model, the performances of several methods are evaluated in terms of the accuracy of the within-sample as well as post-sample predictions for several macroeconomic aggregates using the mean absolute percent error of forecasts.

Stock Prices and Accounting Data

Chair: ***Mine Aksu***
Graduate School of Business, Koç University, Çayýr Cad., 80860 Ýstinye, Ýstanbul, Turkey

The Quotient of Two Correlated Normal Variables: Application to P/E Ratios

Dolun Öksoy
Mehmet E. Karaaslan
College of Business, Alfred University, Alfred, NY 14802, USA

We present new results on the distribution of the quotient of two correlated normal variables as it pertains to the analysis of P/E ratio of securities. The results encourage use of the exact distribution of the quotient instead of the normal approximation. A fundamental question in security analysis is: What is the appropriate time to buy a particular stock (or portfolio)? The literature on the P/E ratio provides some answer by normal approximation. We demonstrate, by comparing the probability coverage of normal approximation with the distribution of the quotient for a sample of securities, that the coverage probabilities of normal approximation and the distribution of the quotient for some securities can be quite different leading to unwarranted buy or sell decisions, and to potential financial losses under an arbitrary P/E criteria.

Stock Market Anomalies

Yarkýn Cebeci
Garanti Investment Bank and Boðaziçi University, Bebek, Istanbul 80815, Turkey

This study aims at seeking the presence of stock market anomalies on the Istanbul Stock Exchange (ISE), determining the stationarity of these anomalies, and finally arriving at a position to evaluate the market efficiency in Turkey. The study covers all of the prominent market anomalies. These are the day of the week, January, turn of the year, turn of the month, size, earnings/price ratio and the period of listing effects. The results indicate that notwithstanding the differences in tax systems and other institutional features, most of the anomalies cited in the world's largest stock markets are present on the ISE. The fact that certain anomalies get erased away in time implies a learning process on the ISE.

Day of The Week Effect and Volatility on the Ýstanbul Stock Exchange

Ýsmail Orakçýoðlu
Roy Batchelor
Department of Banking and Finance, City University Business School, Frobischer Crescent, Barbican Centre, London EC2Y-8HB, UK

This paper tests for the presence of daily patterns in the expected return, and the variance of return in a panel of leading stocks traded on the Istanbul Stock Exchange (ISE). The study of the day of the week effect on ISE consists of two parts: (I) If the mean return generation process operates continuously in calendar time, then expected mean return for Monday will be different than any other day of the week. On the other hand, if the return generation process operates only during active trading time, mean returns will be the same for all five days; (ii) Variance of return will be investigated and the existence of a significant weekend effect on volatility will be analysed. Hypothesis test results are reported using a GARCH model. No strong day of the week effect on appearance in expected return, but excess volatility is observed after weekend and holidays.

Market Reaction to Annual Earnings Announcements and the Size Effect in Ýstanbul Stock Exchange

Türkan Önder
Faculty of Economics and Administrative Sciences, Göztepe, 81040 Ziverbey, Ýstanbul, Turkey

This paper examines the “information content” of annual earnings' announcements and the size effect in Ýstanbul Stock Exchange which is an emerging market for the period 1991. The results suggest that the annual earnings' announcements are “useful” to investors in setting new equilibrium prices as evidenced by significant negative excess returns during the announcement period. Cross-sectional differences related to size, book-to-market are also investigated. The finding of

negative size and positive book-to-market effects confirms that abnormal returns are a compensation for risk as cited in the literature.

Efficiency in Banking Industry

Chair: ***Kamil Yýlmaz***
Graduate School of Business, Koç University, Çayýr Cad., 80860 Ýstinye, Ýstanbul, Turkey

Analysis of Asset and Liability Management Decisions in a Commercial Bank

Emine Persentili
Sabancý Holding, Sabancý Center, Ýstanbul, Turkey
Sibel Güven
Industrial Engineering Department, Middle East Technical University, Ankara, Turkey

Banks in Turkey operate in a challenging environment with volatile markets, unstable interest rates and exchange rates, high inflation and devaluation rates, pliis constantly changing regulations. In this environment, bank balance sheet management which involves the determination of` the size and composition of assets and liabilities over a multi-period planning horizon while maintaining the profitability within the liquidity requirements and the overall risk preferences of bank's management becomes a complicated strategic planning issue. It is further complicated, since the decisions made at any time affect profits, liquidity and risk not only at the time they are made, but also in the periods that follow. This paper summarizes the statistical analysis stage of a study carried out in constructing a multi-period linear programming model for balance sheet management of` a Turkish Bank. The importance of understanding the behavior of assets and liabilities over time, and estimation of parameters used in the model is emphasized in developing a model to be used as a planning tool for assessing consequences of' alternative decisions and changing, environmental scenarios.

Market Structure and Efficiency in the Turkish Banking Industry

E. Nur Özkan-Günay
Þenesenevler Can Sok., Uçarsu Apt., No. 5/29, Erenköy 81090, Ýstanbul, Turkey

Banking in Turkey has witnessed structural changes with the implementation of Financial Liberalization Program since 1980 and the industry is expected to experience more drastic changes in the next decade as a result of globalization and integration with European financial markets. The number of banks has increased and competition has brought pressure to close inefficient branches. On the other hand, preferential government supports for the state owned banks and encouragement of mergers among large banks aim to ensure safety in the banking industry, but it has also provided unfair protection and resulted in the fostering of oligopolistic market and incurred market inefficiency. Policy makers, economists and the banks themselves have raised concerns over the competitiveness of the industry. The argument so far has been largely based on historical analysis of change in banking industry, many trends in the past have been identified, but their importance for what will happen in the next decade has been ignored for the most part. An understanding of the structure of the banking industry is crucial for evaluating changing circumstances, for forecasting and developing appropriate policies and legislation for the early 2000s. Therefore, the objective of this study is to examine empirically whether concentration is a result of collusive behavior or efficiency of the leading banks is the Turkish banking industry. The next step is to discuss the projection of trends that are based on the empirical findings. If the existing market structure reflects a collusive behavior of large Turkish banks, then a public policy toward encouraging entry, discouraging mergers between large banks and privatization of the state owned banks can be justified in terms of efficiency in the coming years.

Treasury's 3-Month Borrowing Rate: An Analysis of the Demand Pressures on the Borrowing Rate

Zerrin Gürgenci
T.C. Merkez Bankasý, Araþtýrma Genel Müdürlüðü, 06100 Ulus, Ankara, Turkey

In Turkey, most of the Treasury's borrowing is through the auction market, where the major participants are the banks. This study inquires the factors affecting the effective auction rates over June, 1987-December, 1993, with an emphasis on the demand for the Treasury bills (T-bills). Starting from the banks' demand for the T-bills, which is a solution to the short run profit maximization problem, a constant parameter error correction equation for the 3-month borrowing rate is estimated. Estimation results indicated that in the long run, the borrowing rate is positively related to the real value of the time deposits denominated in Turkish lira, the real exchange rate, interbank overnight borrowing rate, and the consumer prices. In the short run, total impact of the current rate the inflation, depreciation of the Turkish lira, the interbank overnight borrowing rate are positive, while it is negative for the time deposits denominated in Turkish lira.

Rankings of Turkish Banks by Using Single and Many Strategic Variables and by Relative Efficiency

Noyan Dereli
Albert Mearns
Business School, Liverpool John Moores University, 98 Mount Pleasant, Liverpool L3 5UZ, UK

In many countries and in Turkey the soundness of the banks is assumed to be predictable by using a set of rankings using one variable. This is quite clearly observed in Turkey, where the banks in their advertising slogans of quote rankings using either the number of branches or the total of the assets. There are in many Western countries rating organizations that give ranks of organizations (in some form of league tables) using singly or in some sort of a list the strategic variables, mostly observed in the balance sheets. The main aim of this article is to construct and compare various different types of rankings of the Turkish banks using the yearly balance sheets from 1980 onwards as data and in this process examine if the rankings could be used for predictors of economic *soundness*.

We have obtained a number of different types of rankings. Firstly, a set of (augmented) balance sheet items are used singly to construct rankings for different years. Next, a set of strategically important financial ratios are constructed and these are used in rankings. Thirdly, the single rankings of different ratios are treated as different attributes and a multi-attribute decision analysis tool (linear assignment technique) is used to obtain a single time series of composite rankings. Finally, using data envelopment analysis the rankings for Turkish banks are made and a time series of league tables are calculated. All these different rankings are compared pairwise and in groups using different types of rank correlation coefficients. Were they to be associated, it could be claimed that rankings could be used as indicators of soundness of the banks.

Analysts' Forecasts of Earnings II

Chair: ***Eric Press***
Acounting Dpartment, School of Business and Management, Temple University, Philadelphia, PA 19122, USA

International Variation in Accounting Measurement Rules and Analysts' Earnings Forecast Errors

Sudipta Basu
LeeSeok Hwang
Baruch College, City University of New York, New York, NY 10010
Ching-Lih Jan
California State University - Hayward, Hayward CA 94542

We hypothesize that accounting measurement rules and disclosure environments affect analysts' forecast accuracy by changing the variability of earnings. We argue that the use of accruals and historical cost accounting reduces the volatility of earnings, reducing analysts' earnings forecast errors ex-post. We also argue that restricting the choice of accounting methods can result in inappropriate accounting methods by some firms, increasing average forecast errors. We theorize that the frequency, timeliness and comprehensiveness of accounting disclosures affect the quality of the information used for analysts' forecasts, and that more informative disclosure environments should reduce forecast errors ex-post. These hypotheses are tested in an international context, where we examine whether variation in accounting measurement rules and disclosure environments across countries explain variation in analysts' earnings forecast bias and accuracy. Our preliminary results in a multiple regression are largely consistent with our hypotheses.

The Association Between Analyst Forecast Revisions, Accounting Changes, and the Behavior of Security Returns: Functional Fixation Revisited

Claire Eckstein
1661 4th Street, Brooklyn, NY 11204, USA

The purpose of this study is to propose and test a theory of Financial Analyst Fixation [FaF]. It is hypothesized that the investor makes a rational decision to rely on the financial analyst as a source of information. Financial Analyst Fixation is descriptive of a scenario wherein the investor does not investigate the underlying economic reasons for an analyst forecast revision of earnings per share. Therefore, the investor does not determine if the forecast revision was a result of a change in accounting method, or an outcome of changing economic conditions. To test the FaF theory, market reaction to forecast revisions based on substantive and nonsubstantive (no cash flow effect) changes in accounting method are analyzed. If investors are fixated on analyst revisions, positive (negative) revisions would lead to positive (negative) equity price movements. Financial analyst revisions preceding a period wherein an accounting change was adopted were analyzed using different samples and windows for calculating excess market returns.

The results provide evidence of a significant and positive correlation between the analyst's revision and the accounting change. The evidence suggests that the analysts' information set includes the current portion of the accounting change, and that it is incorporated into their revisions of income from operations. Furthermore, significant market reaction to analyst revisions is observed in a period wherein the firm adopts an accounting change. However, the direction of the price change, is in general, inconsistent with the proposed theory. Although the results are inconsistent with Financial Analyst Fixation, they nonetheless contribute to our understanding of investor behavior related to both analyst revisions and accounting changes.

Sales Forecast Accuracy

Chair: ***Kemal Büyükkurt***
Graduate School of Management, Koç University, Çayir Caddesi, 80860, Ýstanbul, Turkey

Neural Networks and Traditional Statistical Models as Forecasting Tools in Marketing Application

Stefania Pandelidaki
London Business School, Department of Decision Science, Sussex Place, Regent's Park, London NW1 4SA, UK
Andrew Neil Burgess
London Business School, Department of Decision Science, Sussex Place, Regent's Park, London NW1 4SA, UK

This paper reviews the recent applications of neural networks in marketing, and compares them with the traditional applications of statistics in the field. Consumer classification and market response modelling are the two major areas where neural networks demonstrate results that often outperform, in terms of predictive performance, statistical models such as linear/logistic regression, discriminant analysis, factor analysis or CHAID (Chi-Squared Automatic Interaction Detector). The paper focus on consumer classification through a comparative study between a logistic regression model and a back propagation neural network model used in order to identify cross-sales potential for software products and to sharpen targeting within marketing campaigns. The data we used were company level cross-section data and our findings show that the two methods perform the same. The reasons for this are investigated together with the conditions under which the results hold. Additionally, alternative neural networks architectures were considered.

Predicting Short-Term Sales Cycles with Weekly Point-Of-Sale Data

Hans Levenbach
Delphus Inc., 103 Washington St. Suite 348, Morristown, NJ 07960 USA
Bill Sichel
Monet Group, 16 E 34th Street, New York, NY 10016, USA

The retail industry is faced with increasingly shortened leadtime demands due to changing customer-supplier relationships and overall competitive and profitability pressures. Many retailers utilize weekly POS data to improve forecasting accuracy of detailed product sales by customer location. In this talk we describe an analysis of weekly cycles in the costume jewelry industry and show how weekly forecasts can be effectively combined to improve forecasts of very short-term trends.

Situational Factors and Sales Forecast Accuracy

Douglas C. West
Henley Management College, Greenlands, Henley-on-Thames, Oxfordshire RG9 3AU, UK

Over the past twenty years three distinct strands of sales forecasting studies have developed in the marketing literature. These have been: accuracy, combining forecasts, and the organizational context. This paper belongs to the latter grouping. It examines the situational factors affecting sales forecast accuracy from a marketing management perspective. There is an emerging consensus that no one forecast method or category of methods provides marketers with an ideal solution for all circumstances. The question asked is: "*what kind of situation will lead forecast accuracy to improve or decline?*". A clearer understanding of situational factors will enable marketing managers to make better forecasts. Findings are based on a mail questionnaire to 900 senior marketers, which achieved a 37 per cent response rate. In view of the literature, the key variables examined are sales, employment, market type, product, company growth, volatility of sales, sources of data and the timing of forecast reviews.

Issues in Forecasting V

Chair: ***Richard Hoptroff***
Right Information Systems Limited, 9 Westminster Palace Gardens, Artillery Row, London SW1P 1RL, UK

Theory Underlying the Classification of Business and Economic Forecasting as a Profession

Vladimir J. Simunek
Department of Economics and Finance-CBA, College of Business Adminitration, St.John's University, Jamaica, NY 11439, USA

This paper corroborates five criteria that specify the contents, direction, and purposes of a forecaster's work. These criteria are based on foundations laid out by the economic theory and contribute to specifications of distinctions between the forecaster's, planner's, and decision makers roles. Findings support the view that business and economic forecasting as a branch of economics is a specific field of knowledge to which statistics, econometrics, mathematical economics, economic psychology, and other segments of science serve as supporting and not determining factors.

Do Forecasts Add Value?

Rae Weston
Ernest Jordan
Macquarie Graduate School of Management, Macquarie University, NSW 2109, Australia

Alongside the long-run purchasing power parity estimates and the short-run interest-rate parity estimates (reflected in the forward rates) appear currency forecasts for 3, 6 and 12 months ahead. It is the purpose of this contribution to test whether these forecasts for the US/Canadian dollar, US/Australian dollar and US/New Zealand dollar have, over the past four years, added value.

While there is considerable literature on the relationship of the US dollar to other major currencies, little has been provided about the lesser volume currency relationships between the US dollar and the Australian and New Zealand dollars. The US/Canadian dollar is used as a yardstick in this study. We use two-weekly data giving currency forecasts for 3, 6 and 12 months forward, and compare these with the PPP and forward rate forecasts for 1993-96.

In the light of the argument by Rose (1994) that exchange rates may not be economic phenomena, there is a new importance in testing the information content of forecasts that may add external factors to the explanation of movements.

Forecasting for the Masses

Richard Hoptroff
Right Information Systems Limited, 9 Westminster Palace Gardens, Artillery Row, London SW1P 1RL, UK

We have extensively researched the aspects of forecasting which are most important to business people. This paper outlines the conclusions of this research, and covers:

- The current range of skills in the business community
- Key factors involved in encouraging the use of more sophisticated forecasting techniques:
  1. Low cost; 2. Speed with which results are obtained; 3. Robustness to naive use; 4. Ease of use without a statistical background; 5. Accuracy of results
- The potential dangers of encouraging the use of forecasting software in place of expert forecasters.

—E—

—F—

—G—

—H—

—I—

—J—

—K—

—L—

—M—

—N—

—O—

—Ö—

—O—

—Ö—

—O—

—Ö—

—O—

—Ö—

—P—

—Q—

—R—

—S—

—T—

—U—

—V—

—W—

—Y—

—Ý—

—Z—

—Þ—

Index

Index

Index